Set No._____

Project Manual
for
Construction of the

BCDC YOUTH DETENTION CENTER

at the
Baltimore City Detention Center
in the
Division of Pretrial Detention and Services (DPDS)

STATE OF MARYLAND
CONTRACT NO.: DPSCS KT-000-150-C01

5 FEBRUARY 2015

Department of Public Safety & Correctional Services
Stephen T. Moyer Secretary
David Bezanson, Assistant Secretary

Board of Public Works
Lawrence J. Hogan, Jr.,Governor
Peter Franchot, Comptroller
Nancy K. Kopp, Treasurer

Architect (A Joint Venture): **PSA-Dewberry + Penza Bailey Architects**

Joint Venture Prime / Contract Office
Penza Bailey Architects
401 Woodbourne Avenue
Baltimore, MD 21212

Joint Venture Prime / Security
PSA-Dewberry
401 SW Water Street #701
Peoria, IL 61602

Civil / Geotechnical / Environmental Engineer
EBA Engineering, Inc.
4813 Seton Drive
Baltimore, MD 21215

Structural Engineer
Hope Furrer Associates, Inc.
501 Fairmount Ave. Suite 205
Towson, MD 21286

Surveyor
Dewberry & Davis, LLC
3106 Lord Baltimore Drive
Baltimore, MD 21244

Mechanical / Plumbing / Elect. / IT / Telecom / MATV-CATV Fire Protection Engineer
Sidhu Associates, Inc.
11350 McCormick Drive #1000
Hunt Valley, MD 21031

Food Service / Laundry Consultant
R&R Designer, Inc.
5300 Holmes Run Parkway
Suite 1006
Alexandria, VA 22304

Landscape Architect
P.E.L.A. Design, Inc.
7400 York Road, Suite 403
Towson, MD 21204

Cost Estimator
Lewicki Estimating Services, Inc.
13600 Old Chatwood Place
Chantilly, VA 20151

Sustainability Consultant
TerraLogos Eco Architecture
2901 E. Baltimore Street, #300
Baltimore, MD 21224

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volume 1 of 6

Bid documents are available only online from eMaryland Marketplace (eMM). Those are the only official documents to be used by Bidders for this Invitation for Bid (IFB). The Bidders shall print on their own stationary the required documents for submitting their bid (as Construction BID Form, Bid Proposal Affidavit, BID Bond, etc.) and submit to the Owner (DPSCS, Division of Capital Construction and Facilities Maintenance) in a sealed envelope which clearly indicates that it contains a sealed bid for this project with the bid due date and the name and address of the Bidder.

Minority Business Enterprises (MBEs) are encouraged to participate and respond to this request for Bid.

CONFORMED DOCUMENT 3 APRIL 2015: This project manual contains sections revised during bidding, and is published for the Contractor's convenience for use during construction. It does not replace the Contract Documents, which comprise the Bid Documents plus revisions issued as Addenda.

VOLUME 1

DIVISION 00 – BIDDING AND CONTRACT REQUIREMENTS

DIVISION 01 - GENERAL REQUIREMENTS

VOLUME 2

DIVISION 02 – EXISTING CONDITIONS

DIVISION 03 - CONCRETE

DIVISION 04 – MASONRY

DIVISION 05 – METALS

DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES

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DIVISION 22 – PLUMBING

DIVISION 23 - HEATING VENTILATING AND AIR CONDITIONING

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VOLUME 6

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DIVISION 0

FORMS AND DOCUMENTS, INSTRUCTIONS TO BIDDERS, AND CONDITIONS OF THE CONTRACT

SECTION 00 10 00

PROFESSIONAL CERTIFICATIONS

SECTION 00 10 00 – PROFESSIONAL CERTIFICATIONS

PART 1 GENERAL

1.1 SECTION INCLUDES: PROFESSIONAL CERTICATIONS

1.2 ARCHITECT

PSA-Dewberry + Penza Bailey Architects, a *Joint Venture*

DEWBERRY ARCHITECTS
401 SW Water Street, Ste. 701
Peoria, IL 61602-1530
309-282-8100

The Contract Documents for the indicated public improvement were prepared under my supervision, and, to the best of my knowledge, information and belief, they comply with the relevant building codes of the State of Maryland.
License Number: 13814
Expiration Date: 3-28-15

Seal and Signature
James L. Beight

PENZA BAILEY ARCHITECTS
401 Woodbourne Ave
Baltimore, MD 21212
410-435-6677

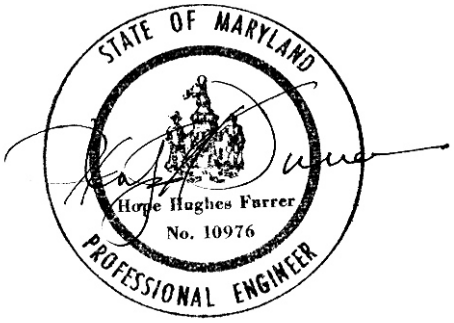
The Contract Documents for the indicated public improvement were prepared under my supervision, and, to the best of my knowledge, information and belief, they comply with the relevant building codes of the State of Maryland.
License Number: 6928-R
Expiration Date: 1-16-2016

Seal and Signature
Daniel L. Bailey

1.3 STRUCTURAL ENGINEER

Hope Furrer Associates, Inc.
501 Fairmount Ave. Suite 205
Towson, MD 21286
410-583-4874

I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed professional engineer under the laws of the State of Maryland.
License Number: 10976
Expiration Date: 6-9-16



Seal and Signature
Hope H. Furrer, PE

1.4 MECHANICAL ENGINEER

Sidhu Associates, Inc.
11350 McCormick Drive #1000
Hunt Valley, MD 21031
410-329-1115

I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed professional engineer under the laws of the State of Maryland.
License Number: 43481
Expiration Date: 5-15-2015

Seal and Signature
Dexter W.O'Neil, PE

1.5 PLUMBING ENGINEER

Sidhu Associates, Inc.
11350 McCormick Drive #1000
Hunt Valley, MD 21031
410-329-1115

I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed professional engineer under the laws of the State of Maryland.
License Number: 43481
Expiration Date: 5-15-2015

Seal and Signature
Dexter W.O'Neil, PE

1.6 FIRE PROTECTION ENGINEER

Sidhu Associates, Inc.
11350 McCormick Drive #1000
Hunt Valley, MD 21031
410-329-1115

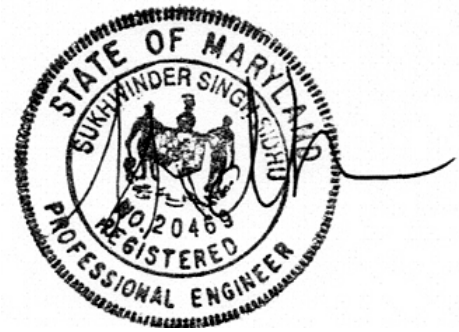
I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed professional engineer under the laws of the State of Maryland.
License Number: 43481
Expiration Date: 5-15-2015

Seal and Signature
Dexter W.O'Neil, PE

1.7 ELECTRICAL ENGINEER

Sidhu Associates, Inc.
11350 McCormick Drive #1000
Hunt Valley, MD 21031
410-329-1115

I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed professional engineer under the laws of the State of Maryland.
License Number: 20469
Expiration Date: 6-3-2016

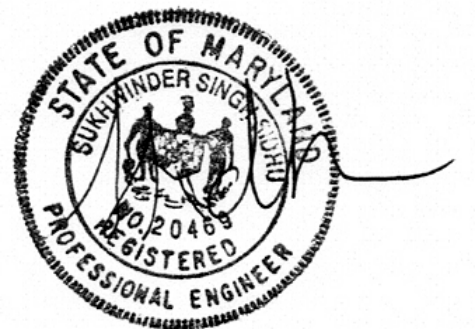


Seal and Signature
Sukhwinder S. Sidhu, PE

1.8 COMMUNICATIONS ENGINEER

Sidhu Associates, Inc.
11350 McCormick Drive #1000
Hunt Valley, MD 21031
410-329-1115

I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed professional engineer under the laws of the State of Maryland.
License Number: 20469
Expiration Date: 6-3-2016

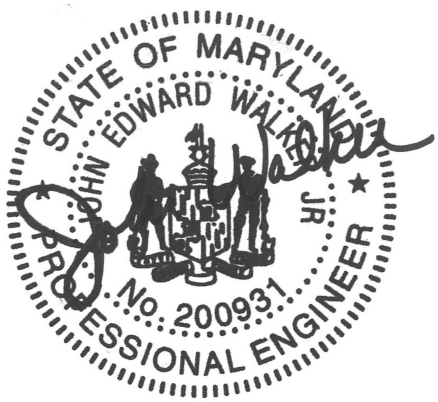


Seal and Signature
Sukhwinder S. Sidhu, PE

1.9 CIVIL ENGINEER

EBA Engineering, Inc.
4813 Seton Drive
Baltimore, MD 21215
410-358-7171

I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed professional engineer under the laws of the State of Maryland.
License Number: 200931
Expiration Date: 7-9-2015

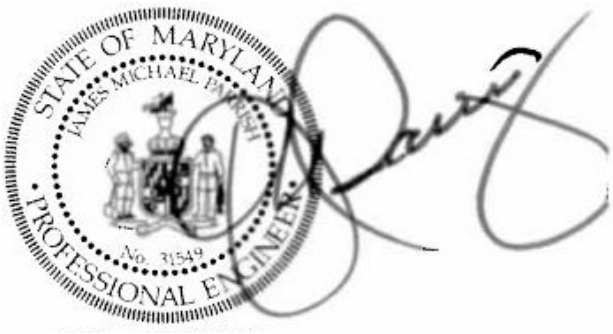


Seal and Signature
John E. Walker, Jr., PE

1.10 SECURITY ELECTRONICS ENGINEER

Dewberry Security
401 SW Water Street #701
Peoria, IL 61602
309-282-8000

I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed professional engineer under the laws of the State of Maryland.
License Number: 31549
Expiration Date: 3-14-2015



Seal and Signature
Michael Parrish, PE

1.11 GEOTECHNICAL ENGINEERS

EBA Engineering, Inc.
4813 Seton Drive
Baltimore, MD 21215
410-358-7171

I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed professional engineer under the laws of the State of Maryland.
License Number: 18565
Expiration Date: 1/19/2016

Seal and Signature
Steven W. Diggins, PE

END OF SECTION 00 10 00

SECTION 001250

CONSTRUCTION BID FORM

DO NOT USE THIS FORM FOR SUBMITTING THE BID. USE FORM PROVIDED BY THE ISSUING OFFICE.

CONSTRUCTION BID FORM

Date Submitted:_____

STATE OF MARYLAND
Department of Public Safety and Correctional Services (DPSCS)
Division of Capital Construction and Facilities Maintenance (DCCFM)
Carl Lazerow; Director and Procurement Officer
6776 Reisterstown Road, Suite 201, Plaza Office Center
Baltimore, Maryland 21215-2341
DPSCS CONTRACT NO: KT-000-150-C01

Gentlemen:

The undersigned hereby submits its Bid for the construction of the following Contract:

BCDC Youth Detention Center, Baltimore Detention Center, Baltimore, Maryland

1. The undersigned has received, read, and fully understands:

   The Drawings and Project Manual for the project, dated February 5, 2015 as prepared by PSA-Dewberry + Penza Bailey Architects, a Joint Venture, including the "Instructions to Bidders," and the "General Conditions," contained therein.

   Addenda to above numbered and dated:

   _____
   (Insert all addendum numbers and respective issue dates)

   _____
   (Insert all addendum numbers and respective issue dates)

   _____
   (Insert all addendum numbers and respective issue dates)

   _____
   (Insert all addendum numbers and respective issue dates)

2. The undersigned has examined the site, existing structures, access roads, existing utilities, fencing, and all existing conditions that affect the construction bid.

3. The undersigned is able to provide all the materials, products, labor, equipment, supervision, managerial and professional services necessary for the Contract, and is able

_____ _____
(Sign for Identification) Firm Name (Please PRINT or Type)

to construct the Contract as intended by the Contract Documents (Drawings, Project Manual, and Addenda).

4. The undersigned is able to complete this project within the stipulated calendar days and/or critical completion dates specified in the Contract Documents.

5. The undersigned understands that this Construction Bid Form must be completed and submitted by the Bidder in its entirety to be considered a responsive Bid. Failure to completely fill in all blanks, including Unit Price Schedule, may be cause for rejection of Bid.

6. The undersigned understands that the Minority Business Enterprise (MBE) Utilization overall total goal shall be **THIRTY PERCENT (30%) of the BID with SUBGOAL REQUIREMENTS,** as stated below and in the General Conditions of the Contract between Owner and Contractor, Section 10. The minimum percentage of MBE participation as proposed by the Bidder shall be documented and maintained at the time of contract award.

   Subgoals: **7%** African American-owned MBE, **4%** Asian-owned MBE;

   If a bidder is unable to achieve the MBE Utilization goal, the bidder shall request a waiver on forms **DPSCS OS 01A MBE (**MBE Utilization and Fair Solicitation Affidavit and Participation Schedule)**, DPSCS OS 01B MBE (**MBE Participation Waiver Guidance), & **DPSCS OS 01C MBE** (Good Faith Efforts Documentation to Support Waiver Request).

7. The undersigned understands that the Veteran Owned Small Business Enterprise (VSBE) Utilization overall total goal shall be **ONE PERCENT (1%) of the BID,** as stated below and in the General Conditions of the Contract between Owner and Contractor, Section 10. The minimum percentage of VSBE participation as proposed by the Bidder shall be documented and maintained at the time of contract award. If a bidder is unable to achieve the VSBE Utilization goal, the bidder shall request a waiver on forms **DPSCS OS 11B MBE** (VSBE Waiver Guidance) and **DPSCS OS 11C MBE** (VSBE Good Faith Effort Documentation to Support Waiver Request).

8. The undersigned understands that the completed MBE forms **DPSCS OS 01A MBE** (MBE Utilization and Fair Solicitation Affidavit and Participation Schedule) and **DPSCS 0S 11A MBE** (VSBE Utilization Fair Solicitation Affidavit Participation Schedule with Instructions) **MUST BE SUBMITTED WITH THE BID**.

   The undersigned also understands that if the undersigned fails to submit these forms with the Bid as required, the procurement officer shall deem the Bid non-responsive. The undersigned clearly understands that failure to comply with the affirmative action plan requirement may cause the Bid to be considered non-responsive.

(Sign for Identification) Firm Name (Please PRINT or Type)

9. The undersigned understands that if the undersigned is the apparent Awardee, the undersigned shall submit to the State the MBE documentation as herein stated and specified in Section 10 of the "State of Maryland General Conditions."

   The undersigned understands that the completed MBE forms **DPSCS OS 03A MBE** (MBE Subcontractor Project Participation Certification), **DPSCS 0S 03B MBE** (MBE Prime Project Participation Certification), and **DPSCS OS 04 MBE** (Outreach Efforts Compliance Statement), as applicable, must be submitted within 10 working days of notification of apparent awardee.

10. The undersigned provides its eMaryland Market Place Vendor ID on Page 14 of this Construction Bid Form.

Having carefully examined the "Instructions to Bidders", the "General Conditions", technical specifications, drawings and addenda, and having received clarification from the State on any and all issues, questions and items of conflict or upon which any doubt arose, the undersigned proposes to furnish all materials, labor, equipment, supervision, managerial, and professional services necessary for the project in accordance with the contract documents.

(This Space is Intentionally Left Blank)

(Sign for Identification) Firm Name (Please PRINT or Type)

A. AWARD OF CONTRACT:

The **Contract** will be awarded to the responsible Bidder submitting the lowest responsive **LUMP SUM BID PRICE**, which shall include the total cost to complete all the work specified in the solicitation documents inclusive of the **LUMP SUM PRICE** for the **SPECIALTY ALLOWANCE SCHEDULE A** and the **LUMP SUM PRICE** for the **UNIT PRICE SCHEDULE B,** in accordance with DPSCS "Instructions To Bidders For Construction Contracts"**.** The State reserves the right to reject any or all bids, at its sole discretion, in the interest of the State of Maryland.

The BID: The **LUMP SUM PRICE** for construction of the Project as described in Section 01 10 00 – Summary, within the limits defined in the Contract Documents, inclusive of Contractor's staging area, temporary facilities, fencing, and access drives, and all other Work as written, drawn, and/or indicated in the Contract Documents. The **LUMP SUM BID PRICE** includes all work in place including the required demarcation line terminations/interface points for structures and utility systems as described in the Summary of Work and as otherwise required by the Contract Documents. The price shall include all materials and labor, overhead, profit, applicable fees, permits and sales tax, to provide a complete and fully operational system inclusive of any other associated Work. Work shall be performed within the time identified herein.

The SPECIALTY ALLOWANCE SCHEDULE A and UNIT PRICE SCHEDULE B: The **LUMP SUM PRICE** for the **SPECIALTY ALLOWANCE SCHEDULE A** and the **UNIT PRICE SCHEDULE B** is as described in Section 01 21 00 Specialty Allowances, and Section 01 22 00 Unit Price Allowances. These **LUMP SUM PRICES** include all work in place including the required demarcation line terminations/interface points for structures and utility systems as described in the Summary of Work and as otherwise required by the Contract Documents. The price shall include all materials and labor, overhead, profit, applicable fees, permits, and sales tax, to provide a complete and fully operational system inclusive of any other associated Work. Work shall be performed within the time identified herein.

It is understood that the **BID** price will remain firm for a time period of **one hundred and twenty (120) calendar days from the Bid Opening Date**; and that if the undersigned be notified of acceptance of this proposal within this time period, the undersigned shall execute a contract for the above stated compensation(s); and shall complete the contract work in accordance with the sequences called for within the Contract Documents; and in accordance with and within the duration indicated hereinafter from the Notice-to-Proceed (NTP) date, and furthermore agrees that if the work is not completed within the time period specified, the Contractor will be liable for Liquidated Damages as specified in the "General Conditions", Section 7.06.O.

(Sign for Identification) Firm Name (Please PRINT or Type)

B. **BID:** The following **LUMP SUM BID PRICE,** includes **LUMP SUM TOTAL PRICE** for the **SPECIALTY ALLOWANCE SCHEDULE A** and the **LUMP SUM TOTAL PRICE** for the **UNIT PRICE SCHEDULE B**, as required by the Contract Documents:

_____ Dollars
Written

($)_____
Figures

Failure to properly and completely fill in all blanks, may be cause for rejection of this Bid.

C. SPECIALTY ALLOWANCE - SCHEDULE A:

The Specialty Allowance Prices in **Specialty Allowance Schedule A** are for contractual purposes as indicated and shall be included in the **LUMP SUM BID (Paragraph B, above)**. Prices shall remain in effect for the duration of the Contract. The Specialty Allowance shall be used only as directed and approved by the Owner indicating amounts to be charged to the allowance. The Specialty Allowance shall include all material, labor, incidentals, other direct and indirect costs, overhead, taxes, insurance, profits, applicable fees, permits, and sales tax. Work shall be performed within the time identified.

The Contractor is responsible, through the Contractor's Construction Inspection and Testing Firm (CCITF), to determine measurement of material and quantities per the Contractor's Quality Control Program. The State reserves the right to verify materials and quantities through the State's Construction Inspection and Testing Firm (SCITF). Payment for any Construction Allowance items will be made on the basis of the quantities as actually measured in place where applicable. All items of work required for **Specialty Allowance Schedule A** shall be completed in compliance with the Contract Documents for this Project.

Specialty Allowance Schedule A is provided in the Contract as an Allowance for use by the Owner. All items of work may or may not be utilized during the Contract Period. All remaining and unused portions of the Allowance shall revert to and be credited to the State, or may be used for any other Contract work as requested by the Owner. The Contractor will not be allowed to submit a claim against the State should the items be eliminated entirely or in part.

SPECIALTY ALLOWANCE SCHEDULE A				
#	Task	Quantity/ Unit	Unit/Cost	Item Total
SA-1	Removal of Unknown Below-Grade Site Structures: In accordance with description and requirements in Section 01 21 00 Specialty Allowances.	1	$ 30,000.00	$ 30,000.00

_____ _____
(Sign for Identification) Firm Name (Please PRINT or Type)

SA-2	Removal of Hazardous Roof Material: In accordance with description and requirements in Section 01 21 00 Specialty Allowances.	1	$ 25,000.00	$ 25,000.00
SA-3	Removal of Hazardous Material from Existing Fire Suppression System and Fire Alarm/Detection System in the OSTC Portion of SUI Building: In accordance with description and requirements in Section 01 21 00 Specialty Allowances.	1	$15,000.00	$15,000.00
SA-4	Repair of the Existing Concrete Masonry Partition that Separates the Renovated YDC Portion of the SUI Building from the OSTC Portion of the SUI Building: In accordance with description and requirements in Section 01 21 00 Specialty Allowances	1	$10,000.00	$10,000.00
SA-5	Upgrade to Existing Fire Suppression System in OSTC Occupied Portion of SUI Building In accordance with description and requirements in Section 01 21 00 Specialty Allowances.	1	$45,000.00	$45,000.00
SA-6	Resolution to Unknown Below Grade or Hidden Utility Conflicts In accordance with description and requirements in Section 01 21 00 Specialty Allowances.	1	$25,000.00	$25,000.00
SA-7	Penetration Scan of First Floor "Dox Plank" Type Slab System in YDC Renovation Area of SUI Building to Locate Existing Reinforcing for New Openings In accordance with description and requirements in Section 01 21 00 Specialty Allowances.	1	$10,000.00	$10,000.00
SA-8	Maintenance of Electrical Service to Occupied Areas of SUI Building: In accordance with description and requirements of Section 01 2100 Specialty Allowances.	1	$30,000	$30,000
SA-9	Repairs to Existing 15kV Switchgear in D-Block Basement: In accordance with description and requirements of Section 01 20 00 Specialty Allowances.	1	$7,500	$7,500
			LUMP SUM TOTAL	$ 197, 500.00

Total **LUMP SUM PRICE** for **SPECIALTY ALLOWANCE SCHEDULE A** as required by the Contract Documents**:**

One Hundred Ninety-seven Thousand Five Hundred & 00/100 Dollars
Written

($) **197,500.00**
Figures

- **Include Lump Sum Price for the Specialty Allowance in the Lump Sum Bid Price, Paragraph B, above**

(Sign for Identification) Firm Name (Please PRINT or Type)

D. UNIT PRICE SCHEDULE B:

The Unit Prices in **Unit Price Schedule B** are for contractual purposes as indicated and shall be included in the **LUMP SUM BID (Paragraph B, above)**. Prices shall remain in effect for the duration of the Contract. The Unit Prices are for work beyond the limits of work indicated in the Contract documents and will be used to increase or decrease the Contract Sum. The Unit Price will be used only as directed by the Owner indicating amounts to be charged to the allowance. The Unit Prices shall include all material, labor, incidentals, other direct and indirect costs, overhead, taxes, insurance, profits, applicable fees, permits, and sales tax. Work shall be performed within this Contract time.

The Contractor is responsible, through the Contractor's Construction Inspection and Testing Firm (CCITF), to determine measurement of material and quantities per the Contractor's Quality Control Program. The State reserves the right to verify materials and quantities through the State's Construction Inspection and Testing Firm (SCITF). Payment for any Unit Price items will be made on the basis of the quantities as actually measured in place where applicable. All items of work required for **Unit Price Schedule B** shall be completed in compliance with the Contract Documents for this Project.

Unit Price Schedule B is provided in the Contract for use by the Owner. All items of work may or may not be utilized during the Contract Period. All remaining and unused portions of the Allowance shall revert to and be credited to the State, or may be used for any other Contract work as requested by the Owner. The Contractor will not be allowed to submit a claim against the State should the items be eliminated entirely or in part.

UNIT PRICE SCHEDULE B				
#	Task	Quantity-Unit	Cost/Unit	Item Total
UPA-1	Filling of Existing Openings in Gypsum Deck System in YDC Renovation Area of SUI Building In accordance with description and requirements in Section 01 22 00 Unit Price Allowances. Unit of Measurement: Payment will be made for the actual number of square feet of floor system repair, in place.	500 SF	$_____/SF	$_____
UPA-2	Rock Excavation: In accordance with description and requirements in Section 01 22 00 Unit Price Allowances. Unit of Measurement: Payment will be made for the actual number of cubic yards of rock excavation.	250 CY	$_____/CY	$_____

(Sign for Identification) Firm Name (Please PRINT or Type)

UPA-3	Removal of Unsuitable Material (backfill with structural fill material): In accordance with description and requirements in Section 01 22 00 Unit Price Allowances. Unit of Measurement: Payment will be made for the actual number of cubic yards of fill material in place.	1,200 CY	$_____/CY	$_____
UPA-4	Removal of unsuitable material (backfill with aggregate fill material): In accordance with description and requirements in Section 01 22 00 Unit Price Allowances. Unit of Measurement: Payment will be made for the actual number of cubic yards of fill material in place.	1,500 CY	$_____/CY	$_____
UPA-5	Provision of Exit Signs, in Place: In accordance with description and requirements in Section 01 22 00 Unit Price Allowances. Unit of Measurement: Payment will be made per exit sign, in place. Each sign shall include 100 linear feet of wiring.	10 EA	$_____/EA	$_____
UPA-6	Provision of Security Cameras: In accordance with description and requirements in Section 01 22 00 Unit Price Allowances. Unit of Measurement: Payment will be made for each camera type, including 150 linear feet of wiring per camera.	5 EA 0.3 Mega Pixel Interior IP	$_____/EA	$_____
		5 EA 0.3 Mega Pixel Exterior IP	$_____/EA	$_____
		1 EA 1.3 Megapixel Exterior IP	$_____/EA	$_____
		2 EA 1.3 Megapixel Interior IP	$_____/EA	$_____
		1 EA Wall Mount V-Cell Fixed IP	$_____/EA	$_____
		3 EA Corner Mount V-Cell Fixed IP	$_____/EA	$_____

(Sign for Identification) Firm Name (Please PRINT or Type)

UPA-7	Patching of Existing Concrete Roof Slab where Roofing Material is Removed on SUI Building: In accordance with description and requirements in Section 01 22 00 Unit Price Allowances. Unit of Measurement: Payment will be made for the actual square feet of concrete leveling patch in place.	1200 SF	$_____/SF	$_____
UPA-8	Replacement of Conduit & Wiring for Existing OSTC Fire Alarm System In accordance with description and requirements in Section 01 22 00 Unit Price Allowances. Unit of Measurement: Payment will be made for actual linear feet of conduit/wiring replaced.	5000 LF	$_____/LF	$_____
UPA-9	Replacement of Duct Detectors for Existing OSTC Fire Alarm System In accordance with description and requirements in Section 01 22 00 Unit Price Allowances. Unit of Measurement: Payment will be made per duct detector, in place. Each detector shall include 100 linear feet of wiring.	10 EA	$_____/EA	$_____
UPA-10	Filling of Existing Small Unreinforced Openings (< .5 SF) in First Floor "Dox Plank" Type Slab System in YDC Renovation Area of SUI Building In accordance with description and requirements in Section 01 22 00 Unit Price Allowances. Unit of Measurement: Payment will be made for the actual number of square feet of floor system repair, in place.	250 SF	$_____/SF	$_____
UPA-11	Filling of Existing Large Reinforced Openings (> .5 SF) in First Floor "Dox Plank" Type Slab System in YDC Renovation Area of SUI Building In accordance with description and requirements in Section 01 22 00 Unit Price Allowances. Unit of Measurement: Payment will be made for the actual number of square feet of floor system repair, in place.	250 SF	$_____/SF	$_____

(Sign for Identification) Firm Name (Please PRINT or Type)

UPA-12	Filling of Existing Openings in Second Floor Metal Deck and Concrete Slab System in YDC Renovation Area of SUI Building In accordance with description and requirements in Section 01 22 00 Unit Price Allowances. Unit of Measurement: Payment will be made for the actual number of square feet of floor system repair, in place.	250 SF	$_____/SF	$_____
			LUMP SUM TOTAL	$

Failure to properly and completely fill in all blanks, may be cause for rejection of this Bid.

Total **LUMP SUM PRICE** for **UNIT PRICE SCHEDULE B** as required by the Contract Documents**:**

_____Dollars
Written

($) _____
Figures

- **Include the Unit Price Lump Sum Total in the <u>Lump Sum Bid Price, Paragraph B, above</u>**

_____ _____
(Sign for Identification) Firm Name (Please PRINT or Type)

E. PREQUALIFED DETENTION EQUIPMENT CONTRACTOR (DEC):

The Bidder shall name its **DETENTION EQUIPMENT CONTRACTOR (DEC)**, who on the Bidder's behalf, will provide the work described in the Contract Documents and who is one of the Prequalified Detention Equipment Contractors listed in Section 00 15 30 – List of Prequalified Detention Equipment Contractors. **Failure to properly fill in the DEC may be cause for rejection of the Bid.**

_____
Corporate/Company Name

_____
Address Telephone

F. PREQUALIFED SECURITY ELECTRONICS CONTRACTOR (SEC):

The Bidder shall name its **SECURITY ELECTRONICS CONTRACTOR (SEC)**, who on the Bidder's behalf, will provide the work described in the Contract Documents and who is one of the Prequalified Security Electronics Contractors listed in Section 00 15 30 – List of Prequalified Security Electronics Contractors. **Failure to properly fill in the SEC may be cause for rejection of the Bid.**

_____
Corporate/Company Name

_____
AddressTelephone

G. CLARIFICATIONS DURING BIDDING:

All questions related to this project are to be submitted in typed written format only, simultaneously to **DPSCS** and **the Architect**, **by email** no later than 4:00 pm, TEN (10) calendar days prior to the Bid Opening Date. All questions received after this time and date will not be answered. During the bid period, DPSCS, and the Architect will **not** answer telephone or verbal questions. A response to all valid questions will be answered by written Addendum only. Transmit questions to the following individuals as follows:

1. **DPSCS:** Andreana Aytch, Contract Specialist, Division of Capital Construction and Facility Maintenance (DCCFM), Department of Public Safety and Correctional Services (DPSCS): **email: dccfm@dpscs.state.md.us**

2. **PSA-DEWBERRY + PENZA BAILEY ARCHITECTS: email: ydc@penzabailey.com**

_____ _____
(Sign for Identification) Firm Name (Please PRINT or Type)

H. CONSTRUCTION PERIOD START DATE:

"Start Date" is the date stipulated in the "Notice to Proceed" (NTP) for the Contractor to begin as defined in Section 7.01 of the State of Maryland General Conditions.

I. CONTRACT TIME AND COMPLETION DATE:

In accordance with the State of Maryland General Conditions the **Substantial Completion Date** for the contract shall not exceed **Five Hundred Forty-eight (548) calendar days** from the Notice-to-Proceed (NTP) date. The following is a breakdown of the required schedule milestones and their respective completion calendar days:

CONSTRUCTION PHASE MILESTONES	CALENDAR DAYS PER PHASE	CUMULATIVE CALENDAR DAYS
Construction Notice-to-Proceed	0	0
Pre-Commissioning Completion	488	488
Commissioning: Includes all Commissioning Completion & LEED Testing Completion and Final Inspection	60	548
SUBSTANTIAL COMPLETION		**548**

J. LIQUIDATED DAMAGES:

Liquidated damages will be assessed on a per calendar day basis commencing on the day following the date established for the Substantial Completion Milestone. Liquidated damages will accrue until the Work is accepted and approved for use under the requirements established in the State of Maryland General Conditions Article 7.12, Substantial Completion and Final Inspection.

1. If Substantial Completion Milestone is not met, including all successful Commissioning and LEED testing, the Contractor shall be liable for liquidated damages of **Two Thousand-Five Hundred ($2,500.00)** Dollars for each calendar day, as provided in the General Conditions, Section 7.06, until the Substantial Completion is achieved.

K. BIDDERS KEY PERSONNEL QUALIFICATION REQUIREMENTS

It is agreed that if the undersigned is the apparent awardee, the undersigned shall submit to the State the Key Personnel Qualification documentation as specified in Section 00 15 20, Bidder's Key Personnel Qualification Requirements. Qualifications of each of the required Key Personnel shall be submitted not later than ten (10) working days of notification of apparent awardee.

(Sign for Identification) Firm Name (Please PRINT or Type)

L. PRELIMINARY PROGRESS SCHEDULE:

As required by the “State of Maryland Instructions to Bidders" and the “State of Maryland General Conditions,"the Contractor shall submit, within fourteen (14) calendar days following execution of the Contract, the Preliminary Progress Schedule in Gantt Bar Chart format, showing the intended start date (NTP), each milestone completion date noted above. The fully cost loaded Project CPM schedule shall be submitted to the State within thirty (30) calendar days following Notice-to-Proceed per Specification Section 01 32 00 of the Project Manual.

M. BID BONDS:

Submitted with this Bid shall be a fully executed Bid Bond in the amount of **5%** of the **TOTAL BID** (Base Bid + Allowances). Bid Bonds, except those of the three low bidders, will be returned after the Bid opening. Other bid bonds will be returned after the related contract has been executed. If no Bid has been accepted within one hundred and twenty (120) calendar days after the Bid opening, then any bond may be returned upon demand of the Bidder.

N. BID DOCUMENT AVAILABILITY:

Bid documents are available only online from eMaryland Marketplace (eMM). Those are the only official documents to be used by Bidders for this Invitation for Bid (IFB). The Bidders shall print on their own stationery the required documents for submitting their bid (such as Construction Bid Form, Bid Proposal Affidavit, Bid Bond, etc.) and submit to the Owner (DPSCS, Division of Capital Construction and Facilities Maintenance) in a sealed envelope which clearly indicates it contains a sealed bid for this project with the **project name, contract number, bid due date, and the name and address of the Bidder**.

(This Space is Intentionally Left Blank)

(Sign for Identification) Firm Name (Please PRINT or Type)

BCDC YOUTH DETENTION CENTER **BALTIMORE CITY DETENTION CENTER**
DPSCS CONTRACT NO. KT-000-150-C01 **BALTIMORE, MARYLAND**

_____
(Construction Firm License No.)

_____
(eMaryland Marketplace Vendor I.D.)

_____
(Federal Employer Identification No. or Social Security No., if no F.E. I. N.)

INDIVIDUAL PRINCIPAL

In Presence of: Firm Name:_____

Witness:_____ Signed:_____

Address:_____

_____

Phone Number: ( )_____

CO-PARTNERSHIP PRINCIPAL

In Presence of: Firm Name:_____

Witness:_____ Signed:_____

Address:_____

_____

Phone Number: ( )_____

_____as to By_____
(Witness) (Partner)

_____as to By_____
(Witness) (Partner)

_____as to By_____
(Witness) (Partner)

_____ _____
(Sign for Identification) Firm Name (Please PRINT or Type)

BCDC YOUTH DETENTION CENTER **BALTIMORE CITY DETENTION CENTER**
DPSCS CONTRACT NO. KT-000-150-C01 **BALTIMORE, MARYLAND**

JOINT VENTURE PRINCIPAL

_____
(Name of Joint Venture)

Address: _____

_____

Phone Number: ( ) _____

Attest:

_____ as to By _____
(Secretary) (Principal)

_____
(Firm Name)

_____ as to By _____
(Secretary) (Principal)

_____
(Firm Name)

CORPORATE PRINCIPAL

Attest:

_____ _____
(Corporate Secretary) (Name of Corporation)

Address: _____

_____

Phone Number: ( ) _____

_____ _____
(Sign for Identification) Firm Name (Please PRINT or Type)

BCDC YOUTH DETENTION CENTER **BALTIMORE CITY DETENTION CENTER**
DPSCS CONTRACT NO. KT-000-150-C01 **BALTIMORE, MARYLAND**

By:_____
(Corporate Principal)

(Affix Corporate Seal)

_____
(Print Name and Title)

The Bidder represents, and it is a condition precedent to acceptance of this Bid, that the Bidder has not been a party to any agreement to Bid a fixed or uniform price.

WITNESS:

_____ _____(SEAL)
(Signature of Officer and Title)

All Bidders shall:

SUBSCRIBED AND SWORN TO before me, a Notary Public of the State of

_____, County or City of_____

on this_____day of_____, 2015

_____
(Notary Public)

My Commission Expires:_____

Please submit this form, and pages 1 through 16 complete, with original signatures.

END OF CONSTRUCTION BID FORM

_____ _____
(Sign for Identification) Firm Name (Please PRINT or Type)

SECTION 001520

APPARENT AWARDEE'S KEY PERSONNEL QUALIFICATION REQUIREMENTS

SECTION 00 15 20 – APPARENT AWARDEE'S KEY PERSONNEL QUALIFICATION REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. This section is subject to the State of Maryland Department of Public Safety and Correctional Services General Conditions of the Contact between Owner and Contractor.

1.2 ADDITIONAL INFORMATION REQUIRED TO BE SUPPLIED BY THE APPARENT AWARDEE

A. This Section identifies specific requirements for Qualifications of the General Contractor's (Apparent Awardee's) Key Personnel.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 The apparent awardee shall submit the following information in accordance with the qualifications requirements stated herein.

3.2 Qualifications of each of the required Key Personnel, as noted herein, shall be submitted not later than ten (10) working days of notification of apparent Awardee.

3.3 INFORMATION REQUIRED:

APPARENT AWARDEE'S KEY PERSONNEL QUALIFICATION REQUIREMENTS

1. INTRODUCTION

1.1. The purpose of this Section is to seek key personnel qualification information from General Contractor who is the apparent awardee (herein referred to as "Apparent Awardee") for this construction contract.

2. PROCUREMENT AGENCY

These Qualification Requirements are set forth on behalf of the Owner.

2.1. Issuing Office:

State of Maryland, Department of Public Safety and Correctional Services (DPSCS)

Division of Capital Construction & Facilities Maintenance (DCC&FM)

6776 Reisterstown Rd, Suite 201

Baltimore, MD 21215

2.2. Procurement Officer:

Carl L. Lazerow, Director

DCC&FM

Email: cllazerow@dpscs.state.md.us

2.3. Contract Management Specialist:

Andreana Aytch

DCC&FM

Email: aaytch@dpscs.state.md.us

3. GENERAL INFORMATION

3.1. The Contract Management Specialist shall be the sole point of contact with the Owner for the purposes of preparation and submission of Qualifications. All questions on this Section are to be directed to the Contract Management Specialist.

4. REQUEST FOR PROPOSAL DOCUMENTS

4.1. This document constitutes the entire Key Personnel Qualifications package.

5. PRE-PROPOSAL WALK-THROUGH

5.1. See Invitation to Bid documents.

6. MANDATORY KEY PERSONNEL QUALIFICATION CRITERIA (Minimum Qualifications)

6.1. An unsatisfactory response to any item in the category titled "Mandatory Key Personnel Criteria" will be considered sufficient cause to disqualify an applicant from further consideration for Project Qualification.

6.2. The Apparent Awardee shall provide resume documentation with the qualifications for the following Project key personnel which meet or exceed the following criteria:

6.3. Apparent Awardee shall manage the Project with a Project Superintendent who has a minimum of 10 years of correctional and institutional facility experience which includes at least two (2) completed institutional projects of $15 million, or more, of similar type and complexity to the Project where the individual was the Project Superintendent; **RESUME REQUIRED FROM APPARENT AWARDEE;** AND

6.4. Apparent Awardee shall manage the Project with a Project Manager who has a minimum of 10 years of correctional and institutional facility experience which includes at least two (2) completed institutional projects of $15 million, or more, of similar type and complexity to the Project where the individual was the Project Manager; **RESUME REQUIRED FROM APPARENT AWARDEE;** AND

6.5. Apparent Awardee shall engage a full time LEED Construction Coordinator to manage the LEED certification requirements and LEED construction process on behalf of the Construction team. This individual must be LEED AP, but preferably LEED AP BD+C. The LEED Construction Coordinator must have a minimum of 8 years of LEED project experience, including LEED Silver or greater certified completed projects of similar size and complexity to this Project; **RESUME REQUIRED FROM APPARENT AWARDEE;** AND

6.6. Apparent Awardee shall engage a full time **Security Detention Construction Coordinator (SDCC)** to manage, coordinate, and ensure compliance with all Security related construction work and requirements, including integration with other new construction. The SDCC shall manage all Detention Equipment (doors, windows, hardware, enclosures, furnishings, materials, etc.), and all Security Electronic systems. This individual or firm must have a minimum of 8 years of Security detention equipment and systems project experience within correctional facilities, including two (2) completed correctional projects of $15 million or more; **RESUME REQUIRED FROM APPARENT AWARDEE;** AND

6.7. Apparent Awardee shall engage a **Commissioning Construction Coordinator** to manage, coordinate, and ensure compliance with all Commissioning requirements. This individual or firm must have a minimum of 8 years of project experience with the Commissioning of systems within institutional facilities of projects greater than $15 million; **RESUME REQUIRED FROM APPARENT AWARDEE;** AND

6.8. Substitutions during construction of the key personnel requested above must meet State approval and must meet the qualifications defined herein and as defined within the Project Manual and Contract Documents.

7. QUALIFICATION SUBMISSION CONTENT

7.1. Bid documents are generally subject to the Maryland Public Information Act ("PIA") except that certain documents permitted by PIA are exempt from public disclosure. Clearly mark any information that is considered confidential and privileged.

7.2. The Key Personnel Qualifications shall be submitted **not later than ten (10) working days of notification of apparent Award** and structured in the following manner addressing all the Mandatory Key Personnel Qualification Criteria listed in Paragraph 7, above. Information shall be satisfactory for posting and publication, unless expressly waived by the Contract Management Specialist, as follows:

7.2.1. Key Personnel Qualification Form (Attachment A)

7.2.2. **RESUMES REQUIRED FROM APPARENT AWARDEE** for each of the Key Personnel noted above.

8. ATTACHMENTS TO SECTION 001520

Attachment A: Key Personnel Qualification Form

DEPARTMENT OF PUBLIC SAFETY AND CORRECTIONAL SERVICES

ATTACHMENT A
KEY PERSONNEL QUALIFICATIONS

APPARENT AWARDEE

In Presence of:

Witness:_____

Firm Name:_____

Signed:_____

Address:_____

_____

Phone Number: ( )_____

APPARENT AWARDEE'S KEY PERSONNEL LISTING

A. Project Superintendent's Name:

_____

1. Years of Experience with Correctional / Institutional Projects (10 minimum):_____

2. Number of completed $15 million or greater institutional Projects (2 minimum) _____

_____

_____

_____

_____

_____

_____

3. Was the above designated Project Superintendent also the Project Superintendent on the Projects noted in A.2:

   Yes_____;

   No_____; If no, explain:_____

   _____

   _____

B. Project Manager's Name:

_____

1. Years of Experience with Correctional / Institutional Projects (10 minimum):_____

2. Number of completed $15 million or greater institutional Projects (2 minimum) _____

3. Was the above designated Project Manager also the Project Manager on the Projects noted in B.2:

   Yes_____;

   No_____; If no, explain:_____

   _____

   _____

C. LEED Construction Coordinator's Name:_____

1. Years of Experience with LEED Projects (8 minimum):_____

2. Number of certified LEED Silver or greater institutional Projects (no minimum) _____

3. LEED Professional Certification:

   LEED AP: Yes_____, No_____;

   LEED AP, BD + C: Yes_____; No_____;

   If no LEED Certification, explain:_____

   _____

   _____

D. Security Detention Construction Coordinator (SDCC)'s Name:

_____

1. Years of Experience with managing the Detention Equipment and Security Electronics systems work for Correctional Projects (8 minimum):

   _____

2. Number of completed $15 million or greater Correctional Projects where SDCC managed Detention Equipment and Security Electronics systems (2 minimum)

   _____

   _____

E. Commissioning Construction Coordinator's Name:

_____

1. Years of Experience with the Commissioning of systems for institutional projects of $15 million or more (8 minimum):

_____

F. Attach each Key Personnel's resumes. At a minimum, resumes shall include:

1. Name
2. Role in this Project
3. Project Experience: Provide project requirements noted herein for Key Personnel. Provide brief project description with responsibility of submitted firm or individual. Project description shall include year completed, and project size.
4. Years of experience: Total____; Years with Current Firm____;
5. Registrations, Professional Affiliations, and/or Professional Certifications
6. Education;
7. Other qualifications pertinent to this Project.
8. **Resume must be a maximum of 1 Page**

SECTION 001530

LIST OF PREQUALIFIED DETENTION EQUIPMENT AND SECURITY ELECTRONICS CONTRACTORS

SECTION 00 15 30 - LIST OF PREQUALIFIED DETENTION EQUIPMENT CONTRACTORS (DEC) AND/OR SECURITY ELECTRONICS CONTRACTORS (SEC)

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. This section is subject to the State of Maryland Department of Public Safety and Correctional Services General Conditions of the Contact between Owner and Contractor.

B. This Section includes the List of Prequalified Detention Equipment and Security Electronics Contractors as determined by an evaluation of mandatory criteria set forth by the State.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 On January 15, 2015, the State issued the ***"Request for Qualifications and Information for the Prequalification of Detention Equipment Contractors (DEC) and/or Security Electronics Contractors (SEC)"*** *for the* ***BCDC Youth Detention Center***. The State reviewed the submitted responses for compliance with the requirements and mandatory criteria set forth within the aforementioned Request for Qualifications**.**

3.2 In accordance with State of Maryland regulations, in addition to the Prequalified firms listed below, other prospective Detention Equipment Contractors and/or Security Electronics Contractors have the opportunity to submit their qualifications in accordance with the ***"Request for Qualifications and Information for the Prequalification of Detention Equipment Contractors (DEC) and/or Security Electronics Contractors (SEC)",*** **Attachment 1** to this Section 00 15 30.

A. Qualifications must be submitted no later than **2:00 pm, EST**, **February 17, 2015**.

B. POSTING OF ADDITIONS TO PREQUALIFICATION LIST:

1. If deemed responsive and in compliance with the requirements and mandatory criteria set forth within the aforementioned **Request for Qualifications and Information,** a revised list of prequalified Detention Equipment Contractors and Security Equipment Contractors will be posted on eMarylandMarketplace (eMM) no later than **February 19, 2015**:

   https://ebidmarketplace.com/publicVenSolList.asp

2. Furthermore, the revised list of prequalified Detention Equipment Contractors and Security Equipment Contractors will be included in the earliest issued **Addendum**, but no later than **February 26, 2015**.

3.3 The following is a **LIST OF PREQUALIFIED DETENTION EQUIPMENT CONTRACTORS (DEC) AND/OR SECURITY ELECTRONICS CONTRACTORS (SEC)** found to be compliant with all mandatory criteria (no ranking was applied):

LIST OF PREQUALIFIED DETENTION EQUIPMENT CONTRACTORS (DEC)				
#	NAME OF FIRM	ADDRESS	NAME OF CONTACT	PHONE # EMAIL
1	CCC Group, Inc. www.cccgroupinc.com	5797 Dietrich Rd. P.O. Box 200350 (78220) San Antonio, TX 78219	Randy DeMent Division Manager	210-662-1694 randyd@cccgroupinc.com
2	Argyle Security Group (Parent) ISI Detention Contracting Group www.argylesecurity.com	Argyle Security 12903 Delivery Dr. San Antonio, TX 78247	David Deason VP Estimating	210-495-5295 ddeason@argylesecurity.com
3	Pauly Jail Building Company, Inc. www.paulyjail.com	17515 Bataan Court Noblesville, IN 46062	Ricky Harrison Pre-Construction Manager	317-580-0833 rj@paulyjail.com
4	Maximum Security Products Corp. (MSP) www.maximumsecuritycorp.com	3 Schoolhouse Lane Waterford, NY 12188	Thomas Townson Estimating Manager	518-233-1800 t.townson@maximumsecuritycorp.com
5	Cornerstone Detention Products (Parent: Norment Security Group) www.cornerstonedetention.com	14000 Alabama Highway 20 Madison, AL 35756	David Tidwell	256-214-1587 dtidwell@cornerstonedetention.com
6	United Prison Equipment Co., Inc. www.unitedprison.com	6306 Fifth St. Green Lane, PA 18054	Marc Smith President	215 234-4683 marc.smith@unitedprison.com
7	Sweeper Metal Fabricators Corp. www.sweepermetal.com	1240 East Broadway Street Drumright, OK 74030	John Schiffmacher General Manager	918 352-2180 jschiff@sweepermetal.com
8	ESITECH, Inc. www.esitechinc.com	2506 Waco St. Richmond, VA 23294	Corey Lewis, Sr. Estimator	804 672-3223 clewis@esitechinc.com

LIST OF PREQUALIFIED SECURITY ELECTRONIC CONTRACTORS (SEC)				
#	NAME OF FIRM	ADDRESS	NAME OF CONTACT	PHONE # EMAIL
1	Accurate Controls, Inc. www.accuratecontrols.com	326 Blackburn St. Ripon, WI 54971	TJ Rogers President	920-748-6603 tjrogers@accuratecontrols.com
2	Argyle Security Group (Parent) ISI Controls dba Metroplex Control Systems (MCS) www.sdd.com	Argyle Security 12903 Delivery Dr. San Antonio, TX 78247	David Deason VP Estimating	210-495-5295 ddeason@argylesecurity.com
3	Pinnacle Integrated Systems, Inc. d/b/a P2 ABC Controls www.p2abc.com	600 Swedesford Rd. Malvern, PA 19355	Robert Betty President	610-644-8300 bbetty@p2abc.com
4	Stanley Convergent Security Solutions, Inc. www.stanleycss.com	14670 Cumberland Rd Noblesville, IN 46060	Matt Hildebrand Sales Engineer	317-703-1167 matt.hildebrand@sbdinc.com
5	Norment Security Group, Inc. www.cornerstonedetention.com	14000 Alabama Highway 20 Madison, AL 35756	David Tidwell	256-214-1587 dtidwell@cornerstonedetention.com
6	ESITECH, Inc. www.esitechinc.com	2506 Waco St. Richmond, VA 23294	Corey Lewis, Sr. Estimator	804 672-3223 clewis@esitechinc.com

ATTACHMENT 1

REQUEST FOR QUALIFICATIONS AND INFORMATION FOR THE PREQUALIFICATION OF DETENTION EQUIPMENT CONTRACTORS (DEC) AND/OR SECURITY ELECTRONICS CONTRACTORS (SEC)

BCDC YOUTH DETENTION CENTER.

1. INTRODUCTION

1.1. **PROJECT DESCRIPTION:** Department of Public Safety and Correctional Services (DPSCS), State of Maryland is set to construct a 60-cell new Youth Detention Center (YDC) facility in Baltimore City (herein referred to as "Project") for housing juvenile detainees charged as adults. The Facility, to be used by the Division of Pre-trial Detention and Services (DPDS), will include functions of housing, administration, security, medical, mental health, education, food services, visiting, recreation, etc. for 50 male and 10 female juveniles. The 3-story building totals approximately 61,604 gross sq. ft.: 37,929 gross sq. ft. of new construction; and 23,675 gross sq. ft. of renovation to SUI building. The project site is bounded by Eager Street to North, Forrest Street to the West, Greenmount Street to the East, and Truxton Street to the South.

1.1.1. The entire facility will be a maximum custody facility with related security detention systems and furnishings, and security electronics systems throughout.

1.1.2. The project will achieve at a minimum LEED Silver rating with the USGBC.

1.1.3. The project services will include commissioning and training.

1.2. The purpose of this **Request** is to seek qualifications information from:

1.2.1. **Detention Equipment Subcontractors (herein referred to as "Detention Equipment Contractors (DEC)")** interested in bidding for this construction contract and pre-qualify the competent Security Electronics Contractors.

1.2.2. **Security Electronics Subcontractors (herein referred to as "Security Electronics Contractor (SEC)")** interested in bidding for this construction contract and pre-qualify the competent Security Electronics Contractors.

1.3. List of current pre-qualified Detention Equipment Contractors and Security Electronics Contractors is included within this Invitation for Bids (IFB) and its related Bid documents.

1.3.1. **The project shall include, but not be limited to, Detention Equipment as follows:**

1) Detention Hollow Metal Doors and Frames – doors and frames shall be

constructed of commercial quality galvannealed steel, meet UL-752 Bullet Penetration and ASTM F 1450-12A Door Assembly Impact tests, as well as, other mandatory performance tests and requirements, and be manufactured by the following acceptable manufacturers: Chief Industries; Habersham Metal Product Co.

2) Detention Stainless Steel Windows – windows shall be constructed of 14 GA Stainless Steel and includes tool resisting steel bars, meet ASTM A 627-03 Security Steel Performance requirements, as well as, other mandatory quality performance tests and requirements, and be manufactured by the following acceptable manufacturers: C.M. Security Group, Inc.; Hope's Security Windows; Willo Products.

3) Detention Hollow Metal Windows – windows shall be constructed of 12 GA galvannealed hollow metal and includes tool resisting steel bars, meet mandatory performance tests and requirements, and be manufactured by the following acceptable manufacturers: Chief Industries; Habersham Metal Product Co.

4) Detention Enclosures – enclosures include detention bar grille partitions, bar grille doors, detention woven mesh assemblies, meet mandatory performance tests and requirements, and be manufactured by the following acceptable manufacturers: Kane Manufacturing Corp.; PDI, Inc.; or approved equal.

5) Detention Hardware – hardware includes detention hinges, detention electric locks, detention mechanical locks, detention closers, detention position switches, detention door accessories, sliding door locking devices, and security fasteners, and meet mandatory performance tests and requirements.

6) Detention Furnishings and Equipment – furnishings and equipment include detention mirrors, detention shower seats and stools, detention access panels, detention pistol lockers, detention deal drawers, and detention grab bars. The following shall be owner furnished and contractor installed: detention tables and chairs, detention bunks and desks, shelves, meet mandatory performance tests and requirements, and be manufactured by the following acceptable manufacturers: Chief Industries; Norix Group, Inc.; PDI, Inc.;

7) Detention Glazing – glazing types shall be laminated tempered glass, glass clad polycarbonate, laminated polycarbonate, and low-E insulating unit with glass clad polycarbonate. Types also vary in thickness, and fire resistance, forced-entry and ballistic resistance ratings. Glazing shall meet mandatory quality performance tests and requirements, especially ballistic resistance and forced-entry resistant performance tests.

1.3.2. **The project shall include, but not be limited to Security Electronics as follows:**

1) Programmable Logic Controller (PLC) – Designed for correctional control applications, the PLC: controls and monitors devices; activates relays; provides power to lock and unlock doors; opens and closes valves; turns on and off power to lights and receptacles; monitors sensors; monitors inputs from door position switches, duress push buttons, wireless duress system devices, perimeter detection devices, and other alarm devices.

2) Closed Circuit Television (CCTV) – Standalone, IP based network video management system that is serially integrated into the overall control system. The CCTV system manages and controls the video signals throughout the facility and consists of IP cameras (mega-pixel and conventional), dedicated network electronics, servers and storage devices. The NVR system provides digital storage of video from the cameras throughout the facility.

3) Intercommunication System (Intercom) – means of audio communication from fixed stations throughout the buildings to the control consoles with limited use of

distributed intelligence. Intelligent exchanges allow full switching control. The intercom system includes automated overhead paging capabilities with schedule annunciation.

4) Backbone System Cabling – Fiber Optic Cabling system that supports video, voice and data as indicated in the Project Documents relative to the implementation of the Security Electronics Systems.

5) Graphical User Interface (GUI) – interface between all of the sub-systems and the operator, to primarily include a computer, touchscreen monitor and the GUI software. The GUI software is configured with graphics representing the floor plans of the facility and the control/monitoring icons.

6) State of the art correctional control system.

7) Cabling systems will be routed overhead via square duct and cable tray. Cable tray is only to be used within the security equipment room; all wire and cable outside of the room will be in conduit.

8) Security equipment will be housed in wall mount NEMA enclosures and in 19" vertical equipment racks.

1.4. The proposed Facility is of utmost importance to the State and citizens of Maryland and must meet the scheduled completion date and the performance and quality goals to be provided in the subsequent.

1.5. Detention Equipment Contractors and Security Electronics Contractors must meet or exceed the mandatory qualifications stated herein to be prequalified to pursue the Detention Equipment **and/or** Security Electronics for this Project in the IFB phase.

2. PROCUREMENT AGENCY

2.1. **Issuing Office and Owner:**

State of Maryland, Department of Public Safety and Correctional Services (DPSCS)

Division of Capital Construction & Facilities Maintenance (DCC&FM)

6776 Reisterstown Rd, Suite 201

Baltimore, MD 21215

2.2. **Contract Management Specialist:**

Ed Hochstedt, DCC&FM, (410) 585-3040

Email: ehochstedt@dpscs.state.md.us

2.3. **Architect:**

Daniel Bailey, Penza Bailey Architects, (410) 435-6677

Email: dbailey@penzabailey.com

3. GENERAL INFORMATION AND SUBMITTAL OF QUALIFICATIONS

3.1. This document and attachments constitute the entire Request for Qualifications package.

3.2. **All questions shall be submitted to the Contract Management Specialist and copied to the Architect by email only, no later than 4:00 PM EST on February 13, 2015. NO PHONE CALLS.**

3.3. **An attached "pdf" file of the required qualification forms and information shall be submitted by email to the Contract Management Specialist, and copied to the Architect, on or before 2:00 PM EST on February 17, 2015, in order to be considered. Late proposals will not be accepted. The email subject line shall read "RFQ for YDC DEC and SEC".**

3.4. **Responsiveness to RFQ:** Only responsive applications will be considered and evaluated. A responsive application must be completed according to the instructions, and include all required forms and requested information.

3.5. **Arrears and Debarment Status:** By submitting an application, the DEC and SEC certifies that neither it nor any affiliated entity is currently listed on the debarred Contractor's list published by the State of Maryland Board of Public Works. Additionally, the DEC and SEC shall not be in arrears with State of Maryland corporate income and property taxes.

4. MANDATORY CRITERIA (Minimum Qualifications)

4.1. **Mandatory Construction Experience –** DEC and/or SEC must submit evidence of the continuous provision of successful Detention Equipment and/or Security Electronic construction Work for institutional facilities for a minimum of 5 years. This Work shall include, but not be limited to, the design, provision (furnishing and installation), testing and troubleshooting of all aspects of detention equipment/systems, and/or an integrated security electronics system. The DEC and/or SEC shall have exhibited dependable performance, quality workmanship, prompt maintenance service, and have readily available spare parts. The minimum experience requirements for prequalification include the following:

4.1.1. **Project Experience Qualification Submission Requirements:**

1) Detention Equipment Work: of at least three (3) building construction projects where the Detention Equipment Work was $1 million or more (Detention Equipment Contract costs only, without General Contractor markups) and completed within the past seven (7) years by the Detention Equipment Contractor, where the Detention Equipment Contractor was the prime Detention Equipment Contractor; AND/OR

2) Security Electronics Work: of at least three (3) building construction projects where the Security Electronics Work was $1 million or more (Security Electronics Contract costs only, without General Contractor markups) and completed within the past seven (7) years by the Security Electronics Contractor, where the Security Electronics Contractor was the prime Security Electronics Contractor; AND/OR

3) **If the submitting entity intends to prequalify for both the Detention Equipment Work and the Security Electronics Work, the same project may be used if that project meets the minimum criteria noted in 4.4.1, 1) and 2). (Hence, a total of three (3) projects would be submitted if those projects qualified for both Detention Equipment and Security Electronics Work).**

4.1.2. **All of the projects in 4.4.1 must have been public sector, maximum-security type correctional facilities, and completed and operational for one (1) year.**

5. MANDATORY KEY PERSONNEL QUALIFICATIONS

5.1. The DEC's and SEC's Project Manager and Key Personnel must have been involved in the role for which they will perform on this project on a minimum of two of the projects listed in 4.1.1; Show evidence of past performance as required; AND

5.2. DEC and/or SEC shall closely collaborate with the General Contractor's Security Detention Construction Coordinator (SDCC) in the performance of its Work; AND

5.3. Substitutions during construction of the personnel requested above must meet State approval and must meet the qualifications defined herein.

5.4. **Personnel Qualification Submission Requirements:**

5.4.1. **DEC:** shall provide one (1) resume for the **DEC's Project Manager**. Project Manager shall have a minimum of 10 years of Detention Facility experience. It is preferred that this experience shall be with Correctional Facilities, including institutional experience with projects of equal scope, quality, type, and complexity to that required herein.

5.4.2. **SEC:** shall provide resumes for the **SEC's Project Manager and Security Electronics Network Engineer or Electronics Programmer** noted below. Project Manager shall have a minimum of 10 years of Security Facility experience, and the Key Personnel shall have a minimum of 7 years experience. It is preferred that this experience shall be with Correctional Facilities, including institutional experience with projects of equal scope, quality, type, and complexity to that required herein.

1) **SEC Project Manager:** SEC Project Manager shall be factory trained and certified in the major systems and subsystems to be provided. SEC Project Manager shall be certified by one of the professional associations related to Security Electronics and integrated control systems.

2) **Security Electronics Network Engineer or Electronics Programmer:** Network Engineer or Electronics Programmer shall be factory trained and certified in network integration, design and troubleshooting of hardware and software components of the specified network solution(s). Network Engineer or Electronics Programmer shall be educated or trained in computer engineering and experienced in the project applications specifically for of security controls integration.

6. OWNER'S RIGHTS AND LIABILITIES

6.1. The State reserves and holds the following rights and options which may be exercised at its sole discretion with respect to the RFQ.

6.1.1. To prequalify responsible and responsive DEC's and SEC's, based upon the submitted proposal, any subsequent clarifications or changes thereto, and the State's evaluation and recommendations, that meets the mandatory requirements as set forth herein, and that best satisfies the requirements and the goals, objectives of the RFQ, the best interest of the State, and the public interest in general.

6.1.2. To supplement, amend, or otherwise modify the proposal requirements at any time after receipt of proposals.

6.1.3. To seek and receive clarifications on any proposal at any time during the procurement process.

7. PROPOSAL CONTENT

7.1. **The RFQ content shall be organized in the following manner addressing all Selection Criteria listed in Sections 4 and 5 above:**

- Cover Letter: Brief one page.
- Application for Prequalification (Attachment A)
- Resumes for Key Personnel listed herein.
- Qualifying Completed Projects (Attachment B)

DEPARTMENT OF PUBLIC SAFETY AND CORRECTIONAL SERVICES

REQUEST FOR PROPOSAL

REQUEST FOR QUALIFICATIONS AND INFORMATION FOR THE PREQUALIFICATION OF DETENTION EQUIPMENT AND/OR SECURITY ELECTRONICS CONTRACTORS FOR THE CONSTRUCTION OF THE BCDC YOUTH DETENTION CENTER, BALTIMORE, MARYLAND

ATTACHMENT 1A

APPLICATION FOR PREQUALIFICATION

A set of attachments and any additional information should be included with each set.

1. ARE YOU SUBMITTING FOR DETENTION EQUIPMENT CONTRACTOR PREQUALIFICATION?

YES		NO	

2. ARE YOU SUBMITTING FOR SECURITY ELECTRONICS CONTRACTOR PREQUALIFICATION?

YES		NO	

3. Detention Equipment Contractor (DEC) or Security Electronics Contractor (SEC) Name

   (Provide all names under which the applicant does business):

   Is the DEC or SEC related to another firm as a parent, subsidiary, or affiliate?

YES		NO	

   If yes, provide names and addresses for all affiliated, parent and/or subsidiary companies, and state the nature of each affiliation.

4. Address:

5. Tax Identification Number (EIN/SSN):

6. Is DEC or SEC a corporation?

YES		NO	

   If yes, what is the State of incorporation?

7. If not incorporated, specify method and date of organization:

8. Provide a brief history of the Detention Equipment and/or Security Electronics Contractor and reflect project experience similar to that required for this project (**limit to space below**):

9. Provide contact information including name, title, phone number and email address of the person who can respond authoritatively to any questions regarding this response:

Name		Title	
Phone		Email	

10. **Mandatory Construction Experience – Project Experience:** Use **Attachment B** for description of Detention Equipment and/or Security Electronic portions of Projects in conformance with Paragraphs 4.1.1.

11. **Mandatory Key Personnel Qualifications:** Attach resumes for each of the Key Personnel in conformance with Paragraphs 5.4.1 and 5.4.2. (**Limit each resume to one page**)

12. Provide a brief understanding and approach of the scope, quality, interfaces, integrations, and technical aspects of the Detention Equipment and/or Security Electronics work. The understanding shall include the following (**limit to one page if submitting for only one prequalification category; if submitting for both DEC and SEC, limit to two pages**):

13. If there is any additional information the Detention Equipment Contractor and/or Security Electronics Contractor would like to provide, please attach (**limit to 1 page**).

Signed By		Phone No.	
Printed Name		Title	
Email			

DEPARTMENT OF PUBLIC SAFETY AND CORRECTIONAL SERVICES

REQUEST FOR PROPOSAL

REQUEST FOR QUALIFICATIONS AND INFORMATION FOR THE PREQUALIFICATION OF DETENTION EQUIPMENT AND/OR SECURITY ELECTRONICS CONTRACTORS FOR THE CONSTRUCTION OF THE BCDC YOUTH DETENTION CENTER, BALTIMORE, MARYLAND

ATTACHMENT 1B

PAST COMPLETED PROJECT

(For **each** cited project, the Detention Equipment Contractor and/or Security Electronics Contractor shall use a separate copy of this form to provide details of projects as required per Paragraph 6.4, Mandatory Construction Experience)

1. DEC or SEC Name: _____

   DEC Project Manager (if submitting for DEC): _____

   SEC Project Manager (if submitting for SEC): _____

2. Project Name: _____

   Project Location: _____

   Project Delivery System (GC, CM, Design-Build, etc.): _____

3. Owner: _____

   Address: _____

   Contact Person: _____

   Contact Title, Phone Number and Email Address:

Title			
Email		Phone	

4. Architect: _____

Contact		Email	

5. Contractor: _____

Contact		Email	

6. DEC or SEC Work Contract Completion Date: _____

7A. Detention Equipment Portion of Project (if submitting for DEC): Provide an understanding of the Detention Work, equipment, systems, furnishings involved, and services for which the DEC had responsibility (**limit to space below**):

7B. Security Electronics Portion of Project (if submitting for SEC): Provide an understanding of the Security Electronics Work, systems and integrations involved, and services for which the SEC had responsibility (**limit to space below**):

8. Total DEC Contract Value (if submitting for DEC): $

Total SEC Contract Value (if submitting for SEC): $

Value of DEC Change Orders (if submitting for DEC): $

Value of SEC Change Orders (if submitting for SEC): $

9. Was SEC or DEC Contractor the Prime SEC or DEC Contractor? YES NO

10. Was Project a Correctional Facility? YES NO

SECTION 00 15 40 - SECURITY

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Security program.

B. Entry control.

C. Personnel identification.

D. Project security

E. Fire protection

F. Executive Directive OPS.110.0002 dated 4-4-14

G. Secretary's Directive 04-07 dated 10-17-07

H. Criminal History Security Background Check

1.2 RELATED SECTIONS

A. Summary of Work: Contractor use of premises.

1.3 REFERENCES

A. DEPARTMENT OF PUBLIC SAFETY AND CORRECTIONAL SERVICES, State of Maryland EXECUTIVE DIRECTIVE OPS.110.0002, Custody and Security – Correctional Facility Construction Projects, dated April 4, 2014, (total of 4 pages) - attached. Refer to Appendix A.

B. DEPARTMENT OF PUBLIC SAFETY AND CORRECTIONAL SERVICES, State of Maryland SECRETARY'S DIRECTIVE – 04-07, dated October 17, 2007, (total of 6 pages) – attached. Refer to Appendix B.

C. DEPARTMENT OF PUBLIC SAFETY AND CORRECTIONAL SERVICES, Criminal History Security Background Check form (1 page) – attached. Refer to Appendix C.

1.4 SECURITY PROGRAM

A. Establish a Security Program as directed by Department's Representative to delineate identification process of Contractor's work force. Identify conduct of Contractor's employees in areas of inmate occupancy.

B. Provide outline of Contractor's responsibility for all materials, supplies, and resources during the Contract period.

C. Protect work existing on premises and Department's operations from theft, vandalism and unauthorized entry.

D. Initiate construction related security program in compliance with the Maryland Department of Public Safety and Correctional Institution prior to job mobilization.

E. Maintain program throughout construction period until Department acceptance precludes the need for Contractor security.

F. Projects that are located inside the secured perimeter of the correctional facility will have inmates present on site. Therefore, access to the site will be restrictive. All employees of the Contractor shall be subject to all rules and regulations of the facility. All vehicles shall have doors and tool bins locked at all times. Tools, equipment, materials, etc. shall be completely inaccessible to inmates at all times. All vehicles shall be removed at the end of each workday. All vehicles that must be left on site shall be disabled and shall have all doors, bins, etc. locked.

1.5 PERSONNEL IDENTIFICATION AND BACKGROUND CHECK

1. Employee List: Provide to DPSCS for identification purposes, a list of employees of Contractor, subcontractors, and other firms providing services for or otherwise assigned to this Project.
2. Complete “Criminal History Security Background Check” form for each employee expected to work on the project and give it to the Department’s representative.
3. Provide photographs and photo identification badges as directed by the Department’s Representative.
4. The Department’s Representative will maintain list and copies of photographs including negative, if applicable, on site.
5. Update list of accredited persons employed by Contractor on site. Report personnel changes to the Department’s Representative when they occur. Maintain the list and submit copies to Department on request.

B. Background Checks: The Department will conduct a criminal background investigation on all Contractor employees.

1. A positive finding of arrest and/or conviction will automatically result in denial to work on this Project.
2. The Department may reject any proposed employee based on the findings of the background check.
3. After an employee is cleared and approved to work on the project, the individual will be scheduled for a department issued photo identification card (in accordance with 1.7 below).

C. Orientation

1. Employees cleared to work on the project may be required to attend a briefing or orientation regarding working inside the secure perimeter of an occupied correctional facility.

1.6 ENTRY CONTROL

A. Allow entrance into project iste only to authorized persons with proper identification.

B. Maintain log of workmen and visitors; to be made available to DPSCS on request.

1.7 PERSONNEL IDENTIFICATION

A. The Contractor shall obtain an identification card from the institution for each person authorized to enter premises, including all employees of all Contractors and subcontractors.

B. The card shall include personal photograph, name and assigned number, expiration date and name of employer.

1.8 PROJECT SECURITY

A. General:

1. Project that are located inside the secured perimeter of the correctional facility. The following rules and regulations shall be adhered by:

a. Construction personnel are prohibited from talking to inmates.

b. Construction personnel are prohibited from giving to or receiving anything from inmates.

c. Alcoholic beverages, tobacco and drugs: PROHIBITED.

d. Construction and personnel vehicles will not be left in unattended running condition.

2. Additional facility rules and regulations are as follows:

a. The Contractor shall keep a daily inventory of all tools. Any lost or missing tools shall be reported immediately to the Department. The Contractor shall not let any tools lay around that are not in use.

b. The Contractor shall insure that all supplies and materials not being used are securely stored.

c. The Contractor shall chain and lock all ladders to a secure area when not in use.

d. All vehicles when not in use must be kept locked at all times. No keys are to be left in vehicles.

e. Under no circumstances is glue or gas to be left unattended. The Contractor must dispose of these items off the property at the end of each workday.

f. No type of debris shall be left lying around. Any materials not used must be taken to the storage area.

g. No contact permitted with the inmates.

h. These rules and regulations will be reviewed at the initiation conference prior to the Contractor commencing the work.

B. Construction Materials and Tools:

1. Flammable Liquids:

a. Maintain flammable liquid (e.g., gasoline, fuels, etc.) containers in locked condition at all times.

b. Remove containers at end of each workday.

2. Tools: Maintain tools and related equipment (e.g., hack saw blades, etc.) in protective custody at all times.

C. Construction Personnel Vehicle Parking:

1. Parking spaces, for privately owned vehicles operated by construction personnel will be limited. Construction personnel are not to park within 3 blocks of the perimeter of the Baltimore City Corrections Complex so as not to consume spaces for Corrections employees.

2. The Department's Representative will not assign areas within the Project site for limited Construction personnel parking, other than for a few Department key personnel. If needed, the Department's Representative will notify the Contractor of spaces or areas for parking.

3. Vehicle inspections may be conducted at discretion of the State for the duration of the Contract.

1.9 FIRE PROTECTION

A. General: Protect and maintain fire department facilities (e.g., hydrants, wires, cables, ducts, manholes, posts, poles, signals, alarm boxes, etc.) at all times.

1. Maintain unobstructed access to the following at all times: Fire hydrants, fire department hose connections, and fire alarm boxes.

2. Immediately notify the Fire Department in the event of accidental damage to fire department facilities.

3. Immediately restore damaged facilities to original condition at no increase to contract sum.

a. Restoration: Approved by Fire Department authorized representative.

B. Fire Department Vehicle/Equipment Access: Provide and maintain temporary vehicle/equipment access roads during construction.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

Executive Directive

Title: Custody and Security — Correctional Facility Construction Projects	Executive Directive Number: OPS.110.0002
Related MD Statute/Regulations: Correctional Services Article, §§2-103, Annotated Code of Maryland;	**Supersedes:** Secretary's Department Directive DPSCS.110.0002, (formerly SDD 03-1995), dated 03/21/95
Related ACA Standards: 2-CO-3A-01, 2-CO-3B-02; 4-4172, 4-4196	**Responsible Authority:** Director, Security Operations
Related MCCS Standards: N/A	**Effective Date:** April 4, 2014 **Number of** 4

Gregg L. Hershberger
Gregg L. Hershberger
Secretary

Carroll
Deputy Secretary
for Operations

.01 Purpose.

This directive updates existing policy and designates responsibilities for security and control during capital construction projects at a Department of Public Safety and Correctional Services (Department) correctional facility.

.02 Scope.

This directive applies to units of the Department responsible for security and control at a Department correctional facility.

.03 Policy.

A. The Department shall establish safeguards during a capital construction project at a correctional facility to maximize security for and control of individuals at the affected Department correctional facility.

B. The Department shall establish safeguards during a capital construction project at a correctional facility that minimize the operational impact on the correctional facility caused by a capital construction project and the individuals responsible for completing the capital construction project.

.04 Definitions.

A. In this directive, the following terms have the meanings indicated.

B. Terms Defined.

(1) Capital Construction Project.

(a) "Capital construction project (project)" means developing, executing, and completing a plan intended to build, modify, renovate, improve, dismantle, or maintain a Department correctional facility.

(b) "Capital construction project (project)" includes a capital maintenance project.

(2) "Construction document" means a written communication, picture, drawing, or other text or graphic communication related to a capital construction project.

(3) "Contractor" means the person obligated to the Department to provide, in part or in whole, materials and services related to completing a capital construction project.

(4) "Contractor's employee" means an individual working for a contractor or a sub-contractor performing tasks related to the contractor's obligations to the Department for a capital construction project.

.05 Responsibility/Procedure.

A. A managing official in cooperation with the Director of Security Operations has operational oversight of security during a project at the managing official's correctional facility.

B. The Division of Capital Construction and Facilities Maintenance (DCCFM) employee designated by the Director of DCCFM as the manager for a project at a correctional facility shall liaison between the affected managing official and Director of Security Operations, or a designee, and the contractor to ensure that:

(1) Security and control measures are included in the planning for the project;

(2) Department approved security and control measures are included in the construction documents presented to the contractor at the work initiation conference;

(3) Effective measures are established to ensure continuous security and control at the correctional facility during the capital construction project; and

(4) The contractor:

(a) And each contractor's employee who will be working at the correctional facility is aware of the security requirements established for the project before work begins by:

(i) Providing each contractor's employee a copy of the security requirements established for the project;

(ii) Having each contractor's employee acknowledges receipt of the security requirements by signing a copy of the security requirements for the project; and

(iii) Forwarding the signed copy of the security guidelines received from the contractor and each contractor's employee to the managing official;

(b) And the contractor's employees are aware that they are required to comply with direction provided by the managing official, or a designee, related to security during the project; and

(c) Is aware of the consequences for breaching security measures established for the project.

C. The following are minimum considerations for security and control during a project at a correctional facility:

(1) To the extent possible, the inmate population shall be isolated from the project work area to minimize security staffing requirements related to the project;

(2) The use of overtime for a Department employee shall be minimized and if overtime becomes necessary, overtime shall be authorized according to established overtime procedures;

(3) Identification for a contractor's employee entering, working at, and leaving the correctional facility;

(4) Searching a contractor's employee and equipment;

(5) Security for tools and equipment at the project location;

(6) Searching and parking contractor's employee's vehicles at the correctional facility;

(7) Ensuring that the capital construction project work area is "smoke free" according to the State's no smoking policy;

(8) Hours of work;

(9) Approving alternative hours of work;

(10) Conducting a criminal history records check for each contractor's employee required to enter the secure perimeter at a correctional facility that includes, at a minimum, a records check through:

(a) The National Crime Information Computer (NCIC); and

(b) The Criminal Justice Information System – Central Repository (CJIS – CR).

D. Contractor.

(1) A contractor is required to agree to comply with security requirements established for the project at the correctional facility before work begins on the project.

(2) A contractor is required to agree to have each contractor's employee working on a project at the correctional facility acknowledge, in writing, receipt of the security requirements for the project.

.06 Attachment(s).

There are no attachments to this directive.

.07 History.

A. This directive rescinds DPSCS.110.0002 - Custody and Security of Major Construction Projects (formerly SDD 03-1995), dated 03/21/95 by updating style and format and changes based on re-organization.

B. This directive supersedes provisions of any other prior existing Department communication with which it may be in conflict.

.08 Operations Distribution.

A
S — Security Chief

Department of Public Safety and Correctional Services Secretary's Department Directive	**Secretary's Department Directive Number: 04-2007**
	Title: Contraband — Criminal Violations
	Effective Date: October 17, 2007
	Authorized By: Gary D. Maynard **Number of Pages: 6**

.01 Purpose.

This directive establishes policy and responsibilities for the Department of Public Safety and Correctional Services (Department) to address amendments to the criminal law that make possessing or delivering contraband at a place of confinement a criminal act.

.02 Scope.

This directive applies to all agencies and units of the Department.

.03 Policy.

A. The Department shall ensure that employees, visitors, and inmates are informed that possessing or delivering contraband at a place of confinement is a criminal violation.

B. The Department shall enforce the criminal act of possessing or delivering contraband at a place of confinement to the same extent and according to the same procedures as other criminal violations occurring under the jurisdiction of the Department.

.04 Authority/Reference.

A. Correctional Services Article, §2-103, Annotated Code of Maryland.

B. Criminal Law Article, §§9-410 — 9-417, Annotated Code of Maryland (Effective October 1, 2007).

.05 Definitions.

A. In this directive, the following terms have the meanings indicated.

B. Terms Defined.

(1) "Alcoholic beverage" means beer, wine, or other distilled spirits.

(2) Contraband.

(a) "Contraband" means any item, material, substance, or other item that:

(i) Is not authorized for inmate possession by a managing official; or

(ii) Is brought into a correctional facility in a manner prohibited by the managing official.

(b) "Contraband" does not include:

(i) The amount of an item, material, substance, or other thing that exceeds the quantity of the item, material, substance, or other thing that the managing official has authorized an inmate to possess; or

(ii) A Department owned and issued telecommunication device necessary for a Department employee to conduct Department business while at a place of confinement.

(c) "Contraband" includes (effective October 1, 2007), but may not be limited to:

(i) An alcoholic beverage;

(ii) A controlled dangerous substance;

(iii) Except under §.05B(2)(b)(ii) of this directive, a telecommunication device; and

(iv) A weapon.

(3) "Controlled dangerous substance" has the meaning stated in Criminal Law Article, §5-101, Annotated Code of Maryland.

(4) Employee.

(a) "Employee" means an individual assigned to or employed by the Department in a full-time, part-time, temporary, or contractual position.

(b) "Employee" includes:

(i) A volunteer;

(ii) An intern; and

(iii) Another individual providing goods or services to the Department.

(5) Managing Official.

(a) "Managing official" means the individual responsible for a place of confinement.

(b) "Managing official includes:

(i) An administrator;

(ii) A director;

(iii) A warden;

(iv) A superintendent;

(v) A sheriff; or

(vi) Other individual with the same responsibility.

(6) Place of Confinement.

(a) "Place of confinement" means:

(i) A correctional facility as defined under Correctional Services Article, § 1-101, Annotated Code of Maryland;

(ii) A detention center for juveniles;

(iii) A facility for juveniles listed in Article 83C, §2-117(a)(2), Annotated Code of Maryland;

(iv) A place identified in a juvenile community detention order; or

(v) Any other facility in which a person is confined under color of law.

(b) "Place of confinement' does not include a place identified in a home detention order or agreement.

(c) "Place of confinement" includes:

(i) Buildings and property used for the purpose, or in support, of detaining or confining an individual in the custody or under the supervision of the Department; and

(ii) Appurtenances to a place of confinement.

(7) Telecommunication Device.

(a) "Telecommunication device" means:

(i) A device that is used to transmit telephonic, electrical, digital, cellular, or radio communications; or

(ii) A part of a device that is used to transmit telephonic, electrical, digital, cellular, or radio communications, regardless of whether the part itself is able to transmit.

(b) "Telecommunication device" includes a:

(i) Cellular telephone;

(ii) Digital telephone;

(iii) Picture telephone; and

(iv) Modem equipped device.

(8) "Weapon" means a gun, knife, club, explosive, or other article that can be used to kill or inflict bodily harm.

.06 Responsibility/Procedure.

A. Criminal Violation.

(1) Except under §§.06A(2) and (3) of this directive, it is a misdemeanor punishable by 3 years imprisonment or $1,000 fine, or both for an individual to:

(a) Deliver contraband to an individual detained or confined in a place of confinement;

(b) Possess with the intent to deliver contraband to an individual detained or confined in a place of confinement; or

(c) Knowingly possess contraband in a place of confmement.

(2) It is a felony punishable by 10 years imprisonment or $5,000 fine, or both for an individual to:

(a) Deliver contraband to an individual detained or confined in a place of confinement with the intent to effect an escape;

(b) Possess contraband with the intent to deliver contraband to an individual detained or confined in a place of confmement to effect an escape;

(c) Deposit or conceal contraband in or about a place of confinement to effect an escape; or

(d) If detained or confined in a place of confmement, knowingly possess or receive contraband to effect an escape.

(3) If the contraband is a weapon, it is a felony punishable by 10 years imprisonment or $5,000 fine, or both for an individual to:

(a) Deliver a weapon to an individual detained or confined in a place of confinement;

(b) Possess a weapon with the intent to deliver contraband to an individual detained or confined in a place of confinement;

(c) Deposit or conceal a weapon in or about a place of confmement to effect an escape; or

(d) If detained or confined in a place of confinement, knowingly possess or receive a weapon.

B. Uniform Procedures.

The Commissioner of Correction, Commissioner of Pretrial Detention and Services, and the Director of Patuxent, or designees, shall ensure that procedures, forms, and signs developed under this directive are, to the degree possible, uniform for all places of confinement.

C. Notification.

(1) A managing official is responsible for ensuring employees working in, visitors to, and individuals detained or confined in a place of confinement are informed of the prohibitions concerning contraband.

(2) A managing official shall establish local procedures for informing employees, visitors and individuals detained or confined in a place of confinement of the prohibitions concerning contraband that, at a minimum, include:

(a) Universal signage that is consistent throughout the Department depicting the prohibitions for contraband that is displayed:

(i) At each point of entry onto place of confinement property;

(ii) At each point of entry into the secure area of a place of confinement;

(iii) At each point of entry used by an employee at a place of confinement;

(iv) At each point of entry used by a visitor to a place of confinement;

(v) In any waiting area where a visitor is waiting to see an individual detained or confined in a place of confinement;

(vi) At a point of entry used by an individual detained or confined to a place of confinement; and

(vii) At a point of entry to an area used by an individual detained or confined in a place of confinement to meet with a visitor;

(b) Provisions for a visitor to temporarily secure personal property legally possessed by the visitor, but otherwise not permitted in a place of confinement by law or Department or facility policy;

(c) Written notification of prohibitions for contraband for:

(i) An individual detained or confined in a place of confinement;

(ii) An individual on an individual detained or confined in a place of confinement visitor list;

(iii) Other visitors to a place of confinement; and

(iv) Employees;

(d) Written notification of and acknowledgement by an individual detained or confined in a place of confinement that the individual is responsible for notifying a visitor named on the individual's visitor list of prohibitions for contraband; and

(e) Retention of documents used to notify inmates and employees of prohibitions for contraband under this directive.

D. Reporting, Investigating, and Documenting Violations of Contraband Prohibitions.

(1) Reporting, investigating, and documenting alleged criminal and administrative violations of contraband prohibitions shall be accomplished according to existing Department policy and procedure for reporting, investigating, and documenting criminal and administrative violations.

(2) The managing official, or a designee, shall report alleged criminal and appropriate employee administrative violations of contraband prohibitions to the IIU.

(3) The Director of the IIU shall ensure that a report of an alleged criminal or appropriate employee administrative violation of contraband prohibitions is recorded and resolved according to existing IIU and Department procedures.

E. Disciplinary Action.

(1) An action taken in response to an alleged criminal violation of contraband prohibitions does not preclude Department disciplinary action against an employee found guilty of the criminal violation with sanctions up to and including termination of employment with the Department.

(2) An action taken in response to an alleged criminal violation of contraband prohibitions does not preclude administrative action against an individual detained by or in the custody of a place of confinement for violation of inmate rules.

.07 Attachments.

There are no attachments to this directive.

.08 History.

A. There is no Secretary's Department Directive that this directive replaces or rescinds.

B. This directive supersedes provisions of any other prior existing Department communication with which it may be in conflict.

END OF SECTION

Department of Public Safety and Correctional Services

Criminal History Security Background Check

Attachment C

Facility: _____

Date: _____ **Project Title:** _____

A security background check will be conducted on all persons entering an institution to provide services. This background check consists of a criminal history check using usual and customary automated criminal history data systems including but not necessarily limited to MDCJIS, NCIC, MVA, FBI, etc.

This requirement pertains to persons providing services on a daily basis for an extended period of time such as medical contractors, volunteers, and long-term construction employees. It does not apply to persons entering and leaving on a one-day basis such as copier repair technicians. This security-check will be completed prior to the issuance of a picture I.D. and a security orientation.

Please provide the following information:

Full Name: _____
First Middle Last

Address: _____
Street City State Zip Code

Date of Birth: _____ **Social Security Number:** _____

Phone Number: _____ **Race:** _____ ☐ **Male** ☐ **Female**

Driver's License No: _____ **State:** _____

Purpose of Clearance:

☐ **Volunteer** **For:** _____
Department

☐ **Intern** **From:** _____ **For:** _____
College/Agency Department

☐ **Other State Agency:** _____
Agency Name

☐ **Contractual Services:** _____
Type (engineering, medical, etc.)

☐ **Construction:**

_____ _____
Firm Phone #

_____ _____
Sub-Contractor Phone #

_____ _____
Contract # Contract Completion Date

_____
Design Engineer Contract #

Insert Scanned Photo ID Here:

Requested by: _____ _____ _____
Name Title Facility

Recommended: _____ ☐ Approved ☐ Disapproved
Name

Approval: _____ ☐ Approved ☐ Disapproved
Signature of Warden or Designee

SECTION 002000

STATE OF MARYLAND
DEPARTMENT OF PUBLIC SAFETY AND CORRECTIONAL SERVICES

INSTRUCTIONS TO BIDDERS FOR CONSTRUCTION CONTRACTS

Department of Public Safety and Correctional Services
Stephen T. Moyer, Secretary
6776 Reisterstown Road
Baltimore, Maryland 21215

Board of Public Works
Lawrence J. Hogan, Jr., *Governor*
Peter Franchot, *Comptroller*
Nancy K. Kopp, *Treasurer*

February 2015

STATE OF MARYLAND
DEPARTMENT OF PUBLIC SAFETY AND CORRECTIONAL SERVICES
INSTRUCTIONS TO BIDDERS FOR CONSTRUCTION CONTRACTS

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Note:

The terms "**Bid**" and "**Bidder**" are used throughout this document. Their meanings are to be considered synonymous with the terms "**Proposal**" and "**Proposer**".

SECTION 00 20 00 – INSTRUCTIONS TO BIDDERS

STATE OF MARYLAND
DEPARTMENT OF PUBLIC SAFETY AND CORRECTIONAL SERVICES (DPSCS)
INSTRUCTIONS TO BIDDERS FOR CONSTRUCTION CONTRACTS

1. NOTICE TO BIDDERS

A. GENERAL

The Notice to Bidders, which may be published as an advertisement, contains a description of the proposed work, together with information to the bidder regarding availability of the Invitation for Bids or Request for Proposals (the "solicitation"), including the project classification, construction bid forms, plans and specifications, the nature of any proposal guarantee, and the reservation of the right of the State to reject any or all bids. Provisions of State statutes and regulations are incorporated into the contract documents, as defined in the General Conditions, pursuant to COMAR (Code of Maryland Regulations) 21.03.01.05B.

B. PROJECT CLASSIFICATION

The Department will estimate the cost of the contract and classify it as falling within one of the following cost groups:

Estimate	Class
Up to $100,000	A
$100,000 to $500,000	B
$500,000 to $1,000,000	C
$1,000,000 to $2,500,000	D
$2,500,000 to $5,000,000	E
$5,000,000 to $10,000,000	F
$10,000,000 to $15,000,000	G
Over $15,000,000	H

The letter designation will be published as part of the solicitation.

2. CONSTRUCTION BID FORM (PRICE PROPOSAL FORM)

A. **The Construction Bid From** (or the Price Proposal Form) is that from which is included in the contract documents and which sets forth the cost of the Work, the alternates (if any), and units prices (if any) solicited by the State.

B. **Unit Prices -** Should contractor be required to perform work over and above that required by contract documents, or should he be ordered to omit work required by contract documents, an equitable adjustment shall be made to the contract price, subject to Sections 3.06 and 3.07 of the General Conditions. In determining the amount of any such extra to the contractor, which is governed by unit prices, the amount of the extra will be the unit price bid by the contractor or a reasonable price, whichever is less. In determining the amount of any such credit due the State which is governed by unit prices, the amount of the credit will be the unit price bid by the contractor or a reasonable price, whichever is greater. Unit prices quoted shall be the same for extra work and for credit work and shall be the sum total compensation payable or creditable for such items of work, including all labor, materials, bailing, shoring, removal, overhead, profit, insurance, bond, etc. Changes shall be processed in accordance with the General Conditions Sections 3.06 and 3.07.

3. SITE INVESTIGATION

See Section 3.04 of the General Conditions.

4. BID SECURITY

A. When the total of the base bid and all add alternates is in excess of $100,000 each bidder must furnish a bid bond issued by a surety company approved by the State with his construction bid. The bond must be in an amount not less than five per cent (5%) of the amount of the base bid plus all add alternates. Bid bonds must conform to COMAR 21.06.07.02 and 21.06.07.03E(1). Submission of a bid bond on a form other than DPSCS's approved form may render the bid nonresponsive and result in rejection of the bid. If the proper bid bond form is not included in the bid package, it may be obtained from the Department of Public Safety and Correctional Services. The provisions of DPSCS's approved bid bond form are a part of these Instructions to Bidders.

B. Certified checks, cash, and other forms of security are acceptable as provided in COMAR 21.06.07.01 and .02.

C. Bid security, regardless of the form (bid bond, certified checks, cash, or other acceptable form of security), shall secure the State against payment of any cost of procuring the work which exceeds the amount of the principal's bid and shall be subject to the condition that the principal may grant to the State an extension of 120 additional days for acceptance of the bid without notice to or consent from the surety.

D. Bidder must submit bids and Contract Security/Bonds in accordance with applicable provisions of this solicitation; COMAR 21.06.07, and other applicable provisions of the law.

E. BONDING ASSISTANCE OFFERED BY THE MARYLAND SMALL BUSINESS DEVELOPMENT FINANCING AUTHORITY (MSBDFA) (Program for Maryland Businesses Only) as provided in BPW Advisory No., 1996-3 Revised, / Revised Date: December 15, 2006 and in BPW Advisory No.: 2006 -4, Dated December 7, 2006.

F. The Maryland Small Business Development Financing Authority (MSBDFA) was created by the Maryland General Assembly in 1978 to assist in the development of socially or economically disadvantaged entrepreneurs in the creation of Maryland businesses. MSBDFA's financing activity is supported through the repayment of loans, generation of interest income and the collection of fees. Please see below for a brief description of some of the programs administered by the MSBDFA:

(1) **CONTRACT FINANCING PROGRAM (CFP) -** This program provides financial assistance to eligible businesses in the form of a direct loan or the guaranty of loans made by a financial institution. These funds may be used for working capital and the acquisition of equipment needed to begin, continue or complete work on contracts where a majority of funds are provided by a federal, state or local governments or utilities regulated by the Public Service Commission. Financing in either form is limited to $1,000,000 and must be repaid during the term of the contract. Interest rates generally range from the prevailing prime rate up to prime plus two percent. Applicants may qualify for financing prior to contract award.

(2) **SURETY BOND PROGRAM (SBP) -** This program assists eligible small businesses in obtaining bid, performance or payment bonds necessary to perform on contracts where the majority of funds are also provided by a government agency or public utility. SBP directly issues bid, performance or payment bonds or guarantees a surety's losses incurred as a result of the contractors breach of a bid, performance or payment bond. Additionally, SBP guarantees a surety's losses incurred as a result of the

contractor's breach of a bid, performance or payment bond. Bonds that are directly issued are limited to $5,000,000. Guaranties are limited to the lesser of ninety percent (90%) of the amount of the bond or $1,350,000. Guaranties on the bonds remain in effect for the duration of the surety's exposure under the bond. Bonds issued directly by the SBP will remain in effect for a period consistent with that of a regular commercial surety contract. A surety bond line may be established to directly issue or guaranty multiple bonds to a principal within pre-approved terms, conditions and limitations.

(3) **GUARANTY FUND PROGRAM (GFP) -** This program provides financial assistance to eligible businesses in the form of loan guaranties and interest rate subsidies to financial institutions for long term loans and short term lines of credit. A loan guaranty cannot exceed the lesser of eighty percent (80%) of the loan or $1,000,000. The term of the loan cannot exceed ten (10) years with the maximum interest rate of prime plus two percent. Loan proceeds can be used, among other things, for working capital, the acquisition and installation of machinery or equipment and the purchase or improvements to real property owned or leased by the applicant. GFP can also subsidize up to four percentage points of the interest rate being charged by the financial institution making the loan. The subsidy is subject to an annual review. Terms of repayment of the subsidy are negotiated directly with the borrower.

(4) **Contractors and subcontractors requiring MSBDFA assistance should contact the:**

MERIDIAN MANAGEMENT GROUP, INC.
MARYLAND SMALL BUSINESS DEVELOPMENT FINANCING AUTHORITY (MSBDFA)
826 E. Baltimore Street
Baltimore, Maryland 21202
Phone - In-State 410-333-2548
Fax Number: 410-333-2552
Email Address: contact@mmggroup.com
Website: http://www.mmggroup.com/contact.html

5. BID OPENING

A. Bids will be opened in public at the time and place stated in the Notice To Bidders or the solicitation.

B. In the event that DPSCS/DCCFM is not open to the public at least one (1) full hour immediately preceding the deadline established in the contract documents for receipt of bids or offers, the deadline for the receipt of bids or offers will be extended automatically, without further action or notice by the Procurement Officer being necessary, to the next regularly scheduled business day at the same time and location.

C. Any bid received after the due date and time set in the solicitation is late and cannot be considered.

6. RIGHT TO REJECT BIDS AND WAIVE IRREGULARITIES/INFORMALITIES

The State reserves the right to cancel a solicitation, to reject any and all bids, and to waive any minor irregularity in a bid in accordance with COMAR 21.06.02.

7. MODIFICATIONS AND WITHDRAWAL OF BIDS

A. Withdrawal or modification of bids will be allowed only as provided in COMAR 21.05.02.09 and .10.

B. Mistakes in bids may be corrected only as provided in COMAR 21.05.02.12.

8. PREPARATION OF CONSTRUCTION BID FORM (PRICE PROPOSAL FORM)

A. The bidder shall submit his bid on the blank form(s) furnished by the Department for this particular contract. The bidder shall state prices in dollars and cents, in both words and numerals. If there is any conflict between the written words and the numerals, the written words shall govern unless circumstances apparent on the face of the bid make it clear that the contractor intended the bid to be based in the amount stated by the numerals.

B. The bid form(s) shall be filled out in ink or typed. Any erasures and/or alterations shall be initialed in ink by the signer.

C. The bid form, if submitted by an individual, shall be signed by the individual; if submitted by a partnership, it shall be signed by such member or members of the partnership having authority to bind the partnership; if submitted by a corporation, it shall be signed by an officer, attested by the corporate secretary or an assistant corporate secretary. If not signed by an officer, as aforesaid, there must be an attached copy of that portion of the By-Laws or a copy of a Board resolution, duly certified by the corporate secretary, showing the authority of the person so signing on behalf of the corporation.

D. Any contractor calling itself a “joint venture” shall be, as between the contractor and the State, an ordinary partnership, whose partners are liable to the State as provided in Corporations and Associations Article §9-307 of the Annotated Code of Maryland.

E. A bidder or contractor, which is a partnership or joint venture, must furnish the Department with a copy of the partnership or joint venture agreement prior to award.

9. BID/PROPOSAL AFFIDAVIT AND CONTRACT AFFIDAVIT

Bidders must read, and truthfully execute the Bid/Proposal Affidavit included in the RFP package and should submit it with the proposal. The Contract Affidavit (if applicable) included in the construction bid package must be executed and submitted by the contractor prior to final award of the contract. If these affidavits are not included in the construction bid package, they can be obtained from the Department of Public Safety and Correctional Services (DPSCS).

10. PUBLIC INFORMATION ACT

Bidders must identify those portions of their bids which they deem to be confidential or proprietary information or trade secrets and must provide, upon demand by the Department, justification for why such materials should not be disclosed by the State upon request under the Maryland Public Information Act, §§10-611, et seq., of the State Government Article of the Annotated Code of Maryland.

11. AWARD AND EXECUTION OF CONTRACT

A. AWARD OF CONTRACT

(1) Unless otherwise stated in the contract documents, the award of the contract, if awarded, will be to the responsible bidder submitting the lowest responsive bid or evaluated bid. The successful bidder will be given a written notice of intent to award

stating that its bid (including applicable add or deduct alternates) has been accepted and that it has been selected for award of the contract. The basis for award of alternates is set forth in the subsection B below, "Award of Alternates."

(2) Award of this contract by DPSCS will not be final and complete until after (a) a proposed award is approved by the appropriate public authorities, (b) the contractor submits complete and satisfactory documentation required under the contract, such as insurance certificates, affidavits, MBE compliance documents, bonds, etc., and (c) DPSCS executes a contract and forwards it to contractor.

(3) The State reserves the right to apply, before or after award of the contract, any reciprocal preference for Resident Bidders as set forth in §14-401 of the State Finance and Procurement Article of the Annotated Code of Maryland, at no additional cost to the State. As required by §14-401(c), a nonresident bidder or offeror submitting a bid or proposal shall attach to its bid or proposal a copy of the current statute, resolution, policy, procedure, or executive order of the resident state of the nonresident bidder or offeror that pertains to that state's treatment of nonresident bidders or offerors. The Reciprocal Preference is a percentage of bid price applied to a non-resident business bidder over a resident business bidder. The State of Maryland does not have an in-state preference but imposes a reciprocal preference in-kind, at the option of the State, against bidders from those states that give in-state bidders a preference against Maryland bidders. COMAR 21.05.01.04 explains the treatment of this preference.

B. AWARD OF ALTERNATES

If alternates are solicited by the Construction Bid Form, one or more alternates may be awarded in the discretion of the Department in the order in which the alternates are listed in the Construction Bid Form; provided that in the event the State lacks funds for award of the base bid and any succeeding alternates, the State in its discretion may forego the award of the alternate for which funds are not available but may award one or more succeeding alternates for which funds are available.

C. EXECUTION OF CONTRACT

(1) After a notice of proposed award has been issued, the Department will forward the formal contract form, and the forms for the Payment and Performance Bonds to the successful bidder for execution. The bidder must execute the contract form and return it with fully executed Payment and Performance Bonds (if required) to the Department within 10 days after mailing by DPSCS.

(2) As a prerequisite to signing the contract and prior to the expiration of the aforesaid 10 day period, the bidder shall have furnished the following in the form and content required by these General Conditions: (a) Performance and Payment Bonds; (b) Certificates of Insurance; (c) Affirmative Action Plan; (d) Contract Affidavit; and (e) all other documents required by the contract documents to be furnished by the contractor as a condition of award.

(3) After receipt of these properly executed documents, the Department will execute the contract within 120 days following receipt and approval by DPSCS of all documents and receipt of all approvals of the proposed award required by law, and the Department will then forward the contractor a signed copy of the contract. In the event the State fails to execute the contract and forward it to contractor within the 120 day period, the contractor will have, as its only remedy, the option (a) to declare the contract void without any liability or obligation by the State to the contractor, or (b) to accept an extended period for execution by the State at no additional cost to the State.

12. PERFORMANCE AND PAYMENT SECURITY

A. Performance and Payment Bonds are required when the amount of the initial contract award, including base bid and any alternates awarded, is in excess of $100,000.

B. Prior to the award of the contract, the State will provide to the contractor for execution copies of the Performance Bond and Payment Bond. The bonds must be executed and returned to the Department. The premium for the bonds shall be paid by the contractor. Bonds must be submitted on the approved DPSCS forms. (See COMAR 21.07.02.10) Other forms are not acceptable.

C. The performance Bond and the Payment Bond shall be in the full amount of the contract price. Both bonds are subject to the applicable provisions of COMAR 21.06.07.

D. At the direction of the Department, the contractor may be required to increase the amount of the bonds; for such additions, the contractor will be reimbursed by the State in the amount of the actual increased bond cost incurred by the contractor. Whenever the amount of the contractor's bonds is increased at the State's request, the State must receive proof of the increase in satisfactory form from the surety. The State will not be liable to the contractor for any increase in bonds not requested by the State.

E. Performance Bonds secure, for the benefit of the State, proper performance of all obligations of the contractor to the State under the contract; provided that Performance Bonds do not secure subcontractors or suppliers at any tier against nonpayment by the contractor or others.

F. The Department may reject a bidder as being not responsible if the bidder fails to furnish performance and payment bonds from a surety, which the Department determines has in the past responded diligently, and in good faith to bond claims of the State or of subcontractors and suppliers.

G. The State may declare the contractor to be in default, so as to obligate the surety to perform as required by the Performance Bond, with or without terminating the contract for default.

H. If the State declares the contractor to be in default, the surety has no right to require the State to contract with a contractor of the surety's choosing. The surety must either (1) complete the project or cure the default or (2) allow the State to complete the project or cure or remedy the default, with the surety to remain liable to the State for excess completion costs and other damages.

I. Types of payment security and performance security:

(1) A bond executed by a surety company authorized to do business in this state.

(2) Cash in an amount equivalent to a bond; or

(3) Other security, including a pledge of real property located in the State which shall become a lien, provided that the security is satisfactory to the Department of Public Safety and Correctional Services.

13. MINORITY BUSINESS ENTERPRISE REQUIREMENTS

To satisfy the requirement of COMAR 21.11.03, Minority Business Enterprise Policies; Bidders are responsible for complying with the requirements of Section 10 of the General Conditions.

The regulations require MBE participation submittals with the bid using Form DPSCS OS 01A MBE (Certified MBE Utilization and Fair Solicitation Affidavit). Failure to complete and submit this form with the bid shall result in the bid being non-responsive. Only the information for MBE participation on Form DPSCS OS 01A MBE submitted with the bid will be considered in determination of contract award.

If, the bidder is unable to achieve either the contract goal or any of the sub goals for each specified MBE classification the bidder shall request, in writing, a waiver on form DPSCS OS 01B MBE to be submitted with the bid, as specified in the State's General Conditions of the Contract between Owner and Contractor.

14. VETERAN-OWNED SMALL BUSINESS ENTERPRISE UTILIZATION (VSBE)

To satisfy the requirement of COMAR 21.11.13, Veteran-Owned Small Business Enterprise Policies; Bidders are responsible for complying with the requirements of Section 11 of the General Conditions.

The regulations require VSBE participation submittals with the bid using Form DPSCS OS 11A MBE (Veteran-Owned Small Business Enterprise Utilization and Fair Solicitation Affidavit and VSBE Participation Schedule). Failure to complete and submit this form with the bid shall result in the bid being non-responsive. Only the information for VSBE participation on Form DPSCS OS 11A MBE submitted with the bid will be considered in determination of contract award.

If, the bidder is unable to achieve the contract goal for VSBE the bidder shall request, in writing, a waiver on form DPSCS OS 11A MBE to be submitted with the bid, as specified in the State's General Conditions of the Contract between Owner and Contractor.

15. PAYMENT TO CONTRACTORS

Payments to the Contractor pursuant to this Contract shall be made no later than 30 days after the State's receipt of a proper invoice from the Contractor. Charges for late payment of invoices, other than as prescribed by Title 15, Subtitle 1, of the State Finance and Procurement Article, Annotated Code of Maryland, or by the Public Service Commission of Maryland with respect to regulated public utilities, as applicable, are prohibited.

16. ARREARAGES TO STATE

By submitting a response to this solicitation, a bidder represents that it is not in arrears in the payment of any obligation due and owing the State of Maryland, including the payment of taxes and employee benefits, and that it shall not become so in arrears during the term of the contract, if selected for award. Bidders are on notice of §7-222 of the State Finance and Procurement Article of the Annotated Code of Maryland prohibiting the issuance of a warrant for payment to any person indebted to the State for $50 or more.

17. PAYMENT TO CONTRACTORS BY ELECTRONIC FUND TRANSFER (EFT) FOR AWARDS OVER $200,000

EFT applies to contracts over $200,000 for which payments are made through the State Comptroller. For awards over $200,000, EFT will be used by the State to pay the contractor unless the State Comptroller's Office grants Contractor an exemption. By submitting a response to this solicitation, the Bidder agrees to accept payments by EFT unless the State Comptroller's Office grants an exemption. After award of a contract, the selected bidder shall register with the Comptroller of Maryland using the forms required by the Comptroller. For further information go to:

http://compnet.comp.state.md.us/General_Accounting_Division/Vendors/Electronic_Funds_Transfer/

Note: Any request for exemption must be submitted to the State Comptroller's Office for approval at the address specified on the COT/GAD X-10 form.

18. TIME FOR BID ACCEPTANCE

Unless otherwise provided in the solicitation, bid prices are irrevocable for a period of ninety (90) days following bid opening. After opening bids, the Procurement Officer may request bidders to extend the time during which the State may accept their bids, provided that, with regard to bids, no other change is permitted.

19. ALL NON-RESIDENT BIDDERS

As set forth in §14-401 of the State Finance and Procurement Article of the Annotated Code of Maryland, a non-resident bidder submitting a bid shall attach to its bid a copy of the current statute, resolution, policy, procedure, or executive order of the resident State of the non-resident bidder that pertains to that state's treatment of non-resident bidders.

20. DISCREPANCIES

A. Should a bidder find discrepancies in the contract documents or should he be in doubt as to the meaning or intent of any part thereof, he must, prior to the bid opening: (1) request and receive clarification from the Procurement Officer (who will issue a written addendum if necessary), or (2) file a protest. Failure of the bidder to do so will constitute a waiver of any claim by the bidder for expenses or costs of complying after contract award with the Procurement Officer's interpretation of the contract documents.

B. Only written addenda issued by the Procurement Officer are binding on the State. If a bidder is not satisfied with oral clarification or with written clarification issued other than in written addenda by the Procurement Officer, the bidder must demand and receive a written addendum from the Procurement Officer; and, if one is not issued, the bidder must timely file a protest or be bound to the State's interpretation of contract requirements. Failure of the bidder to act as required by this section will bind the bidder to the Procurement Officer's interpretation of the contract documents. Any addenda resulting from these requests will be mailed to all listed holders of the Bid Documents within a reasonable time prior to the bid opening. The bidder must acknowledge the receipt of all addenda in the space provided on the Construction Bid Form or Price Proposal Form.

21. MODIFICATIONS AND WITHDRAWAL OF BIDS

A. Withdrawal or modification of bids will be allowed only as provided in COMAR 21.05.02.09 and .10.

B. Mistakes in bids may be corrected only as provided in COMAR 21.05.02.12.

22. CONTRACTOR'S FAILURE TO EXECUTE CONTRACT

Failure of the contractor to execute the contract and submit all documents required within the time provided shall be just cause for the payment of the penal sum of the bid bond or other security to the Department. In the event that the damages sustained by the State exceed the amount of the bid security, the State reserves the right to proceed against the contractor for the balance of its damages, which shall include any and all costs of obtaining the work from another source, including additional administrative costs, architects fees, and other costs and expenses. In the alternative, if

the contractor executes the contract but fails to furnish other required documents, the State may treat the contractor's failure to furnish the required documents as a default of the contract and may terminate the contract for default under the General Conditions and avail itself of any other remedy provided by the contract.

23. CONTRACTOR'S ADDRESS

The bid must state a street address (physical location as opposed to a post office box) of the contractor to which the State may send mail and deliver notices to contractor. A post office box without a street address is not acceptable. Contractor must inform the State in writing of any changes in the contractor's mailing address and street address during the term of the contract and all warranty periods under the contract.

24. COMPONENTS OF THE BID

A. **Base Bid**: The Base Bid is the price submitted on the Bid Form and must include the total cost to complete all of the work specified in the solicitation documents. Base bid **does not include** prices for alternates.

B. **Total Bid:** Base Bid plus all alternates.

C. **Unit Price**: A Unit Price is a bid price per unit of measure specified for materials and/or labor. The amount for estimated quantity shall be **included** in the Base Bid amount.

D. **Allowance**: An allowance is a specified dollar amount to be **included** in the Base Bid. Allowances are established in lieu of specific requirements and defer selection of materials and equipment to a later date when additional design and/or specifications can be developed.

E. **Alternate**: An Alternate is for a specific scope of work or material **not included** in the Base Bid. Alternates may be Add or Deduct. The bid price for the Alternate should only represent the amount for the Alternate over and above the Base Bid work.

Words not defined in these Instructions to Bidders but defined in the General Conditions shall have the meanings stated in the General Conditions.

25. PROCUREMENT PRACTICES

A. **Information Disclosure during Procurement**. After a solicitation is issued and before the Procurement Officer makes a determination recommending the award of the contract, the only information that a Procurement Officer may disclose to a person outside the executive department is whether (or not) a decision has been made regarding a solicitation.

B. **Ethics Prohibitions.**

(1) The prohibition against a vendor offering employment, discussing employment, or offering any other thing of value during a procurement extends to procurement extends to procurement officers and to individuals who participate in the drafting of specifications.

(2) The Ethics Law currently prohibits employees from participating in matters in which they have a "financial interest". A financial interest is defined as owning more than 3% of a business. This amendment expands the definition of "financial interest" to include businesses in which an employee's spouse owns more than 3%.

(3) An employee may not be employed by or have a financial interest in a procurement subcontractor as well as the prime contractor.

(4) In addition, an employee will not be able to participate in a matter involving a business entity to which the employee or certain relatives have applied for a job.

26. eMARYLAND MARKETPLACE Vendor ID Number:

In order to receive a contract award, a vendor must be registered on eMaryland Marketplace. Registration information can be found on the eMaryland Marketplace website at https://emaryland.buyspeed.com/bso/

Bidders must provide their eMaryland Marketplace Vendor ID number on the Construction Bid or Price Proposal Form.

27. SMALL BUSINESS RESERVE PROCUREMENT

The following language is applicable only for Small Business Reserve Procurements:

This is a Small Business Reserve Procurement for which award is limited to certified small business vendors. Only businesses that meet the requirements set forth in State Finance and Procurement Article, §§ 14-501 – 14-505, Annotated Code of Maryland, and who are registered with the Department of General Services Small Business Reserve Program are eligible for award.

For the purposes of a Small Business Reserve procurement, a small business is a for-profit business, other than a broker, that meets the following criteria:

- It is independently owned and operated;
- It is not a subsidiary of another business;
- It is not dominant in its field of operation;
- Its **wholesale** operations did not employ more than 50 persons, and its gross sales did not exceed an average of $4,000,000 in its most recently completed 3 fiscal years;*
- Its **retail** operations did not employ more than 25 persons, and its gross sales did not exceed an average of $3,000,000 in its most recently completed 3 fiscal years;*
- Its **manufacturing o**perations did not employ more than 100 persons, and its gross sales did not exceed an average of $2,000,000 in its most recently completed 3 fiscal years;*
- Its **service** operations did not employ more than 100 persons, and its gross sales did not exceed an average of $2,000,000 in its most recently completed 3 fiscal years;* and
- Its **construction** operations did not employ more than 50 persons, and its gross sales did not exceed, an average of $7,000,000 in its most recently completed 3 fiscal years.*

If a business has not existed for three years, the employment and gross sales average(s) is the average for each year or part of a year during which the business has been in existence.

Further information on the certification process is available at **www.dgs.maryland.gov** and click on the Small Business Reserve hyperlink.

28. SMALL BUSINESS PREFERENCE PROCUREMENT

The following language is applicable only for Small Business Preference Procurements:

The preference percentages for this procurement are as follows:

- State-certified, small business (not a veteran-owned or disabled-veteran-owned small business) **5%**

- State-certified, veteran-owned small business **7%**

- State-certified, disabled-veteran-owned small business **8%**

The procurement agency will accept the most favorable responsive bid from a responsible, certified small business if the bid does not exceed the most favorable responsive bid received from a bidder who is not a certified small business by more than the percentage(s) listed above.

ELIGIBILITY: To be eligible for the preference, your company must have a current small business certification from the Maryland Department of General Services (DGS).

Small business size standards in Maryland are different than federal standards. You CANNOT substitute an SBA 8(a) certification or VetBiz verification for Maryland small business certification.

If your small business is eligible but not certified by the State, apply for certification on the DGS website at www.smallbusinessreserve.maryland.gov and obtain a small business certification number.

State Law requires that the veteran business owner be domiciled in Maryland. There is no Maryland residency requirement for owners of small business participating in the Preference as small businesses without the veteran-owned or disabled-veteran-owned designation.

REQUIRED INFORMATION: The bidder must provide the following to the procurement officer to prove eligibility for the preference:

- **Certified small business that is not veteran-owned or disabled-veteran-owned:** Provide the DGS Small Business Certification number on the "**Construction Bid Form" or "Price Proposal Form**".

- **Veteran-owned certified small business:** Provide the DGS Small Business Certification number **AND** a copy of the business owner's DD Form 214 attesting to discharge or release under conditions other than dishonorable.

- **Disabled-veteran-owned small business that is currently verified and registered on www.VetBiz.gov:** Provide the DGS Small Business Certification number **AND** a copy of the letter from the U.S. Department of Veterans Affairs Verification Program showing your verification is current.

- **Disabled-veteran-owned small business that is NOT currently verified and registered on www.VetBiz.gov:** Provide the DGS Small Business Certification number **AND** a copy of the business owner's DD Form 214 showing discharge or release under conditions other than dishonorable **AND** a copy of your Adjudication Letter from the U.S. Veterans Administration.

  For more information about the Small Business Preference Program, log onto the Department of General Services Internet Site at **www.dgs.maryland.gov**.

29. CONTRACTOR QUESTIONNAIRE

The Contractor Questionnaire, which is included with this solicitation package, provides certain information to permit the Procurement Officer to evaluate the Responsibility of the bidder. In order to be eligible to receive a contract a bidder must be considered a Responsible Bidder. A Responsible

Bidder is defined as a person or firm who has the capability in all respects to perform fully the contract requirements and the integrity and reliability that shall assure good faith performance. This document must be fully executed and returned with the bid. The Procurement Officer may also investigate past performance on other projects in evaluating responsibility as well as any and all other sources of information.

30. AVAILABLE DOCUMENTS

A. Contract Documents will be made available to the Bidders as herein described in the Instructions to Bidders. The documents will also be posted on **eMarylandMarketplace (eMM)**:

https://emaryland.buyspeed.com/bso/

B. The following documents form a part of the Contract Documents but are only made available for reference through their posting on **eMarylandMarketplace (eMM)**:

https://emaryland.buyspeed.com/bso/

1) **Limited Hazardous Materials Survey Report:** Dated December 24, 2014; as prepared by EBA Engineering, Inc. on behalf of PSA-Dewberry Inc. / Penza Bailey Architects, JV for the Department of Public Safety and Correctional Services, Project KT-000-150-C01.
2) **Geotechnical Report:** Dated August 2014; as prepared by EBA Engineering, Inc. on behalf of PSA-Dewberry Inc. / Penza Bailey Architects, JV for the Department of Public Safety and Correctional Services, Project KT-000-150-C01.

C. Additional Reference Documents: The following documents **do not** form a part of the Contract Documents but are only made available for reference through their posting on **eMarylandMarketplace (eMM)**:

https://emaryland.buyspeed.com/bso/

1) **Record Drawings for the Existing Buildings:** The following record drawings are provided to the Contractor for reference only. The record drawings may not represent the actual built conditions. All information included within the record drawings must be verified by the Contractor. Neither the Department of Public Safety and Correctional Services, nor PSA-Dewberry Inc. / Penza Bailey Architects, JV and its consultants take responsibility for the accuracy of these documents. **To view these documents, the Contractor must download the files. Any printing of these documents by the Contractor or its Subcontractors, shall be at the Contractor's expense:**

   a. SUI (State Use Industries) Building: 1964 drawings (John A. Ahlers); file name 26 sheets "Central Office and Storage Building for the State Use Industries";
   b. BPRU (Baltimore Pre-Release Unit) Building: 1969 drawings (Wrenn Lewis & Jencks); 28 sheets "Dormitory Building";
   c. BPRU & SUI Renovation drawings: 1977 drawings (Lapicki-Smith); 35 sheets "Conversion of Central Office to Work-Release Housing";
   d. Construction of OSTC - Bid Documents 1991: 1991 drawings (Gaudreau); 77 sheets "Occupational Skills Training Center";
   e. Fire Range Renovation in Occupational Skills Training Center: 03/08/93 drawings; 4 sheets.
   f. Construction of OSTC – As-Built Drawings, 12/01/1992: Johnson Controls Flow Diagrams; 8 sheets; MAU & EF Flow Diagrams, and AHU & RAF Flow Diagrams for the Occupational Skills Training Center.
   g. Existing YDC Photos Full Package; 11 pages.

h. 400-Bed Dormitory 1993; 8 sheets.

END OF SECTION 00 20 00

SECTION 002750

WAGE RATES AND INSTRUCTIONS

SECTION 00 27 50 – WAGE RATES AND INSTRUCTIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. State of Maryland Prevailing Wage Rates and Instructions.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions.

1.3 RELATED SECTIONS

A. Division 1 Specification Sections.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION

3.1 State of Maryland Prevailing Wage Rates and Instructions appended to and made part of this Section.

3.2 **If additional Prevailing Wage Rates are needed for this project beyond those listed below, contact the Prevailing Wage Unit. Phone: (410) 767-2342, email:** prevailingwage@dllr.state.md.

END OF SECTION 00 27 50

STATE OF MARYLAND

DEPARTMENT OF LABOR, LICENSING AND REGULATION
DIVISION OF LABOR AND INDUSTRY
PREVAILING WAGE SECTION
1100 N. Eutaw Street, Room 607
Baltimore, MD 21201
(410) 767-2342

The wage rates to be paid laborers and mechanics for the locality described below is announced by order of Commissioner of Labor and Industry.

It is mandatory upon the successful bidder and any subcontractor under him, to pay not less than the specific rates to all workers employed by them in executing contracts in this locality. Reference: Annotated Code of Maryland State Finance and Procurement, Section 17-201 thru 17-226.

These wage rates were taken from the locality survey of 2014 for Baltimore City, issued pursuant to the Commissioner's authority under State Finance and Procurement Article Section 17-209, Annotated Code of Maryland or subsequent modification.

**Note: If additional Prevailing Wage Rates are needed for this project beyond those listed below, contact the Prevailing Wage Unit. Phone: (410) 767-2342, email: prevailingwage@dllr.state.md.

Name and Title of Requesting Officer: Andreana Aytch - Procurement Officer

Department, Agency or Bureau: Dept. of Public Safety and Correctional Services
6776 Reisterstown Rd Baltimore , MD 21215

Project Number
KT-000-150-C01

Location and Description of work:
Baltimore City: Construction

Determination Number
23218

Date of Issue: Dec 09, 2014

BUILDING CONSTRUCTION

CLASSIFICATION	MODIFICATION REASON	BASIC HOURLY RATE	BORROWED FROM	FRINGE BENEFIT PAYMENT
BALANCING TECHNICIAN	AD	$38.02		$1.37
BOILERMAKER	AD	$26.66		$7.82
BRICKLAYER	AD	$28.17		$9.32
BRICKLAYER/SAWMAN	AD	$26.47		$11.12
CARPENTER	AD	$26.01		$12.55
CARPENTER - SHORING SCAFFOLD BUILDER	AD	$26.01		$12.55
CARPET LAYER	AD	$23.67		$8.36
CEMENT MASON	AD	$26.00		$6.58
COMMUNICATION INSTALLER TECHNICIAN	AD	$31.83		$6.65 b
DRYWALL - SPACKLING, TAPING, & FINISHING	AD	$26.01		$12.55

ELECTRICIAN	AD	$35.10		$16.53
ELEVATOR MECHANIC	AD	$41.65		$31.75
FIREPROOFER - BY HAND	AD	$32.47		$0.00
FIREPROOFER - SPRAYER	AD	$23.00		$3.89
FIRESTOPPER	AD	$26.06		$6.02
GLAZIER	AD	$26.91		$14.96
INSULATION WORKER	AD	$33.13		$13.88
IRONWORKER - FENCE ERECTOR	AD	$26.88		$17.24
IRONWORKER - ORNAMENTAL	AD	$27.23		$18.39
IRONWORKER - REINFORCING	AD	$27.23		$18.39
IRONWORKER - STRUCTURAL	AD	$26.88		$17.74
MILLWRIGHT	AD	$29.26		$12.80
PAINTER	AD	$24.89		$9.15
PILEDRIVER	AD	$26.01		$12.55
PLASTERER	AD	$19.46		$3.76
PLASTERER - MIXER	AD	$35.58		$13.21
PLUMBER	AD	$36.55		$17.95
POWER EQUIPMENT OPERATOR - ASPHALT DISTRIBUTOR	AD	$23.78	005	$0.00
POWER EQUIPMENT OPERATOR - BACKHOE	AD	$25.03		$14.85 a + b
POWER EQUIPMENT OPERATOR - BOOM TRUCK	AD	$38.85		$11.00
POWER EQUIPMENT OPERATOR - BULLDOZER	AD	$28.85		$8.70 a + b
POWER EQUIPMENT OPERATOR - CONCRETE PUMP	AD	$27.50		$17.80 a + b
POWER EQUIPMENT OPERATOR - CRANE	AD	$30.30		$15.30 a + b
POWER EQUIPMENT OPERATOR - CRANE - TOWER	AD	$45.00		$0.00 a + b
POWER EQUIPMENT OPERATOR - DRILL - RIG	AD	$32.45		$8.55
POWER EQUIPMENT OPERATOR - EXCAVATOR	AD	$25.30		$11.55 a + b
POWER EQUIPMENT OPERATOR - FORKLIFT	AD	$21.54		$4.76 a + b
POWER EQUIPMENT OPERATOR - GRADALL	AD	$37.50		$5.78
POWER EQUIPMENT OPERATOR - GRADER	AD	$27.68	005	$12.62 a
POWER EQUIPMENT OPERATOR - GUARD RAIL POST DRIVER	AD	$17.00		$4.73
POWER EQUIPMENT OPERATOR - HOIST	AD	$27.38		$12.97
POWER EQUIPMENT OPERATOR - LOADER	AD	$15.00		$16.01 a + b
POWER EQUIPMENT OPERATOR - MECHANIC	AD	$37.00		$2.88
POWER EQUIPMENT OPERATOR - MILLING MACHINE	AD	$39.30	005	$3.98
POWER EQUIPMENT OPERATOR - OILER	AD	$32.40		$8.55
POWER EQUIPMENT OPERATOR - PAVER	AD	$25.55	005	$12.15
POWER EQUIPMENT OPERATOR - ROLLER - ASPHALT	AD	$22.38		$1.10 a + b
POWER EQUIPMENT OPERATOR - ROLLER - EARTH	AD	$28.85		$7.70 a + b
POWER EQUIPMENT OPERATOR - SCREED	AD	$25.03	003	$14.85
POWER EQUIPMENT OPERATOR - SKID STEER-BOBCAT	AD	$24.05	003	$11.55 a
POWER EQUIPMENT OPERATOR - SKIDDER	AD	$35.48		$14.66
POWER EQUIPMENT OPERATOR - TRENCHER	AD	$35.91		$11.70
POWER EQUIPMENT OPERATOR-VACCUM TRUCK	AD	$24.10	005	$2.88

RESILIENT FLOOR	AD	$35.00		$10.59
ROOFER/WATERPROOFER	AD	$29.85		$10.59
SHEETMETAL WORKER	AD	$34.21		$17.54
SPRINKLERFITTER	AD	$31.76		$18.22
STEAMFITTER/PIPEFITTER	AD	$36.55		$17.95
STONE MASON	AD	$34.18		$16.22
TILE & TERRAZZO FINISHER	AD	$21.48		$9.34
TILE & TERRAZZO MECHANIC	AD	$26.28		$10.50
TRUCK DRIVER - DUMP	AD	$21.00		$0.00 a + b
TRUCK DRIVER - DUMP - ARTICULATING	AD	$21.14	005	$0.45
TRUCK DRIVER - FLATBED	AD	$25.42		$0.00
TRUCK DRIVER - LOWBOY	AD	$30.90		$6.75
TRUCK DRIVER - TACK/TAR TRUCK	AD	$22.94		$7.87
TRUCK DRIVER - TANDEM	AD	$21.71	005	$15.33
TRUCK DRIVER - TRACTOR TRAILER	AD	$29.00		$15.12 a + b
TRUCK DRIVER - WATER	AD	$26.95	005	$11.55
LABORER GROUP II				
LABORER - ASPHALT RAKER	AD	$17.89		$2.81
LABORER - COMMON	AD	$17.89		$2.81
LABORER - CONCRETE PUDDLER	AD	$17.89		$2.81
LABORER - CONCRETE TENDER	AD	$17.89		$2.81
LABORER - CONCRETE VIBRATOR	AD	$17.89		$2.81
LABORER - DENSITY GAUGE	AD	$17.89		$2.81
LABORER - FIREPROOFER - MIXER	AD	$17.89		$2.81
LABORER - FLAGGER	AD	$17.89		$2.81
LABORER - GRADE CHECKER	AD	$17.89		$2.81
LABORER - HAND ROLLER	AD	$17.89		$2.81
LABORER - JACKHAMMER	AD	$17.89		$2.81
LABORER - LANDSCAPING	AD	$17.89		$2.81
LABORER - LAYOUT	AD	$17.89		$2.81
LABORER - LUTEMAN	AD	$17.89		$2.81
LABORER - MORTAR MIXER	AD	$17.89		$2.81
LABORER - PLASTERER - HANDLER	AD	$17.89		$2.81
LABORER - TAMPER	AD	$17.89		$2.81
LABORERS GROUP I				
LABORER - AIR TOOL OPERATOR	AD	$16.43		$4.30
LABORER - ASPHALT PAVER	AD	$16.43		$4.30
LABORER - BLASTER - DYNAMITE	AD	$16.43		$4.30
LABORER - BURNER	AD	$16.43		$4.30
LABORER - CONCRETE SURFACER	AD	$16.43		$4.30
LABORER - HAZARDOUS MATERIAL HANDLER	AD	$16.43		$4.30
LABORER - MASON TENDER	AD	$16.43		$4.30
LABORER - PIPELAYER	AD	$16.43		$4.30
LABORER - SCAFFOLD BUILDER	AD	$16.43		$4.30

FRINGE REFERENCES AS NOTED:

a. PAID HOLIDAYS: New Year Day, Memorial Day, July 4th, Labor Day, Thanksgiving Day & Christmas Day.

b. PAID VACATIONS: Employees with 1 year service - 1 week paid vacation;
2 years service - 2 weeks paid vacation;
10 years service - 3 weeks paid vacation.

Incidental Craft Data: Caulker, Man Lift Operator, Rigger, Scaffold Builder, and Welder receive the wage and fringe rates prescribed for the craft performing the operation to which welding, scaffold building, rigging, operating a Man Lift, or caulking is incidental.

These **Informational Prevailing Wage Rates** may not be substituted for the requirements of pre-advertisement or onsite job posting for a public work contract that exceeds $500,000 in value and either of the following criteria are met: (1) the contracting body is a unit of State government or an instrumentality of the State and there is any State funding for the project; or (2) the contracting body is a political subdivision, agency, person or entity (such as a county) and the State funds 50% or more of the project.

Modification Codes:

(AD) 17-209 Annual Determination from Survey Wage Data Received
(CH) 17-211 Commissioners' Hearing
(CR) 17-208 Commissioners' Review
(SR) 17-208 Survey Review by Staff

Each "Borrowed From" county is identified with the FIPS 3-digit county code unique for the specific jurisdiction in Maryland.

For additional information on the FIPS (Federal Information Processing Standard) code, see http://www.census.gov/datamap/fipslist/AllSt.txt

The Prevailing Wage rates appearing on this form were originally derived from Maryland's annual Wage Survey. The Commissioner of Labor & Industry encourages all contractors and interested groups to participate in the voluntary Wage Survey, detailing wage rates paid to workers on various types of construction throughout Maryland.

A mail list of both street and email addresses is maintained by the Prevailing Wage Unit to enable up-to-date prevailing wage information, including Wage Survey notices to be sent to contractors and other interested parties. If you would like to be included in the mailing list, please forward (1) your Name, (2) the name of your company (if applicable), (3) your complete postal mailing address, (4) your email address and (5) your telephone number to PWMAILINGLIST@dllr.state.md.us. Requests for inclusion can also be mailed to: Prevailing Wage, 1100 N. Eutaw Street - Room 607, Baltimore MD 21201-2201.

SECTION 003000

STATE OF MARYLAND
DEPARTMENT OF PUBLIC SAFETY AND CORRECTIONAL SERVICES

GENERAL CONDITIONS OF THE CONTRACT BETWEEN OWNER AND CONTRACTOR

STATE OF MARYLAND

Department of Public Safety and Correctional Services

GENERAL CONDITIONS OF THE CONTRACT BETWEEN OWNER AND CONTRACTOR

Department of Public Safety and Correctional Services
Stephen T. Moyer, *Secretary*
6776 Reisterstown Road
Baltimore Maryland 21215

January 2015

STATE OF MARYLAND
DEPARTMENT OF PUBLIC SAFETY AND CORRECTIONAL SERVICES
GENERAL CONDITIONS OF THE CONTRACT BETWEEN OWNER AND CONTRACTOR

Note:

The terms "**Bid**" and "**Bidder**" are used throughout this document. Their meanings are to be considered synonymous with the terms "**Proposal**" and "**Proposer**".

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Form DPSCS OS 11A MBE
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i. Proposed Change Order/PCO
ii. Change Order

STATE OF MARYLAND
DEPARTMENT OF PUBLIC SAFETY AND CORRECTIONAL SERVICES (DPSCS)
GENERAL CONDITIONS OF THE CONTRACT BETWEEN OWNER AND CONTRACTOR

SECTION 1 - DEFINITIONS AND RESPONSIBILITIES:

1.01 DEFINITIONS AND CONDITIONS:

A. The words and terms stated in subsection B have the meanings indicated. The words "he" or "his" may also mean "she" or "her" and applies to any gender or firm as the case may be.

B. (1) **Approved Equal -** Those materials, supplies or services, or compatible items of construction whose quality, design or performance characteristics are functionally equal or superior to an item specified and which meet all salient characteristics and other requirements of the contract as determined by the Procurement Officer.

(2) **The Architect -** The person or the firm commissioned by the State to design the project and/or provide construction-phase architectural or engineering services. If the design was performed by an engineer rather than an architect, "architect" shall refer to the engineer. If the design was performed by the State, "architect" shall refer to the State. The Procurement Officer may exercise any power or authority of the architect under the contract. Architect, Engineer or Architect/Engineer (A/E) mean the same.

(3) **Breach –** Means material breach of the contract. Synonymous with "default."

(4) **Change Order -** A written order or directive signed by the Procurement Officer, directing a contractor to act as directed, which the Changes clause of the contract authorizes the Procurement Officer to issue with or without the consent of the contractor. An order of the Procurement Officer, by virtue of being called a "change order," does not necessarily constitute and shall not be construed to be a change in the scope of the contract or in the work required under the contract or to entitle the contractor to additional compensation for performing the work which is the subject of the order.

(5) **Claim -** Means a complaint by the contractor or by the State relating to the contract. Also called a "dispute."

(6) **Contract and Contract Documents -** The written agreement executed between the State and the contractor by which the contractor is bound to perform the work and furnish the labor, services, equipment and materials, and by which the State is obligated to compensate him therefore at the mutually established and accepted rate or price. The contract includes the construction bid form, contract forms and bonds, Instructions to Bidders, the executed Bid/Proposal Affidavit and Contract Affidavit, General Conditions, specifications, addenda, supplemental conditions and specifications, all special conditions and provisions, all technical provisions, all plans, the notice to proceed, any written change orders and supplemental agreements that are required to complete the construction of the work in an acceptable manner, including authorized extensions thereof, all approved shop drawings (subject to Sections 2.02 I and J and all other provisions of the contract) which are in accordance with the requirements of the other contract documents, and all other documents as provided in the contract. These documents which comprise the contract are sometimes referred to collectively as the "contract documents."

(7) **The contractor -** The person or organization having a direct contractual relationship with the State for the execution of the work. May be stated as Prime or General Contractor, but the meaning remains the same.

(8) **Contract Completion Date -** The date upon which the Work of the Contract is to be completed. The Contract Completion Date is calculated by adding the Contract Time to the Start Date.

(9) **Contract Time -** The number of calendar days, including weekends and holidays, within which the Contractor shall complete the Work of the Contract. The Contract Time shall commence upon the Start Date.

(10) **Critical Path Method (CPM) -** Critical Path Method (CPM) - A scheduling/management tool recognizing a network of work elements or activities and a critical path for completion of a construction project.

(11) **Day -** Means calendar day unless otherwise designated.

(12) **For Design/build construction contracts –** Contractor means Design/Build (D/B) Contractor.

(13) **The Department or DPSCS -** Refers to the Department of Public Safety and Correctional Services, State of Maryland.

(14) **Dispute -** Means a complaint by the Contractor or the State relating to the contract - also called a "claim."

(15) **Including -** Means "including but not limited to."

(16) **Inspector -** A representative of the Department assigned to review on-site construction activities for the State in accordance with Section 4.06.

(17) **Joint Venture -** means a legal entity consisting of two or more members brought together temporarily to form a joint venture to function as a Prime or General contractor. A joint venture itself can never be certified as a minority business. The joint venture agreement must reveal the scope of the MBE's managerial and financial responsibilities

(18) **Notice to Proceed -** A written notice to the Contractor of the start date on which he shall begin the prosecution of the work.

(19) **Payment Bond -** The security in the form approved by the Department and executed by the Contractor and his surety, and paid for by the Contractor, as a guarantee that the Contractor will pay in full all his bills and accounts for materials and labor used in the construction of the work, as provided by law.

(20) **Performance Bond -** The security in the form approved by the Department and executed by the Contractor and his surety, and paid for by the Contractor, guaranteeing for the benefit of the State complete performance of the contract in accordance with its terms.

(21) **Plans -** The official design drawings issued or accepted by the State as part of the contract documents, including those incorporated into the contract documents by reference.

(22) **Procurement Officer -** (a) Any person (i) authorized by the Department to formulate, enter into, or administer the contract or to make written determinations with respect to the contract and (ii) an authorized representative acting within the limits of the representative's authority; and (b) the Secretary or Deputy Secretary of the Department.

(23) **Project Manager –** The individual designated by the Department to manage the project on behalf of the State.

(24) **Repair -** To restore after injury, deterioration, or wear; to mend; to renovate by such means as appropriate and to supply such materials and labor as necessary to render the item to be repaired sound, solid, true, plumb, square, even, smooth and fully serviceable; or to bring into conformity with contract requirements. Upon completion of such repair it must be, unless otherwise stated, rendered to such condition as to present a first-class finished work, or in instances where the repaired item serves as a base for additional finish, the repaired work must be such as to permit a first-class finish, to be applied without extra cost to the State. When the word "repair" is used in connection with machinery or mechanical equipment it shall mean, in addition to the above, rendering the equipment completely serviceable and efficient and ready for the normal use for which it was intended.

(25) **The Owner or State-** The State of Maryland and/or the Department of Public Safety and Correctional Services.

(26) **The Secretary -** The Secretary or Deputy Secretary of the Department of Public Safety and Correctional Services, or his designee.

(27) **SF&P -** The State Finance and Procurement Article of the Annotated Code of Maryland.

(28) **Solicitation Documents -** The State's Invitation to Bid or Request for Proposals and any amendment(s) thereto.

(29) **Start Date -** The date provided in the Notice to Proceed upon which the Work is authorized to commence.

(30) **Subcontractor -** Except as is otherwise provided herein, "Subcontractor" means an entity having a direct contract with the Contractor to furnish a part of the work. It includes one who furnishes material worked to a special design according to the plans and specifications for the Work.

(31) **Superintendent –** The field representative of the contractor who in the absence of a Resident Project Manager is authorized to receive and execute instructions from the Department, and who shall supervise and direct the construction.

(32) **Supervisory Personnel -** The individual(s) designated by the Contractor to direct or oversee the on-site work of the Contract.

(33) **Surety -** The corporate body bound as required by law for the full and complete performance of the contract by the Contractor or for the payment by the Contractor to Subcontractors and suppliers.

(34) **Work -** The furnishing of any and all labor, materials, equipment, services, utilities and other incidentals and the manufacture or fabrication of materials or equipment necessary to the successful completion of the project and the carrying out of all the duties and obligations imposed upon the Contractor by the contract.

(35) **Written Notice** - Written notice shall be deemed to have been duly served on the Contractor if delivered in person to the individual or to the member of the firm or to an office of the corporation to whom it is directed, or if delivered or sent by regular or certified mail or by facsimile transmission to the last business address known to the State. Written notice shall be deemed to have been given to the Department upon actual receipt of written notice.

1.02 CONTRACTOR'S RESPONSIBILITIES:

A. The contractor shall supervise and direct the work, using his best skill and attention. He shall be solely responsible (1) for all construction means, methods, techniques, sequences and procedures, (2) for coordinating all portions of the work under the contract, and (3) to the extent he or his Subcontractors or suppliers at any tier design or are required to design any portion of the work, for design. contractor must aggressively and diligently pursue completion of the contract within the contract time.

B. The contractor shall be responsible to the State for the Acts and omissions of his employees, Subcontractors and suppliers at any tier, and their agents and employees performing any of the work for the Project.

C. The contractor shall not be relieved from its obligations to perform the work in accordance with the contract documents either by the activities or duties of the architect in its administration of the contract, or by the performance or nonperformance of inspections, tests or approvals by the State or persons hired by the State.

D. The contractor shall confine operations at the site to areas permitted by law, ordinances, permits and the contract documents and shall not unreasonably encumber the site with any materials or equipment.

E. Cutting And Patching of Work:

(1) The contractor shall be responsible for all cutting, fitting or patching that may be required to complete the work or to make its several parts fit together properly.

(2) The contractor shall not damage or endanger any portion of the work or the work of the owner or any separate contractors by cutting, patching or otherwise altering any work, or by excavation. The contractor shall not cut or otherwise alter the work of the owner or any separate contractor except with the written consent of the owner and of such separate contractor. The contractor shall not unreasonably withhold from the owner or any separate contractor his consent to cutting or otherwise altering the work.

F. The contractor shall perform all work in accordance with the terms, provisions, conditions, lines, grades, typical cross-sections, dimensions, and other data in or required by the contract documents, including the furnishing of all materials, services, implements, machinery, equipment, tools, supplies, transportation, labor, and all other items necessary for the satisfactory prosecution and completion of the project in full compliance with the requirements of the contract documents.

G. Indemnification.

(1) To the fullest extent permitted by law, the contractor shall indemnify and hold harmless the State and the architect and their agents and employees from and against all claims, damages, losses and expenses, including but not limited to attorney's fees, arising out of or resulting from the performance of the work, provided that any such claim, damage, loss or expense (1) is attributable to actual or threatened bodily injury, sickness, disease or death, or to actual or threatened injury to or destruction of tangible property including the loss of use resulting there from, and including but not limited to purely economic loss, and (2) is caused in whole or in part by any failure by the contractor or its Subcontractors or suppliers at any tier to perform any requirement of the contract or by any negligent act or omission on the part of the contractor or its Subcontractors or suppliers at any tier, or anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, regardless of whether or not it is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or otherwise reduce any other right or obligation of indemnity which would otherwise exist as to any party or person described in this subsection.

(2) In any and all claims against the State or any of their agents or employees by any employee of the contractor, any Subcontractor or supplier at any tier, anyone directly or indirectly employed by any of them, or anyone for whose acts any of them may be liable, the indemnification obligation under this paragraph shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the contractor or any Subcontractor or supplier under workers' or workmen's compensation acts, disability benefit acts or other employee benefit acts.

(3) Except to the extent that the contractor is also the architect, as provided in Section 1.01B, the obligations of the contractor under this subsection shall not extend to the liability of the architect, his agents or employees, arising out of (1) the preparation or approval of maps, drawings, opinions, reports, surveys, change orders, designs or specifications, or (2) the giving of or the failure to give directions or instructions by the architect, his agents or employees providing such giving or failure to give is the primary cause of the injury or damage.

H. **Performance Evaluations**

(1) The Department will perform for the benefit of itself and other State agencies evaluations (interim and/or final) of the performance of the contractor and Subcontractors and suppliers.

(2) Performance evaluations may be used or reviewed by a procurement officer in the course of making a determination of responsibility under other procurements.

(3) Unsatisfactory performance of this contract (or any part of it), whether or not the contract is terminated for default and whether or not an unsatisfactory report (interim or final) is issued, may result in a determination that the contractor is not a responsible bidder under **COMAR 21.06.01.01.**

(4) Nothing in this contract shall be construed to limit or qualify the authority of a procurement officer under the SF & P or **COMAR Title 21**.

SECTION 2 - CONTRACT DOCUMENTS - SHOP DRAWINGS:

2.01 CONTRACT DOCUMENTS:

A. The contract documents are complementary. That which is called for by any one shall be as binding as if called for by all.

(1) The intent of the contract documents is to include in the scope of the contract, at no additional cost to the State, all work necessary for proper completion of the project ready for continual efficient operation and not to include any work not properly inferable.

(2) **Clarification**: Prior to bidding, the contractor should obtain clarification of all questions which may have arisen as to intent of the contract documents, or any actual conflict between two or more items in the contract documents. Should the contractor have failed to obtain such clarification, then the Procurement Officer may direct that the work proceed by any method indicated, specified or required, in the judgment of the Procurement Officer, by the contract documents. Such direction by the Procurement Officer shall not constitute the basis for a claim for extra costs by the contractor. The contractor acknowledges that he had the opportunity to request clarification prior to submitting his bid to the State and that he is not entitled to claim extra costs as a result of failure to receive such clarification.

(3) **Jargon**: Work described in words that have a well-known technical or trade meaning shall be held to refer to such recognized standard use.

(4) **Precedence:** In case of conflict between the specifications and the drawings, the specifications will control. Typewritten or printed text shall govern over handwritten or drafted notes.

B. **Drawings:** The contractor shall do no work without proper drawings and/or instructions. Drawings may or may not be drawn to scale, and symbols may be used to indicate materials and structural and mechanical requirements. When symbols are used, those parts of the drawings are of necessity diagrammatic or schematic and it is not possible to indicate all connections, fittings, fastenings, etc., which are required to be furnished for the proper execution of the work. Diagrammatic or schematic indications of piping, duct work and conduit and similar items in the work are subject to field adjustment in order to obtain proper grading, fitting passage over, under or past obstructions, to avoid exposure in finished rooms and unsightly and obstructing conditions. The contractor shall make these adjustments at no increased cost to the State.

(1) **Copies Furnished:** The Contractor shall print on their own stationary the required documents for their own use and for their subcontractors during the bid and construction periods. The State will no longer furnish to the Contractor (successful bidder), printed Contract/Bid Documents (Project Manual and Drawings), for the construction contract accomplishment.

(2) **Copies At the Site/As-built Drawings:** The contractor shall keep in the job site office a complete set of all drawings, specifications, shop drawings, schedules, etc., in good order and available to the architect and the State. Additionally, one set of all contract drawings must be maintained as “as-built” drawings. These as-built drawings shall be marked up by the contractor in the field on a regular basis (at least monthly) to record all changes in the work as they occur, and the exact location of all work and equipment, including exposed and concealed pipe runs, cables, valves, plugged outlets, cleanouts and other control points including electrical conduits and ducts, in such manner as will provide a complete, accurate “as-built” record. The location of pipes or control points concealed underground, under concrete, in chases or above hung ceiling shall be dimensioned. contractor will not be entitled to receive progress payments unless the on-site as-built drawings are kept up to date as required by the

Contract. "As-Built/Project Record Documents" Utilizing AutoCAD 2015 software prepared by Contractor and drawings shall be delivered to the architect, in a condition satisfactory to him, as a condition precedent to final acceptance of work. Release of final retain age will be subject to receipt of the as-built drawings.

(3) **Ownership:** All drawings including as-built remain the property of the State. They must not be used by the contractor on other projects and they shall be returned to the State, if requested, upon completion of the work.

C. **Large Scale Detail Drawings**: The architect shall furnish, when the State directs, additional instructions, in the form of large scale developments of the drawings used for bidding, or to amplify the specifications for the proper execution of the work. These shall be true developments of the bidding documents and reasonably inferable there from. The work shall be executed in conformity therewith.

D. **Dimensions:** The contractor shall carefully check all dimensions prior to execution of the particular work. Whenever inaccuracies or discrepancies are found, the contractor shall consult the Architect and the Department prior to any construction or demolition. Should any dimensions be missing, the Department must be consulted and it will supply them prior to execution of the work. Dimensions for items to be fitted into constructed conditions at the job will be taken at the job and will be the responsibility of the contractor. The obvious intent of the documents or obvious requirement dictated by conditions existing or being constructed supersedes dimensions or notes which may conflict therewith. Whenever a stock size manufactured item or piece of equipment is specified or is proposed by the contractor to be furnished, it is the responsibility of the contractor to determine the actual space requirements for setting or entrance to the setting space. No extra will be allowed by reason of work requiring adjustments in order to accommodate the particular item of equipment furnished by the contractor.

2.02 SHOP DRAWINGS AND SUBMITTALS:

A. After checking and verifying all field measurements and after complying with applicable procedures specified in the contract documents, contractor shall submit to the architect for review and approval, in accordance with the contractor's schedule, shop drawings and other submittals which will bear a stamp or specific written indication that the contractor has satisfied its responsibility under the contract documents with respect to the review of such submissions. The data on the shop drawing or submittal must be complete with respect to quantities, dimensions, specified performance and/or design criteria, materials and similar data to enable the architect to review the information as required. These documents shall be prepared in conformity with the best practice and standards for the trade concerned. Due regard shall be given to speed and economy of fabrication and erection.

B. All shop drawings, product literature, and samples shall be submitted to DPSCS for review. Each submittal shall be reviewed by the Design/Build contractor and the Architect of Record prior to submittal to DPSCS. DPSCS will notify the contractor within 14 calendar days of receipt of any items found to be unacceptable. When DPSCS requests corrections, or rejects a submittal, the contractor shall resubmit the item with proper corrective changes in a timely manner. DPSCS will not be responsible for any delays caused by DPSCS review or required re-submittal. DPSCS review and approval shall be for the benefit of the State only to confirm compliance with the contract requirements only and does not release or alter responsibilities of the contractor and the architect of record in the review process.

C. All shop drawings and submittals must show the name of the project and the Department's contract number.

D. **Size of Drawings**: All shop drawings and details submitted to the architect for approval shall be printed on sheets of the same size as the contract drawings prepared by the architect. When a standard of a fabricator is of such size to print more than one drawing on a sheet of the size of the architect's drawings, this is acceptable. Sheets larger than the architect's drawings will not be accepted except when specifically permitted by the Department. Shop detail supplied on a sheet of letter size 8-1/2" x 11" is acceptable for schedules and small details.

E. **Items for which shop drawings will be required**: Shop drawings shall be required for all items which are specifically fabricated for the work or when the assembly of several items is required for a

working unit. Shop drawings are required for all concrete reinforcing and structural steel, specially made or cut masonry units, miscellaneous metal work, specially made millwork, plaster molds, moldings, marble and slate, special rough hardware and all heating, ventilating, plumbing and electrical items requiring special fabrication or detailed connections including refrigeration, elevators, dumb waiters, laboratory equipment, ducts, fuel storage tanks, fire sprinkler systems, etc., or as indicated in the submittal register, if provided in the specifications.

F. **Copies Required:** contractor shall supply copies of shop drawings and submittals for the architect's file and review, and the copies for the Department as directed by the Department, in addition to such copies as the contractor may desire to be returned for his own use.

G. **Examination and Approval:** The architect will examine and return shop drawings, submittals, and requests for information with reasonable promptness noting desired corrections, or approving them with or without conditions, or rejecting them. The contractor must allow the architect and DPSCS at least 14 calendar days following receipt of each submittal or re-submittal of shop drawings, submittals, and requests for information to review the documents and respond to the contractor. Items requiring longer than 14 calendar days of review time will be identified in the specifications. The minimum allowed time for architect and DPSCS review shall be increased to the extent that additional time for review is needed due to the fault or responsibility of the contractor or his Subcontractors and suppliers. The contractor will be notified of the cause of the delay and advised of how long it will take to complete the review; provided however that mere failure to give the contractor such notice shall not entitle the contractor to compensation or a time extension.

H. **Field Dimensions and Conditions:** The contractor is responsible for checking dimensions and existing conditions in the field. See also Section 3.04.

I. **Resubmission:** When the architect and/or the state notes desired corrections, or rejects the drawings, the contractor shall resubmit the drawings with proper corrective changes in a timely manner.

J. **Contractor's Responsibility**: Unless the contractor has, in writing, expressly notified the architect and the Procurement Officer to the contrary at the time of the submission, the State and the architect may assume that shop drawings and other submittals from the contractor are in conformity with the contract documents and do not involve any change in the contract price, or any change which will alter the space within the structure, or alter the nature of the building or work from that contemplated by the contract documents, or constitute a substitution of materials or equipment or a change in the contract or the scope of work. If the contractor fails to give notice strictly in accordance with this subsection, approval of any shop drawing or submittal shall not be binding on the State. See also Sections 5.01C and 5.03.

K. **Notations by State or Architect:** Should the Contractor consider any rejection or notation by the State or architect on the shop drawings or other material submittals, or any other action or inaction of the State or the architect, to cause an increase or decrease in the scope of the work from that required by the contract documents, the Contractor shall:

(a) Desist from further action relative to the item he questions;

(b) Immediately notify in writing the architect and the Department; and

(c) Furnish both, within fourteen days, with a written statement of the increased or decreased cost involved.

No work shall be executed until the entire matter is clarified and the Contractor is ordered by the State to proceed. Failure of the Contractor to serve written notice as above required shall constitute a waiver of any claim in relation thereto.

2.03 COST AND PRICE CERTIFICATION (COMAR 21.07.01.23)

A. Contractor by submitting cost or price information certifies that, to the best of its knowledge, the information submitted is accurate, complete, and current as of a mutually determined specified date prior to the conclusion of any price discussions or negotiations for:

(1) A negotiated contract, if the total contract price is expected to exceed $100,000, or a smaller amount set by the procurement officer, or

(2) A change order or contract modification, expected to exceed $100,000, or smaller amount set by the procurement officer.

B. The price under this Contract and any change order or modification hereunder, including profit or fee, shall be adjusted to exclude any significant price increases occurring because the contractor furnished cost or price information which, as of the date agreed upon between the parties, was inaccurate, incomplete, or not current.

SECTION 3 - SCOPE OF THE WORK:

3.01 INTENT OF THE CONTRACT DOCUMENTS:

It is the intent of the contract documents to show all of the work necessary to complete the project.

3.02 GENERAL CONDITIONS CONTROLLING:

In the event of a conflict between these General Conditions and any other provision of the contract documents, these General Conditions shall prevail unless such other provision expressly provides to the contrary. Nothing in the bid, proposal, or other submissions from the Contractor shall prevail over any contract documents unless expressly agreed to by the Procurement Officer in writing by a properly approved change order or contract modification.

3.03 DIFFERING SITE CONDITIONS (COMAR 21.07.02.05)

A. The contractor shall promptly, and before such conditions are disturbed, notify the Procurement Officer in writing of (1) subsurface or latent physical conditions at the site differing materially from those indicated in this contract, or (2) unknown physical conditions at the site of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in this contract. The Procurement Officer shall promptly investigate the conditions, and if he finds that such conditions do materially so differ and cause an increase or decrease in the contractor's cost of, or the time required for performance of any part of the work under this contract, whether or not changed as a result of such conditions, an equitable adjustment shall be made and the contract modified in writing accordingly.

B. No claim of the contractor under this clause shall be allowed unless the contractor has given the notice required in A above; provided, however, the time prescribed therefore may be extended by the Procurement Officer in writing.

C. No claim by the contractor for an equitable adjustment hereunder shall be allowed if asserted after final payment under this contract.

3.04 SITE INVESTIGATION (COMAR 21.07.02.06)

The contractor acknowledges that he has prior to submitting the bid, investigated and satisfied himself as to the conditions affecting the work; including but not restricted to those bearing upon transportation, disposal, handling and storage of materials, availability of labor, water, electric power, roads and uncertainties of weather, river stages, tides or similar physical conditions at the site, the conformation and conditions of the ground, the character of equipment and facilities needed preliminary to and during prosecution of the work. The contractor further acknowledges that he has satisfied himself as to the character, quality and quantity of surface and subsurface materials or obstacles such as existing structural systems, piping, ductwork, utilities, etc. to be encountered insofar as this information is reasonably ascertainable from the inspections of the site and the work areas of the project including all exploratory work done by the State, as well as from information presented by the drawings and specifications made a part of this contract. Any failure by the contractor to acquaint himself with the available information will not relieve him of responsibility for estimating properly the difficulty or cost of successfully performing the work. The State assumes no responsibility for

any conclusions or interpretations made by the contractor on the basis of the information made available by the State.

3.05 CONDITIONS AFFECTING THE WORK:

The contractor shall be responsible for having taken steps reasonably necessary to ascertain the nature and location of the work and the general and local conditions which can affect the work or the cost thereof. Any failure by the contractor to do so will not relieve him from responsibility for successfully performing the work without additional expense to the State. The State is not responsible for any representation or purported agreement concerning conditions or contract requirements made by any State employee or representative prior to the execution of this contract, unless such understanding or representation is expressly stated in the contract.

3.06 CHANGES -- MISCELLANEOUS:

A. Changes **(COMAR 21.07.02.02)**

(1) The Procurement Officer unilaterally may, at any time, without notice to the sureties, if any, by written order designated or indicated to be an order, make any change in the work within the general scope of the contract, including but not limited to changes:

(a) In the specifications (including drawings and designs);
(b) In the method or manner of performance of the work;
(c) In the State-furnished facilities, equipment, materials, services, or site; or
(d) Directing acceleration in the performance of the work.

(2) Any other written order or an oral order, including a direction, instruction, interpretation, or determination from the Procurement Officer that causes or constitutes any such change shall be treated as a change order under this clause provided that the contractor gives the Procurement Officer written notice stating the date, circumstances, and source of the order and that the contractor regards the order as a change order.

(3) Except as herein provided, no order, statement, or conduct of the Procurement Officer shall be treated as a change under this clause or entitle the contractor to an equitable adjustment hereunder.

(4) Subject to paragraph (6) of this subsection, if any change under this clause causes an increase or decrease in the contractor's cost of, or the time required for, the performance of any part of the work under the contract, whether or not changed by an order, an equitable adjustment shall be made and the contract modified in writing accordingly; provided, however, except for claims based on defective specifications, that no claim for any order under (2) above shall be allowed for any costs incurred more than twenty (20) days before the contractor gives written notice as therein required; and provided further, that in the case of defective specifications for which the State is responsible, the equitable adjustment shall include any increased cost reasonably incurred by the contractor in attempting to comply with such defective specifications.

(5) If the contractor intends to assert a claim for an equitable adjustment under this Section 3.06, he shall, within 30 days after receipt of a written order under (1) above or the furnishing of written notice under (2) above, submit to the Procurement Officer a written statement setting forth the general nature and monetary extent and/or time extension of such claim, unless this period is expressly extended by the Procurement Officer in writing. The statement of claim hereunder may be included in the notice under (2) above.

(6) Each contract modification or change order that affects contract price shall be subject to the prior written approval of the Procurement Officer and other appropriate authorities (such as Board of Public Works) and to prior certification of the appropriate fiscal authority of fund availability and the effect of the modification or change order on the project budget or the total construction cost. If, according to the certification of the fiscal authority, the contract modification or change order will cause an increase in cost that will exceed budgeted and available funds, the modification or change order may not be made

unless sufficient additional funds are made available or the scope of the project is adjusted to permit its completion within the project budget.

(7) No claim by the contractor for an equitable adjustment hereunder shall be allowed if asserted after final payment is made under this contract.

B. Miscellaneous

(1) In the event of a dispute between the Department and the contractor as to whether any work is included in the scope of the contract such that the contractor would be obligated to provide that work at no additional cost to the State, the Procurement Officer may order the contractor under this Section 3.06 to perform the work (a "Work Order"). If the contractor considers such an order to be a change in the scope of the contract entitling the contractor to additional compensation, a time extension, or other relief, the contractor must provide the notice required by this section and initiate a claim therefor in accordance with contract requirements. An order of the Procurement Officer, by virtue of being called or referred to as a "change order," does not necessarily constitute a change in the scope of the contract or in the work required under the contract. The contractor shall not be entitled to additional compensation, a time extension, or other relief for complying with an order of the Procurement Officer if the contract otherwise requires the contractor to perform as stated in the order.

(2) A request by the contractor for additional time or additional costs caused by the impact of an order of the Procurement Officer on the as-built critical path for completion must be accompanied by (a) a reasonably detailed description of the effect of the order on the adjusted as-planned/as-built critical path and (b) supporting documentation. The mere existence of a change order does not entitle contractor to an extension of time, compensation for delay, or damages or costs associated with delay. contractor's entitlement thereto shall depend upon the effect of the change order on the adjusted as-planned/as-built critical path for completion, even if a schedule other than a CPM schedule is used on the project, and shall be subject to the requirements of Section 7.06. A change order granting a time extension may provide (a) that the contract completion date will be extended only for specific critical activities, (b) that the remaining contract completion date(s) for all other portions of the work will not be altered, and (c) for an equitable adjustment of liquidated damages under the new required completion dates.

(3) Upon receipt of a signed written order of the Procurement Officer under this Section 3.06, the contractor shall comply with the order promptly, within the requirements of the completion schedule, whether or not the contractor signs or accepts the change order. Failure to comply with the order in a timely manner shall constitute a breach of the contract and grounds for termination for default or any other remedy available to the State.

(4) The State may issue a unilateral order on the State's terms (including a promise to pay the contractor a "not to exceed" ("NTE") amount) which the contractor may then dispute in accordance with Sections 3.06A and 6.13. Pending resolution of such a dispute, contractor must proceed diligently with performance of the contract as ordered by the Procurement Officer.

(5) The terms "not to exceed" and "NTE" when used in a change order mean that the amount of the change order (whether an increase or a decrease in the contract amount) will be a reasonable amount not to exceed the amount stated.

(6) The Change Order/Work Order form attached hereto is the form which will be used by the State for all orders under this Section 3.06.

(7) Contractor shall use the attached PCO Cover Sheet when submitting all requests for change orders and contract modifications.

3.07 MODIFICATION OF CONTRACT PRICE:

When changes in the work require modification of the contract price, such modification shall be accomplished in accordance with the requirements of Section 3.06 and the following requirements:

A. The contractor shall promptly submit to the State and to the architect a fully itemized breakdown of the quantities and prices used in computing the value of the requested change along with a detailed explanation and justification for the proposed change regardless of the nature of the change.

B. For all changes in the work to be performed by a Subcontractor, the contractor shall furnish the Subcontractor's fully itemized breakdown of quantities and prices which shall bear the original signature of a representative of the Subcontractor authorized to act for the Subcontractor. If requested by the State or the architect, proposals from suppliers or other supporting data required to substantiate costs shall be furnished.

C. Modification of the contract price, when required, shall be determined as follows:

(1) Variations in Estimated Quantities (**COMAR 21.07.02.03**) - Where the quantity of a pay item in this contract is an estimated quantity and where the actual quantity of such pay item varies more than twenty-five percent (25%) above or below the estimated quantity stated in this contract, an equitable adjustment in the contract price shall be made upon demand of either party. The equitable adjustment shall be based upon any increase or decrease in costs due solely to the variation above one hundred twenty-five percent (125%) or below seventy-five percent (75%) of the estimated quantity. If the quantity variation is such as to cause an increase in the time necessary for completion, the procurement officer shall, upon receipt of a written request for an extension of time within ten (10) days from the beginning of the delay, or within a further period of time which may be granted by the procurement officer before the date of final settlement of the contract, ascertain the facts and make the adjustment for extending the completion date as in his judgment the findings justify.

(2) A lump sum price agreed upon by both the State and contractor.

(3) If job conditions or circumstances, or the extent or nature of the change, or failure of the State and the contractor to agree upon a lump sum price or the application of unit prices, prevent the determination of the cost of any proposed change, the work shall be done on the basis of a Force Account, as hereinafter stated under Section 8.02 FORCE ACCOUNT WORK, if so ordered by the State.

(4) If the change involves a credit to the State, unless the amount must be determined by the application of unit prices, then the amount of the credit shall be the greater of (a) the alternate or other itemized price for such work stated in contractor's bid, or (b) a reasonable price, including overhead and profit.

(5) If the change involves both a credit and a debit, both sums shall be shown and the two sums balanced to determine the adjusted total cost or credit.

(6) The mark-up allowable to the Contractor for combined overhead and profit for work performed solely by the Contractor with his own forces shall be a reasonable amount not to exceed fifteen percent (15%) of the Contractor's costs, excluding those items which may be included in overhead.

(7) (a) The mark-up allowable to a Subcontractor for overhead and profit for work performed solely with his own forces shall be a reasonable amount not to exceed ten percent (10%) for the Subcontractor's overhead and five percent (5%) for the Subcontractor's profit, based upon the Subcontractor's costs of labor, materials, and equipment.

(b) For work performed by a Subcontractor solely with his own forces, the contractor is entitled to a reasonable mark-up for combined overhead and profit, not to exceed five percent (5%) of the cost of the Subcontractor's materials, equipment, and labor.

(8) The cost of supervisory personnel may be added only when the modification makes necessary the hiring of additional supervisory personnel or makes necessary their employment for time additional to that required by the contract.

(9) The contractor shall be allowed the actual, reasonable additional cost for rental of machine power tools or special equipment, including fuel and lubricants which are necessary to execute the work required on the change, but no percentages shall be added to this cost.

(10) If the contractor and the State cannot agree as to the extent the contract time shall be increased for extra work or the extent the contract time shall be reduced for work omitted by the State, the increase or decrease, as the case may be, shall be determined by the Procurement Officer based on the impact of the change, if any, on the as-built critical path for completion of the work, whether or not a CPM schedule is used.

(11) The architect, with the written approval of the State, shall have authority to make minor changes in the work not involving extra cost, and not inconsistent with the purposes of the work. Otherwise, no extra work or changes to the work shall be done unless authorized by the Procurement Officer prior to any such work or changes to the work being done.

D. The allowable percentages of cost for overhead and profit as provided in 3.07C(6) and (7), 7.06P(3), and 8.02A(9), and all other applicable provisions of the contract, are deemed to include but not be limited to all costs and expenses of the following kinds: project management, supervision and coordination; job supervision and field office expenses required by the contract; expenses for supervisors, superintendents, managers, timekeepers, clerks and watchmen; cost of correspondence of any kind; insurance not specifically mentioned herein; all expenses in connection with the maintenance and operation of the field office, use of small tools, costs of vehicles generally used for transporting either workmen, materials, tools or equipment to job location, and incidental job burdens, including testing and clean-up, etc. required to produce the intended results; and all expenses of maintenance or operation of contractor's regularly established principal office, branch office, and similar facilities, and all other costs and expenses customarily classified as overhead.

E. Contractor's entitlement to compensation or additional time for delays for which the State is responsible or for which an extension is due the contractor is also subject to Sections 3.06 and 7.06.

F. No allowance shall be made to the contractor for loss of anticipated profits on account of changes in the work.

G. Execution of a written change order by contractor, or failure of the contractor to dispute the terms of a written order of the Procurement Officer strictly in accordance with contract requirements, shall be binding and conclusive and shall operate as an accord and satisfaction as to (a) all compensation payable to contractor for the work associated with the change order, and (b) contractor's right to an extension of the contract completion time. contractor may not execute or accept a change order subject to any conditions or reservation of rights or claims which have not been agreed to in writing by the Procurement Officer. Any attempt by the contractor to impose such conditions or reservations shall not be binding on the State. contractor's sole remedy for disputing the terms of an order by the Procurement Officer or for making a claim therefor is to follow strictly the procedures stated in this Section 3.07 and Sections 3.06 and 6.13.

H. Whenever the contractor is entitled to an increase in the contract price, the amount of the increase shall not include any amount for increased costs or premiums of bonds unless: (1) DPSCS requires an increase in the amount of the penal sum of the bond or bonds, (2) the contractor actually incurs such cost, (3) the surety actually increases the penal sum of the bonds, and (4) DPSCS receives proof in satisfactory form that the surety has increased the penal sum of the bonds.

I. The contract is subject to all applicable provisions of **COMAR 21.05.03.04** (Negotiated Overhead Rates) and 21.05.03.05 (Price Negotiation Policies and Techniques).

3.08 UNAUTHORIZED WORK:

The contractor shall not be paid for any work outside the scope of the contract not authorized in writing by the Procurement Officer.

SECTION 4 - CONTROL OF THE WORK:

4.01 INTERPRETATION OF THE CONTRACT DOCUMENTS - AUTHORITY OF THE ARCHITECT:

A. The Procurement Officer shall be the final interpreter of the contract documents. He will furnish with reasonable promptness, through DPSCS or the architect, such clarifications as he may deem necessary for the proper execution of the work. Clarifications issued by the architect shall be consistent with the intent of the contract documents and, when in special instances the architect is authorized by the State so to act, the architect has authority to stop work whenever such stoppage may be necessary to ensure the proper execution of the contract.

B. Except as otherwise expressly provided in the contract documents, all decisions of the architect are subject to approval by the Department. The architect has no authority to waive or change the requirements of the contract documents except as provided in Section 3.07C(11) above.

4.02 CONFORMITY WITH CONTRACT REQUIREMENTS

A. All work performed and all materials furnished shall be in conformity with the contract requirements.

B. In the event the Procurement Officer finds the materials, or the finished product in which the materials are used or the work performed are not in complete conformity with the contract requirements and have resulted in an inferior or unsatisfactory product, the work or materials shall be removed and replaced or otherwise corrected by and at the expense of the contractor.

C. In the event the Procurement Officer finds the materials or the finished product in which the materials are used are not in complete conformity with the contract requirements, but have resulted in a satisfactory product, he shall then make a determination if the work shall be accepted. In this event, the Procurement Officer will document the basis of acceptance by a Change Order which will provide for an appropriate adjustment, if any, in the contract price.

4.03 ADJACENT WORK

The State shall have the right, at any time, to contract for and/or perform other work on, near, over or under the work covered by this contract. In addition, other work may be performed under the jurisdiction of another State agency. The contractor shall cooperate fully with such other contractors and carefully fit his own work to such other work as may be directed by the procurement officer.

4.04 CONTROL BY THE CONTRACTOR:

The contractor shall constantly maintain efficient supervision of the work, using his best skill and coordinating ability. He shall carefully study and compare all drawings, specifications and other instructions and check them against conditions existing or being constructed on the project. He shall at once report to the Department any error, inconsistency or omission which he may discover.

4.05 COOPERATION WITH UTILITIES:

A. It is understood and agreed that the contractor has considered in his bid all of the permanent and temporary utility appurtenances in their present or relocated positions and that no additional compensation will be allowed for normal delays, inconvenience, or damage sustained by him due to any interference from the said utility appurtenances, the operation of moving them, the making of new connections thereto if required by the contract documents, or by other requirements of the utility company.

B. The contractor shall have responsibility for notifying all affected utility companies prior to performing any work on their utilities and shall cooperate with them in achieving the desired results. All damage to utility facilities caused by the contractor's operations shall be the responsibility of the contractor.

C. At points where the contractor's operations are adjacent to properties of railway, telegraph, telephone, water and power companies, or are adjacent to other property, damage to which might result in expense, loss or inconvenience, work shall not be commenced until all arrangements necessary for the protection thereof have been made by the contractor.

D. The contractor shall cooperate with the owners of any underground or overhead utility lines in their removal and rearrangement operations in order that these operations may progress in a reasonable manner, that duplication or rearrangement work may be reduced to a minimum and that services rendered by those parties will not be unnecessarily interrupted.

E. In the event of interruption to utility services as a result of accidental breakage or as a result of being exposed or unsupported, the contractor shall promptly notify the proper authority and shall cooperate with the said authority in the restoration of service. No work shall be undertaken around fire hydrants until provisions for continued service have been approved by the local fire authority.

F. Prior to performance of the work under the contract, the contractor shall determine the existence of any underground utilities using Miss Utility and any other means. The costs associated with such investigation including costs to be paid to Miss Utility, utility companies, and/or inspection/testing firms shall be borne by the contractor. This provision shall apply to any project site, including those on State property.

4.06 INSPECTIONS, TESTS, STATE INSPECTORS:

A. As used in this section and elsewhere wherever the context calls for it, “inspection” includes testing and/or approval of work.

B. The Contractor shall, at his expense, maintain an adequate inspection system and perform, or cause to be performed, such inspections as are required by the contract (such as an electrical inspection from an independent (non-governmental) electrical inspection agency approved or licensed as required by law when required under the contract. The Contractor must make application for the inspection, coordinate same, and pay the required inspection fees. The independent electrical inspection agencies are not considered local authorities - see General Condition Section 8.01E.(2)(b) or as otherwise will ensure that the work conforms to contract requirements. The Contractor shall maintain complete records of inspections and shall give the Department copies of these records as they are made. All work shall be conducted under the general direction of the Department and is subject to State inspection at all places and at all reasonable times to ensure strict compliance with the contract.

C. If the contract, or any applicable laws, ordinances, regulations, or order of any public authority or agency having jurisdiction require any work to be specially inspected, tested or approved, the contractor shall give the State, the architect, and any other public authority or agency which must be present or which otherwise should be notified, timely notice (at least 14 calendar days) of readiness for inspection and, if the inspection is by an authority or agency other than the Department, the date of the inspection. All costs associated with such inspections, testing and approvals; including the regulating Agency’s fees shall borne by the Contractor.

D. The State may charge the contractor any additional cost of inspection when work is not ready at the time specified by the contractor, or when prior rejection makes re-inspection necessary.

E. All work, including fabrication and source of supply, is subject to inspection by the architect, the State, and the State inspector. Inspectors for the State are not authorized to revoke, alter, or waive any requirements of the contract. Inspectors are authorized to call the attention of the contractor to any failure of the work to conform to the contract, including but not limited to the existence of unsafe conditions, inadequate safeguards and exits, and nuisances. Inspectors are authorized to suspend the work or any portion of the work, at no additional charge to the State, until resolution of issues concerning compliance with contract requirements.

F. Inspections by the State or the architect are for the sole benefit of the State. Inspections by the State or the architect, or the presence or absence of a State inspector or the architect at any inspection, or the failure of the State inspector or the architect to report any deviation by the contractor from contract requirements shall not: (1) relieve the contractor of responsibility for adequate quality control measures, compliance with contract requirements, or damage to or loss of material; (2) constitute or imply acceptance of any work; or (3) affect the continuing rights of the State to hold contractor responsible for failure to meet contract requirements.

G. If the State determines that any work requires special inspection not required by the contract, the State at its discretion may direct the contractor to obtain such inspection and the contractor shall do so. If the inspection reveals a failure of the work to comply with contract requirements, contractor shall bear all costs of the inspection, including any additional compensation paid or payable to the architect and any other costs incurred by the State. In all other cases, the State shall bear such costs and an equitable adjustment shall be made to the contract price.

H. Required certificates or other documentation of inspection shall be obtained by the contractor and promptly delivered by him to the architect, DPSCS, and any other public authority or agency entitled thereto.

I. When electrical high voltage work (over 600 volts) is required in construction of a project, the contractor shall utilize and pay for the services of an independent high voltage electrical testing agency to test and inspect all electrical high voltage components of the system prior to its being energized. The tests and inspections shall follow the procedures as established by NETA in their specifications for acceptance testing. The contractor shall submit a copy of the test results and an evaluation of these results prepared by a registered Professional Engineer, retained by the contractor to the Department within ten (10) days of the testing. All costs associated with testing, inspection and engineering shall be borne by the contractor.

4.07 REMOVAL OF DEFECTIVE WORK:

A. All work and materials which do not conform to the requirements of the contract will be considered unacceptable.

B. Any unacceptable or defective work, whether the result of poor workmanship, use of defective materials, damage through carelessness, design error or omission by the contractor or his Subcontractors and suppliers at any tier, or any other cause attributable to the contractor or his Subcontractors or suppliers at any tier, shall be promptly removed and replaced by work and materials which shall conform to the contract requirements or shall be remedied otherwise in an acceptable manner authorized by the Procurement Officer.

C. Upon failure of the contractor to comply promptly with the provisions of this section, the State shall have authority to cause defective or unacceptable work to be remedied or removed and replaced and unauthorized work to be removed at the contractor's expense.

D. Any time lost by the contractor for correction of work not in accordance with the contract shall be made up by the contractor at his expense.

4.08 MAINTENANCE OF WORK DURING CONSTRUCTION:

A. The contractor shall maintain the work during construction and until acceptance. This maintenance shall be continuous and effective, prosecuted with adequate equipment and forces to the end that all parts of the work be kept in satisfactory condition at all times and protected from damage of any kind from external sources.

B. Particular attention shall be given to drainage, both permanent and temporary. The contractor shall use all reasonable precautionary measures to avoid damage or loss that might result from accumulations and concentrations of drainage water, and material carried by such waters and such drainage shall be diverted or dispensed when necessary to prevent damage to excavation, embankments, surfaces, structures or property. Suitable measures shall be taken by the contractor to prevent the erosion of soil in all construction areas where the existing ground cover has been removed. Such measures shall be in compliance with the requirements of any governmental entity having jurisdiction.

C. All cost of maintenance work during construction and before final acceptance shall be included in the base bid and the contractor will not be paid any additional amount for such work.

D. In the event that the contractor's work is halted by the State under the provisions of the contract, the contractor shall maintain the entire project as provided herein and provide such ingress and egress for local residents or tenants adjacent to the project site, for tenants of the project site, and for the general public as may be necessary during the period of suspended work or until the contractor has been declared in default.

E. On projects where traffic flow is maintained, the contractor shall be responsible for repair and restoration of all traffic damage to the work, either partially or totally completed, until such time as the work is accepted by the State.

4.09 FAILURE TO MAINTAIN ENTIRE PROJECT:

Failure on the part of the contractor, at any time, to comply with the provisions of Section 4.08 may result in the State notifying the contractor to comply with the required maintenance provisions. In the event that the contractor fails to remedy unsatisfactory maintenance promptly after receipt of such notice, the State may immediately proceed to maintain the project and the entire cost of this maintenance will be charged against the contractor.

4.10 STATE'S RIGHT TO DO WORK:

If the contractor fails to prosecute the work properly or diligently or fails to perform any provision of the contract, the State may make good such deficiencies at the contractor's expense or terminate the contract for default under Sections 7.07 and/or 7.08, or both.

4.11 PROGRESS MEETINGS--SCHEDULING MEETINGS:

A. General.

The contractor and his major Subcontractors shall hold and attend progress meetings with the State and the architect (unless the architect's absence is excused by the State) at the site at least monthly. The State may require progress meetings to be held more frequently at no additional cost to the State. Minutes of progress meetings shall be prepared and circulated by the architect.

B. Subcontractor Progress Meetings.

The State and the architect must receive timely prior written notice of all progress meetings between the contractor and its Subcontractors or suppliers at any tier. The State and the architect may attend any or all such meetings. contractor must keep minutes of all such meetings and must promptly provide DPSCS and the architect with copies of the minutes.

C. Scheduling Meetings.

See Section 7.06T.

SECTION 5 - MATERIALS

5.01 GENERAL:

A. All materials shall meet all quality requirements of the contract. In order to expedite the inspection and testing of materials, the contractor shall notify the architect and the state in writing, as soon as possible after receipt of notification award of the contract, of the sources from which he proposes to obtain all materials requiring approval, testing, inspection, or certification prior to incorporation into the work.

B. Materials include all: equipment; parts; products; methods of construction or of performing the work which may be the subject of a patent, copyright or other right or restriction governing its use; and processed and unprocessed natural substances required for completion of the contract. The contractor, in accepting the contract, is assumed to be thoroughly familiar with the materials required and their limitation as to use and requirements for connection, setting, maintenance and operation. Whenever an article or material or equipment is specified and a fastening, furring, connection (including utility connections), access hole, flashing closure piece, bed or accessory is normally considered essential to its installation in good quality construction, such shall be included as if fully specified. Nothing in these

specifications shall be interpreted as authorizing any work in any manner contrary to applicable laws, codes or regulations.

C. Approval. All materials are subject to the architect's and the state's approval as to conformity with the specifications, quality, design, color, etc. No work for which approval is necessary shall be used until written approval is given by the architect and the state. Approval of a Subcontractor or supplier as such does not constitute approval of a material which is other than that included in the specifications. See also Sections 2.02I and 5.03.

D. New Materials. Unless otherwise specified, all materials shall be new. Old or used materials must not be used as substitutes for new, regardless of condition or repair, unless approved in writing by the Procurement Officer.

E. Quality. Unless otherwise specified, all materials shall be of the best quality of the respective kinds.

F. Samples. The contractor shall furnish for approval all samples as directed. The materials used shall be the same as the approved samples.

G. Proof of Quality. The contractor shall, if requested, furnish satisfactory evidence as to the kind and quality of materials either before or after installation. He shall pay for any tests or inspections called for in the specifications and such tests as may be deemed necessary for "substitutions," as set forth in Section 5.03 of these General Conditions.

H. Standard Specifications. When no specification or code is cited or otherwise applicable and the quality, processing, composition or method of installation of an item is only generally referred to, then:

(1) For items not otherwise specified below, the applicable specification shall be the latest edition of the applicable American Society for Testing Materials specification.

(2) For items generally considered as plumbing and those items requiring plumbing connections, the applicable specification shall be the applicable portions of the latest edition of the State plumbing code.

(3) For items generally considered as heating, refrigerating, air-conditioning or ventilation, the applicable specifications shall be the applicable portions of the latest edition of the A.S.H.R.A.E. Handbook published by the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.

(4) For items generally considered as electrical, the applicable specifications shall be the applicable provisions of the latest State adopted edition of the BOCA Code and the National Electric Code.

(5) For items generally considered as fire protection, the applicable specifications shall be the applicable sections of the latest edition of the State Fire Prevention Code and the National Fire Protection Association Code.

5.02 STORAGE AND HANDLING OF MATERIALS:

A. Materials shall be stored so as to assure the preservation of their quality and acceptability for the work. Stored materials, even though approved before storage, may again be inspected prior to their use in the work. Stored materials shall be located so as to facilitate their prompt inspection. Approved portions of the project site may be used for storage purposes and for the placing of the contractor's plant and equipment. At completion of the project such storage areas must be restored to their original condition by the contractor at his expense.

B. All mechanical and/or electrical equipment delivered to the job site shall be stored on pedestals, above ground and under roof or other approved covering. All enclosures for equipment shall be weatherproof. Any motors, which are not totally enclosed, and dry type transformers that are involved in

the work, shall be stored in a heated area with a minimum temperature of fifty degrees Fahrenheit (50°F). All valves shall be stored under roof on wood pedestals, above ground. All insulation shall be stored under roof or in trailers, adequately protected from the weather. The contractor shall follow all written instructions and recommendations of the manufacturer and all requirements of the architect on oiling, protection and maintenance of equipment during storage. It shall be solely the contractor's responsibility to safely store and care for all equipment and materials. Materials not properly stored prior to installation shall not be considered for payment.

C. Materials shall be handled in such a manner as to preserve their quality and acceptability for the work.

D. Contractor shall confine his tools and equipment and the storage of materials to the area delineated in the contract documents as the "Limit of Contract."

E. Contractor shall not load or permit any part of a structure to be loaded with a weight that will endanger the safety of the structure or any part thereof.

F. Explosives.

(1) Explosives shall not be stored upon any property belonging to the State.

(2) Should the contractor desire to use explosives on any project he shall first receive written approval of DPSCS and obtain all permits required by law, at the contractor's expense. The approval will stipulate the time, place and quantity to be used and manner of use.

(3) The contractor assumes all responsibility for injury to persons or property which may result from the use or transportation of explosives, as well as complying with any and all applicable statutes, ordinances, regulations and restrictions in relation to the use of explosives.

G. Paints.

(1) Oil base paints and flammable liquids shall not be stored in large quantities on the project. Containers shall be limited to five gallon size. Any liquid with a flash point of less than one hundred (100) degrees Fahrenheit shall be contained in safety cans, UL approved. Liquid with a higher flash point shall be stored in rigid cans.

(2) Oily rags, waste, etc., must be removed from the work site at the close of each working day.

5.03 SUBSTITUTIONS:

A. Should the contractor desire to substitute another material for one or more specified by name, he shall prior to performance of work apply in writing for such permission and state the credit or extra involved with the use of such material.

B. The contractor shall not submit for approval materials other than those specified without a clear, express, written statement that such a substitution is proposed. Approval in any form or by any means of a substitute material by the architect or anyone else, when the contractor has not so designated such material as a "substitute," shall not be binding on the State nor release the contractor from any obligations of his contract, unless the Procurement Officer, in writing, expressly acknowledges the proposed substitution and approves it. See also Sections 2.02I and 5.01C.

5.04 APPROVED EQUALS:

A. The terms "or equal," "equal," and "approved equal" are used as synonyms throughout the specifications. They are implied in reference to all manufacturers or products named in the specifications unless otherwise stated. The Department is the final judge as to equality. The Department does not represent or warrant under any circumstances that there exists an equal to any item specified or that an equal is readily available, even if the words "or equal" are used in the specifications.

B. When several products or manufacturers are named in the specifications as acceptable for the same purpose or use, the contractor may select any of those so named. However, all of the units of a given type required for and used in the project must be the same in material and manufacture.

5.05 BUY AMERICAN STEEL:

The contractor must comply with the requirements of the Maryland Buy American Steel Act, Title 17, Subtitle 3 of the SF & P and **COMAR 21.11.02**, which are incorporated into and made a part of the contract.

SECTION 6 - LEGAL RELATIONS AND RESPONSIBILITIES:

6.01 LAWS TO BE OBSERVED:

A. The contractor shall keep fully informed of all Federal, State, and local laws, ordinances, rules and regulations and all orders and decrees of bodies or tribunals having any jurisdiction or authority, which in any manner affect those engaged or employed on the work, or which in any way affect the conduct of the work. He shall at all times observe and comply with all such laws, rules, ordinances, regulations, orders and decrees; he shall protect and indemnify the State and its representatives against any such claim or liability arising from or based on the violation of any law, ordinance, regulation, order, or decree, whether by himself or his employees, Subcontractors or suppliers at any tier. Whenever the contract documents require the contractor to comply with provisions of Federal, State, or local laws, regulations, ordinances or codes, contractor must comply whether such laws, regulations, ordinances or codes are expressly incorporated into the contract or not.

B. The contractor must comply with the provisions of the Workers' Compensation Act and Federal, State and local laws relating to hours of labor.

C. The provisions of this contract shall be governed by the laws of the State of Maryland.

D. If the contractor observes that the contract documents are at variance with any applicable law, ordinance or regulation, he shall promptly notify the Procurement Officer and the architect, and, except as provided in subsection F, any necessary changes shall be adjusted as provided in the contract for changes in the work. If the contractor performs any work knowing it to be contrary to such laws, ordinances, rules and regulations, and without such notice, he shall bear all costs arising there from.

E. The State is not responsible for the actions, orders or interpretations of Federal, county, municipal, or other local officials or representatives respecting the application to the work of Federal, State, or local laws, ordinances, regulations or codes. contractor shall not be entitled to additional compensation for unanticipated costs of complying with any such actions, orders or interpretations.

F. Compliance with Laws. – (**COMAR 21.07.01.22**) The Contractor hereby represents and warrants that:

(1). It is qualified to do business in the State of Maryland and that it will take such action as, from time to time hereafter, may be necessary to remain so qualified;

(2). It is not in arrears with respect to the payment of any monies due and owing the State of Maryland, or any department or unit thereof, including but not limited to the payment of taxes and employee benefits, and that it shall not become so in arrears during the term of this Contract;

(3). It shall comply with all federal, State, and local laws, regulations, and ordinances applicable to its activities and obligations under this Contract; and

(4). It shall obtain, at its expense, all licenses, permits, insurance, and governmental approvals, if any, necessary to the performance of its obligations under this Contract.

6.02 PERMITS AND LICENSES:

A. When required by law or the contract, the State or its authorized representative will file with the appropriate local authority, drawings and specifications and any pertinent data reasonably proper for their information. The contractor will be required to pay all necessary fees to local authorities for review, approval, inspection or for the privilege or right to execute the work as called for in the contract documents and he shall include the cost of said fees in his bid. The State shall not be responsible for the actions or interpretations of county, municipal, or other local agencies or officials respecting the application of Federal, State or local laws, rules, ordinances, regulations, codes, or policies to the work.

B. The contractor must be licensed as required by Title 17, Subtitle 6 or Title 8 of the Business Regulation Article, Annotated Code of Maryland, and must be qualified by submission and approval of a Qualification Questionnaire (DPSCS Form 340-8-CQ3) to the Department.

6.03 PATENTS, COPYRIGHTS, TRADE SECRETS, AND PROTECTED MATTER:

A. The contractor assumes the risk that any materials, equipment, processes, or other items required under the contract or furnished by the contractor (including the CPM software furnished to the State under Section 7.06J.(2)(i)) are subject to any patent, copyright, trademark, trade secret or other property right of another. The contractor shall pay for all royalties and license fees and shall obtain all necessary licenses or permits to permit use of any such item by the State. contractor shall defend all suits or claims of infringement of any patent, copyright, trademark, trade secret or other property right of another and shall save the State harmless from loss or expense on account thereof.

B. When an item specified by the State or furnished by the contractor infringes or is alleged to infringe any patent, copyright, trademark, trade secret or other property right of another, the contractor will, at his option, and at no additional cost to the State, (1) procure for the State the right to use the item; (2) replace the item with an approved, non-infringing equal; or (3) modify the item so it becomes non-infringing and performs substantially the same as the original item.

6.04 LAND, AIR AND WATER POLLUTION, AND EROSION CONTROL:

A. The contractor shall incorporate all permanent erosion control features into the work at the earliest practicable time and shall maintain them in proper condition during the course of the contract. Temporary pollution control measures will be used to correct conditions that develop during construction that were not foreseen during design, that are needed prior to installation of permanent pollution control features, or that are needed temporarily to control erosion that develops during normal construction practices, but are not associated with permanent control features on the project.

B. Temporary pollution control may include measures outside the project site where such work is necessary as a direct result of project construction. The Department shall be kept advised of all such off-site control measures taken by the contractor. This shall not relieve the contractor of responsibility for such work.

C. The contractor must submit evidence to the Department that the governing Federal, State and local air pollution criteria will be and were met. This evidence and related documents will be retained by the Department for on-site examination.

D. If the performance of all or any part of the work is suspended, delayed, or interrupted due to an order of a court of competent jurisdiction as a result of environmental litigation, as defined below, or by the order of any State or Federal agency or official enforcing applicable laws, such suspension, delay, or interruption shall be considered as if ordered by the Procurement Officer under Section 7.09, Suspension of the Work. If it is determined that the suspension, delay, or interruption is due wholly or in part to acts or omissions of the contractor in breach or violation of the terms of this contract or acts of the contractor not required by this contract, contractor shall be responsible for all additional costs and delays resulting from such acts or omissions.

E. The term "environmental litigation," as used herein, means a lawsuit alleging that the work will have an adverse effect on the environment or that the State has not duly considered, either substantively or procedurally, the effect of the work on the environment.

6.05 INSURANCE REQUIREMENTS:

A. The Contractor shall maintain in full force and effect liability insurance necessary to cover claims arising from the Contractor's operations under this Contract. The following types of insurance coverage shall be provided:

Primary General Liability
Umbrella Liability or Excess Liability
Automobile Liability
Workers' Compensation
Builder's Risk
Professional Design Errors & Omissions, if design services are provided by Contractor

Note: The Contract may require the Contractor to maintain other types of insurance.

B. The insurance shall be kept in full force and effect until all work has been satisfactorily completed and accepted. Evidence of insurance shall be provided to the Department prior to the execution of the Contract by means of a Certificate of Insurance with copies of all endorsements attached or by certified copy of the complete policy with all endorsements. Failure to obtain or to maintain the required insurance or to submit the required proof of insurance shall be grounds for termination of the contract for default. Exclusion endorsement copies shall be attached to the Certificate of Insurance. The Certificate of Insurance shall be accompanied by a document (a copy of State License or letter from insurer) which indicates that the agent signing the certificate is an authorized agent of the insurer.

C. The Contractor shall not commence work under this Contract until all the insurance required under this Subsection has been obtained and approved by the Department, nor shall the Contractor allow any Subcontractor to commence work on its subcontract until the insurance required of the Subcontractor has been obtained by the Subcontractor and approved by the Contractor. All Subcontractors shall be required in the subcontract documents to carry insurance for the line items described in the subcontract. The Contractor shall be responsible to determining appropriate limits for Subcontractors, and for enforcing insurance coverage requirements for its Subcontractors.

D. All insurance policies required by this Subsection or elsewhere in the Contract Documents shall be written on forms (including the actual wording of the policies and all endorsements) acceptable to the Department and with insurance companies that hold a current A.M. Best rating of A and that are duly licensed to transact the prescribed coverage's in the jurisdiction in which the work of the Contract is to be performed.

E. All insurance policies required by this Subsection or elsewhere in the Contract Documents shall be endorsed to state that the insurance carrier shall provide at least sixty (60) days notice to the Department in the event of cancellation, non-renewal, or material change in the coverage, either by the insurance company or the Contractor.

F. The General Liability and Umbrella Liability/Excess Liability insurance policies required by this Subsection or elsewhere in the contract Documents shall include endorsements stating that the State and the Department and any other entities designated by the Department are additional insured's with respect to liability arising out of or resulting from the operations and completed operations of the named insured under the Contract.

G. All insurance policies required by this Subsection or elsewhere in the Contract Documents shall contain endorsements stating that such coverage as is provided by the policies for the benefit of the additional insured is primary and other coverage maintained by additional insured (if any) shall be non-contributing with the coverage provided under the policies.

H. All insurance policies required by this Subsection or elsewhere in the Contract Documents shall contain waivers of subrogation in favor of the State and the Department and any other entity

designated by the Department and shall provide that the bankruptcy or insolvency of the insured does not relieve the insurance company of its obligations under the policies.

I. In the event any party maintains insurance with limits exceeding the limits required hereunder, the Certificates of Insurance provided to the Department shall state the full extent of the coverage available to the parties. Such excess liability coverage will inure to the benefit of the parties in the event of loss in excess of the minimum insurance required herein.

J. If, during the term of the Contract, the Contractor fails to secure and maintain the required insurance, the Department shall have the right (without the obligation to do so) to secure the insurance in the amounts specified in the name of the Contractor, in which case, the Contractor shall pay all premiums, deductibles, self-insured retentions or other amounts associated with the insurance and shall furnish all information that may be required in connection with the Department purchasing such insurance.

K. It is understood and agreed that the coverage's and limits contained herein are the minimum requirements only. The Contractor is responsible for providing insurance coverage that meets the needs of the Contractor itself, its Subcontractors, sub-consultants, employees, and others as obligated in the Contract Documents. All insurance policies shall contain at a minimum the following provisions:

(1) Primary General Liability Insurance

Coverage – The policy shall include provisions that offer protection against all risks and exposures, including without limitation:

- Premises and Operations Coverage
- Products and Completed Operations Coverage
- Blanket Contractual Liability Coverage, including any indemnity provisions
- Broad Named Insured Endorsement
- Notice, Knowledge, and Unintentional Errors and Omissions Coverage
- Incidental Malpractice Coverage
- Independent Contractors Coverage
- Personal Injury Coverage
- Broad Form Coverage for damage to property of the State, as well as other third parties resulting from the Contractor's Work
- Any aggregate limits apply on a "per project" basis

Limits of Liability – Minimum Limits of Liability dedicated to the Project of $1,000,000 each occurrence and $2,000,000 aggregate shall be provided.

Deductibles/Self-Insured Retentions – The Contractor is responsible for payment of all deductibles or self-insured retentions and shall include and specifically identify in its bid any amounts that it expects to pay for deductibles and/or self-insured retentions.

Status of the State as Additional Insured – The Policy shall name the State and the Department and any other entities required by the Department as additional insured.

Term of Coverage – The term of coverage shall be the full contract period. Contractor shall continue to name all additional insured for the entire Period.

Other Coverage/Features – The Primary General Liability Insurance Policy and all Umbrella Liability/Excess Liability Policies are also subject to the following requirements:

All policies shall include a provision that no act or omission of the Contractor or any party acting under its direction will affect or limit the obligations of the insurance company in respect of any additional insured.

All policies shall delete any warranty stating that coverage is null and void (or words to that effect) if the Contractor does not comply with the most stringent regulations governing the work under the Contract.

All policies must provide that the insurance company has the duty to adjust a claim and provide a defense.

(2) Umbrella Liability Insurance

Coverage – Coverage shall be at least as broad as the underlying primary commercial general liability policy.

Limits of Liability – Unless expressly modified by the Procurement Officer, Limits of Liability dedicated to the project in the amounts of $5 million per occurrence and $5 million aggregate shall be provided.

Deductibles/Self-Insured Retentions – The Contractor is responsible for payment of all deductibles or self-insured retentions and shall include and specifically identify in its bid any amounts that it expects to pay for deductibles and/or self-insured retentions.

Status of the State as Additional Insured – The Policy shall name the State and the Department and any other entities required by the Department as additional insured.

(3) Automobile Liability Insurance

Coverage – All vehicles used in conjunction with the Contract shall be insured.

Limits of Liability – Minimum Limits of Liability, primary to Umbrella Liability coverage described above, in the amounts of $1 million per occurrence and $1 million aggregate shall be provided.

Deductibles/Self-Insured Retentions – The Contractor is responsible for payment of all deductibles or self-insured retentions and shall include and specifically identify in its bid any amounts that it expects to pay for deductibles and/or self-insured retentions.

(4) Workers' Compensation

Coverage – Statutory Workers' Compensation as required by the State of Maryland.

Limits of Liability – Statutory.

(5) Builder's Risk Insurance (and Installation Floater, if not included in Builder's Risk Coverage)

Named Insured – At a minimum the policy shall insure the Contractor, the State, the Department, and any other party with an insurable interest in the Project.

Coverage – All risks of direct physical loss of or damage to the property (including without limitation perils of flood). Coverage shall be as broad as possible with respect to both covered property interests and covered locations. All covered locations shall be named, and shall include the contract number and project description. Coverage applies to all materials, supplies, and equipment that are consumed on or intended for specific installation in the Project while such materials, supplies and equipment are located at the Project site. If the Builder's Risk Policy does not cover materials onsite that have not yet been installed, Contractor shall also provide an Installation Floater. Contractor shall comply with any requirements in the Policy for project reports by the Contractor to the insurance company. The Builder's Risk Policy shall be endorsed: (i) waiving the insurance company's rights of recovery under subrogation against all insured's and additional insured's on the policy; (ii) to make the Department a Loss Payee for all claims; and (iii) to delete any provisions that void coverage with respect to the Department for acts or omissions of the Contractor or any other party.

Limits of Liability – Full replacement cost of the structure under construction, plus debris removal coverage and ordinance coverage for all risk perils, and cost of materials onsite that have not yet been installed. Any sub-limits must be clearly identified, and are subject to prior approval by the Department.

Deductibles/Self-Insured Retentions – The Contractor is responsible for payment of all deductibles or self-insured retentions and shall include and specifically identify in its bid any amounts that it expects to pay for deductibles and/or self-insured retentions.

(6) Design Errors & Omissions (applicable only to projects where Contractor is also providing Design Services).

Coverage – Work done or to be done by or on behalf of the Contractor and covering errors and omissions.

Limits of Liability – Limits of Liability dedicated to the project in the amounts of $1 million per occurrence and $2 million aggregate shall be provided.

Deductibles/Self-Insured Retentions – The Contractor is responsible for payment of all deductibles or self-insured retentions and shall include and specifically identify in its bid any amounts that it expects to pay for deductibles and/or self-insured retentions.

Status of the State as Additional Insured – The Policy shall name the State and the Department and any other entities required by the Department as additional insured.

6.06 ASSIGNMENT, NOVATION, CHANGE OF NAME:

The provisions of **COMAR 21.05.02.24** respecting assignment, novation and change of name are incorporated into and made a part of the contract.

6.07 SEPARATE CONTRACTS:

A. The State reserves the right to let other contracts in connection with or adjacent to this work. (See also Section 4.03.) The contractor shall afford other contractors reasonable opportunity for the introduction and storage of their materials and the execution of their work, and shall properly connect and coordinate his work with theirs. The contractor is entitled to no overhead, profit, or other compensation for work done for the State by other contractors.

B. If any part of the contractor's work depends on proper execution or results of the work of any other contractor, the contractor shall inspect and promptly report to the Department and the Architect any defects in such work that render it unsuitable for such proper execution and results. His failure to so inspect and report shall constitute an acceptance of the other contractor's work as fit and proper for the reception of his work, except as to the defects which may develop in the other contractor's work after the execution of his work.

C. To ensure the proper execution of his subsequent work, the contractor shall measure work already in place and shall at once report to the architect and the Procurement Officer any discrepancy between the executed work and the drawings.

6.08 RELATIONSHIP OF CONTRACTOR TO PUBLIC OFFICIALS AND EMPLOYEES:

A. In carrying out any of the provisions of the contract, or in exercising any power or authority granted to them by or within the scope of the contract, there shall be no liability upon the Procurement Officer or other authorized representatives of the State, it being understood that in all such matters they act solely as agents and representatives of the State.

B. The State may terminate the contract for default or hold the contractor liable for damages for breach of the contract as provided in subsection C if it is found by the Procurement Officer that gratuities (in the form of entertainment, gifts, or otherwise) were offered or given by the contractor, or any agent or representative of the contractor, to any officer or employee of the State with a view toward securing a contract or securing favorable treatment with respect to the awarding or amending of the contract, or the making of any determinations with respect to the performance of the contract.

C. In the event this contract is terminated for default or the contractor is held liable for damages as provided in subsection B hereof, the State shall be entitled (1) to pursue the same remedies against the contractor as it could pursue in the event of a termination for default or a breach of the contract by the contractor, and (2) in addition to any other damages to which it may be entitled, to exemplary damages in an amount (as determined by the Procurement Officer) which shall be not less than three nor more than ten times the costs incurred by the contractor in providing any such gratuities to any such officer or employee.

D. Non-hiring of officials and employees (**COMAR 21.07.01.05**) - No official or employee of the State of Maryland, as defined under State Government Article, §15-102, Annotated Code of Maryland, whose duties as such official or employee include matters relating to or affecting the subject matter of this contract, shall during the pendency and term of this contact and while serving as an official or employee of the State become or be an employee of the Contractor or any entity that is a Subcontractor on this contract.

6.09 NO WAIVER OF RIGHTS -- STATE'S REMEDIES CUMULATIVE -- STATE'S DAMAGES:

A. The State shall not be precluded or estopped by any measurement, estimate, change order, contract modification, certificate of payment, or payment from showing the true amount and character of the work furnished by the contractor, or from showing that any measurement, estimate, change order, contract modification, certificate of payment, or payment is untrue or was incorrectly made, or from showing that the work does not in fact conform to the contract. The State may recover from the contractor or his sureties, or both, such damages, loss, or additional expense incurred as a result of any such error in measurement, estimate, change order, contract modification, certificate of payment, or payment as a result of such failure to conform to the contract. The State's rights in this respect shall not be waived or barred by any inspection, acceptance or approval of the work, or by payment therefore, or by granting an extension of time, or by taking possession, or by execution of a change order based on the erroneous measurement, estimate, or change order, contract modification, certificate of payment, or payment.

B. The activities of the State personnel respecting this contract, including inspection of the work, review of submittals, monitoring of progress, and so forth are for the benefit of the State only and are not for the benefit of the contractor. The State's failure to bring to the attention of the contractor deficiencies in the work or the contractor's performance will not constitute waiver or excuse of the contractor's failure to comply strictly with contract requirements.

C. The waiver by the Procurement Officer of any breach of contract by the contractor shall not operate as a waiver of any other or subsequent breach.

D. The rights and remedies of the State and the obligations of the contractor under various provisions of the contract documents and under provisions of applicable law are cumulative and not exclusive.

E. For any claim or cause of action accruing to the State as a result of or arising out of this contract, the State may collect damages of any kind, including consequential damages and damages for purely economic loss.

6.10 SOLICITATION WARRANTY -- CONTINGENT FEE PROHIBITION (COMAR 21.07.01.09):

The Contractor, architect, or engineer (as applicable) warrants that it has not employed or retained any person, partnership, corporation, or other entity, other than a bona fide employee or agent working for the Contractor, architect, or engineer, to solicit or secure this agreement, and that it has not paid or agreed to pay any person, partnership, corporation, or other entity, other than a bona fide employee or agent, any fee or any other consideration contingent on the making of this agreement. Contractor must comply with the provisions of 13-223 of SF&P.

6.11 ASSIGNMENT OF ANTITRUST CLAIMS:

The contractor sells, transfers and assigns to the State of Maryland all rights, title and interest of, in and to any causes of action arising at any time before the date of this assignment or during the performance of this contract under the antitrust laws of the United States, including Section 1 of the Sherman Act, and the antitrust laws of Maryland relating to the purchase by contractor or the State of Maryland of any products from any supplier or source whatever that is incorporated in the structure built under the terms of this contract. The contractor hereby certifies that the above causes of action are lawfully owned and that no previous assignment of same has been made nor has the same heretofore been attached or pledged in any manner whatsoever.

6.12 FEDERAL PARTICIPATION:

When the United States government pays all or any portion of the cost of a project, the work may be subject to inspection by Federal agencies. Such inspection shall in no sense make the Federal government a party to this contract.

6.13 DISPUTES AND CONTRACT CLAIMS (COMAR 21.07.02.05-1):

A. This contract is subject to the provisions of State Finance and Procurement Article, Title 15, Subtitle 2, Annotated Code of Maryland and **COMAR 21.10**

B. Except as otherwise provided in this contract or by law, all disputes arising under or as a result of a breach of this contract that are not disposed of by mutual agreement shall be resolved in accordance with this clause.

C. As used herein, “claim” means a written demand or assertion by one of the parties seeking, as a legal right, the payment of money, adjustment or interpretation of contract terms, or other relief, arising under or relating to this contract. A voucher, invoice, or request for payment that is not in dispute when submitted is not a claim under this clause. However, if the submission subsequently is not acted upon in a reasonable time, or is disputed as a liability or amount, it may be converted to a claim for the purpose of this clause.

D. Within 30 days after contractor knows or should have known of the basis for a claim relating to this contract, contractor shall file a written notice of a claim with the procurement officer.

E. Contemporaneously with, or within 90 days after, the filing of a notice of claim, contractor shall submit the written claim to the procurement officer. If contractor so requests, the procurement officer may extend the time in which contractor must submit the claim.

F. The claim shall set forth all the facts surrounding the controversy. contractor, at the discretion of the procurement officer, may be afforded an opportunity to be heard and to offer evidence in support of the claim.

G. The procurement officer shall mail or deliver written notification of the final decision within:

(1) 90 days after the procurement officer receives the claim if the claim is an amount for which the Appeals Board accelerated procedure, set forth in **COMAR 21.10.06.12**, may by used;
(2) 180 days after the procurement officer receives the claim for a claim not covered under § G(1) of this regulation; or
(3) A longer period that the procurement officer and contractor agree to in writing.

H. The final decision may award a contract claim only for those expenses incurred not more than 30 days before Contractor was initially required to have filed the notice of claim.

I. The procurement officer’s decision is the final action of the State. If the procurement officer fails to render a final decision within the time required, contractor may deem the failure to be a final decision not to pay the claim.

J. If the final decision grants the claim in part and denies the claim in part, the agency shall pay contractor the undisputed amount. Payment of the partial claim is not an admission of liability by agency and does not preclude agency from recovering the amount paid if a subsequent determination modifies the final decision.

K. Contractor may file a written appeal with the Maryland State Board of Contract Appeals within 30 days of receipt of notice of the decision.

L. Pending resolution of a claim, contractor shall proceed diligently with the performance of the contract in accordance with the procurement officer’s decision.

M. No claim for extra costs is allowable for delays resulting from the causes stated in Section 7.07D(1). Only non-compensable time extensions will be granted for such delays.

N. As provided in Section 15-219(b) of SF&P and **COMAR 21.10.04.02B**, a claim shall include the amount of the claim, the facts on which the claim is based, and all relevant data and correspondence that may substantiate the claim, and the claim must be certified by a senior official, officer, or general partner of the Contractor or the Subcontractor, as applicable, that, to the best of the person's knowledge and belief, the claim is made in good faith, supporting data accurate and complete, and the amount requested accurately reflects the contract adjustment for which the person believes the State is liable. The Procurement Officer may consider a claim as not being filed until Contractor complies with this provision. The Procurement Officer is not required to notify the Contractor of its failure to comply with this provision; the burden is on the Contractor to comply with the Contractor's obligations under the law and the contract.

O. Contractor shall take all reasonable action to mitigate or to avoid costs or damages for which the State may be liable.

P. A final decision of the Procurement Officer shall be prima facie evidence of the correctness of the decision. On any appeal from a decision of the Procurement Officer, the Contractor will have the burden of proof and the burden of going forward with the evidence on all issues, including the propriety of a termination for default.

Q. (1) As used in this paragraph, "Subcontractor" includes Subcontractors and suppliers of the Contractor at any tier.

(2) The State shall have no liability to the Contractor for any claim of a Subcontractor against the Contractor if the Contractor has no liability therefor to the Subcontractor or if the Contractor has a valid defense against the claim of the Subcontractor. Any agreement between the Contractor and the Subcontractor making liability on the part of the Contractor to the Subcontractor contingent upon a determination of liability on the part of the State to the Contractor shall not make the State liable to the Contractor for the claim of the Subcontractor if the Contractor would not otherwise be liable therefore. The purpose of this provision is to adopt the Severin doctrine, without exception, as a matter of contract between the State and the Contractor.

R. If Contractor contends that any change order or proposal for a change order or other order issued under Section 3.06 will or may cause an increase in the time required for performance, or damages or additional overhead or costs to the Contractor or his Subcontractor and suppliers at any tier, Contractor must include the additional time and compensation claimed to be due in Contractor's change order proposal if one was requested by the State, or if no change order proposal was requested by the State, then in the claim submitted by the Contractor. Contractor is entitled to no extensions of the completion time for which he has failed to file a timely notice of claim or the claim itself, in the proper form and supported by complete and proper documentation, as required by this Section and Sections 3.06, 3.07 and 7.06. Contractor may not unilaterally "reserve his rights" to file any claims or any requests for extensions of time. Contractor's rights to additional compensation or time extensions are contingent upon Contractor strictly following the notice and filing requirements of the contract. All proposals or requests for additional time and time-related compensation are subject to this Section, Sections 3.06, 3.07 and 7.06, and all other applicable provisions of the contract documents.

6.14 MULTI-YEAR CONTRACTS CONTINGENT UPON APPROPRIATION (COMAR 21.07.01.10):

If the General Assembly fails to appropriate funds or if funds are not otherwise made available for continued performance for any fiscal period of this Contract succeeding the first fiscal period, this Contract shall be cancelled automatically as of the beginning of the fiscal year for which funds were not appropriated or otherwise made available; provided, however, that this will not affect either the State's rights or the Contractor's rights under any termination clause in this Contract. The effect of termination of the Contract hereunder will be to discharge both the Contractor and the State from future performance of the Contract, but not from their rights and obligations existing at the time of termination. The Contractor shall be reimbursed for the reasonable value of any non-recurring costs incurred but not amortized in the

price of the Contract. The State shall notify the Contractor as soon as it has knowledge that funds may not be available for the continuation of this Contract for each succeeding fiscal period beyond the first.

6.15 PRE-EXISTING REGULATIONS (COMAR 21.07.01.17):

In accordance with the provisions of Section 11-206 of the State Finance and Procurement Article, Annotated Code of Maryland, the regulations set forth in Title 21 of the Code of Maryland Regulations (**COMAR Title 21**) in effect on the date of execution of this Contract are applicable to this Contract.

6.16 STATE PROPERTY NOT SUBJECT TO LIEN:

Neither the contractor nor any Subcontractor or supplier at any tier may have or acquire any lien against State property.

6.17 STATE NOT SUBJECT TO LIMITATIONS:

The State is not bound by laches or any statute of limitations or repose, and contractor may not assert laches, limitations, or a statute of repose as a defense against any claim or action brought by the State.

6.18 CONFLICT OF INTEREST:

The contract is subject to the provisions of Section 13-212 of SF&P and **COMAR 21.05.08.08**, Conflict of Interest.

6.19 CENTURY COMPLIANT SOFTWARE, ETC.:

“Century compliant” means that a product or item: Is able to process date data accurately including date data century recognition, calculations that accommodate same century and multi-century formulas and date values (including leap year factors), and date data interface values that reflect century when used either in a stand-alone configuration or in combination with other century compliant products used by the State; and will not abnormally terminate its function or provide or cause invalid or incorrect results due to incompatibility with the calendar year.

The contractor warrants that the electronic products and components, including computers, software, and other devises and materials, provide or developed under this contract are century compliant. Contractor agrees to promptly repair or replace any product furnished under this contract that is not century compliant, provided the State give contractor notice or breach of the warranty within a reasonable time after discovery.

The warranty provided by this section is in addition to any other warranties provided by law or this contract.

6.20 COMMERCIAL NONDISCRIMINATION POLICY (COMAR 21.07.01.26):

A. As a condition of entering into this Agreement, Contractor represents and warrants that it will comply with the State’s Commercial Nondiscrimination Policy, as described under Title 19 of the State Finance and Procurement Article of the Annotated Code of Maryland. As part of such compliance, Contractor may not discriminate on the basis of race, color, religion, ancestry or national origin, sex, age, marital status, sexual orientation, or on the basis of disability or other unlawful forms of discrimination in the solicitation, selection, hiring, or commercial treatment of Subcontractors, vendors, suppliers, or commercial customers, nor shall Contractor retaliate against any person for reporting instances of such discrimination. Contractor shall provide equal opportunity for Subcontractors, vendors, and suppliers to participate in all of its public sector and private sector subcontracting and supply opportunities, provided that this clause does not prohibit or limit lawful efforts to remedy the effects of marketplace discrimination that have occurred or are occurring in the marketplace. Contractor understands that a material violation of this clause shall be considered a material breach of this Agreement and may result in termination of this Agreement, disqualification of Contractor from participating in State contracts, or other sanctions. This clause is not enforceable by or for the benefit of, and creates no obligation to, any third party.

Note: Paragraph 6.20A must be incorporated into every subcontract entered into under this contract

B. As a condition of entering into this Agreement, upon the Maryland Human Relations Commission's request, and only after the filing of a complaint against Contractor under Title 19 of the State Finance and Procurement Article, as amended from time to time, Contractor agrees to provide within 60 days after the request a complete list of the names of all Subcontractors, vendors, and suppliers that Contractor has used in the past 4 years on any of its contracts that were undertaken within the State of Maryland, including the total dollar amount paid by Contractor on each subcontract or supply contract. Contractor further agrees to cooperate in any investigation conducted by the State pursuant to the State's Commercial Nondiscrimination Policy as set forth under Title 19 of the State Finance and Procurement Article of the Annotated Code of Maryland, and to provide any documents relevant to any investigation that is requested by the State. Contractor understands that violation of this clause is a material breach of this Agreement and may result in contract termination, disqualification by the State from participating in State contracts, and other sanctions.

SECTION 7 - PROSECUTION, PROGRESS, AND QUALITY OF THE WORK:

7.01 NOTICE TO PROCEED:

After the contract has been executed, the Department will issue to the Contractor a "Notice to Proceed" and this notice will stipulate the start date on which the Contractor is expected to begin work. The specified contract time shall begin on the start date stated in the "Notice to Proceed." Except as provided in Section 7.06Q(1), any work started or materials ordered before the start date stated in the "Notice to Proceed" shall be at the risk of the Contractor. The Contractor is prohibited from doing any work on the site without the insurance required by this contract.

7.02 PROJECT SIGNS AND INSPECTOR'S FIELD OFFICE:

A. Project Sign:

(1) The State will provide one project sign for each major entrance to the project. The contractor shall be responsible for transportation of the sign from its place of origin, placement and maintenance of the sign. The location of signs will be directed by the State Inspector.

(2) Posts for sign(s) shall be supplied by the contractor and made of 4 x 4 inch construction-grade lumber, pressure preservative treated, 10 feet long. The sign(s) shall be bolted to the posts using at least two 1/2 inch bolts per post. Washers shall be used between the bolts and the sign faces and the posts and nuts. The posts shall be set into the ground to a depth of three feet, six inches with the bottom of the signs two feet six inches above the ground.

(3) The contractor shall be responsible for removing the sign(s) and correction or repair of the site after final acceptance of the work and shall dispose of the sign(s) as directed by the State's authorized representative.

B. Inspector's Field Office:

If so specified, the contractor shall furnish and maintain, at his cost and for the State's exclusive use, an inspector's field office. Specific requirements will be described in the specifications.

7.03 PUBLIC CONVENIENCE AND SAFETY:

The contractor at all times shall conduct the work in such a manner as to create the least practicable obstruction to all forms of traffic. The convenience of the general public, tenants, and of the residents along and/or adjacent to the improvement shall be respected. Material stored upon the project site shall be placed so as to cause a minimum of obstruction to the public. Sprinkling to inhibit dust shall be performed at the direction of the Procurement Officer at no additional cost to the State. The contractor shall, unless otherwise specified, provide and maintain in passable condition such temporary access, roads and bridges as may be necessary to accommodate traffic diverted from the project under construction, or using the project under construction and shall provide and maintain in a safe condition temporary approaches to, and crossings of, the project. Existing facilities planned to be removed, but

which might be of service to the public during construction, are not to be disturbed until other and adequate provisions are made. Fire hydrants on or adjacent to the project shall be kept accessible to fire apparatus at all times, and no material or obstruction shall be placed within 15 feet of any such hydrant. Work closed down for the winter or at any other times shall be left entirely accessible at all points to fire apparatus. All footways, gutters, sewer inlets and portions of the project under construction shall not be obstructed more than is absolutely necessary.

7.04 BARRICADES AND WARNING SIGNS:

A. The contractor shall provide, erect and maintain all necessary barricades, suitable and sufficient lights, danger signals, signs and other control devices, and shall take all necessary precautions for the protection of the work and safety of the public. All highways and other facilities closed to traffic shall be protected by effective barricades, and obstructions shall be illuminated during hours of darkness with electric lights.

B. The contractor shall erect warning signs prior to any place on the project where operations may interfere with the use of the facility by vehicular or pedestrian traffic, and at all other points where the new work crosses or coincides with an existing roadway or traffic lane(s). Such warning signs shall be constructed and erected in accordance with the FHWA Manual on Uniform Traffic Control Devices, or as directed.

C. In cases where the contractor's sequence of operations results in grade differentials which would be hazardous to vehicular or pedestrian traffic, the contractor will, at the direction of the Procurement Officer and at no additional cost to the State, provide suitable substantial guardrails to the extent determined by the Procurement Officer.

7.05 PRESERVATION, PROTECTION AND RESTORATION OF PROPERTY:

A. The contractor shall continuously maintain adequate protection of all his work from damage and shall protect the State property from injury or loss arising in connection with this contract. He shall repair and indemnify the State against any such damage, injury or loss, except such as may be directly and solely due to errors in the contract documents or caused by agents or employees of the State. He shall adequately protect adjacent property as provided by law and the contract documents.

B. The contractor shall box all trees which are liable to be injured by the moving, storing and working up of materials. He shall use no tree for any attachment or anchorage.

C. The contractor shall erect and properly maintain at all times, as required by the conditions and progress of the work, all necessary safeguards for the protection of workmen and the public and shall post danger signs warning against the hazards created by such features of construction as protruding nails, hod hoists, well holes, elevator hatchways, scaffolding, window openings, stairways and falling materials.

D. To the extent permitted by law, in any emergency affecting the safety of life, or of the work, or of the adjoining property, the contractor, without special instruction or authorization, is hereby permitted to act, at his discretion, to prevent such threatened loss or injury.

7.06 PROGRESS SCHEDULE - DELAYS:

A. (1) All time limits in the contract documents are of the essence of the contract.

(2) Contractor and the State agree that the time stated in the contract for the completion of the work is a reasonable time, considering the climatic range and the usual business conditions prevailing in the locality of the project. The contract time shall be the full time allowed or required for completion of every task involved in completion of the work, including lead-time for ordering and fabrication of equipment and materials.

(3) This project is subject to limited funding and tight budgeting. The State's budgeting; including budgeting for expenses of operation after completion and for payment to the architect and others working

on the project, is based on the contract extending for the full time allowed by the contract for completion. The State is not obligated (a) to accept an early completion schedule from the contractor, or (b) to accept the project prior to the completion date stated in the contract. The State will not be liable for any claims based on the contractor's assertion of an intention to finish early.

B. Preliminary Network Diagram.

(1) Unless the contract documents expressly state otherwise, the contractor is to furnish a preliminary network diagram.

(2) Within 14 days of the contract execution, contractor must submit a preliminary critical path network (CPM) diagram outlining activities for the first 90 days of construction. Include a skeleton diagram for the remainder of the work with the preliminary diagram. This preliminary diagram must be approved prior to the first requisition being processed. Include each significant construction activity. Coordinate each activity in the network with other activities. Schedule each construction activity in proper sequence.

(3) The diagram must be cost-loaded consistent with the schedule of values as required by Section 8.01 C. and will be used as the basis for approval of requisitions. Requisitions submitted must be accompanied by an updated, cost-loaded schedule. The requisition amount must agree with the amount shown by the cost-loaded CPM.

(4) With submission of the preliminary network diagram, include tabulation by date of submission of submittals required during the first 90 days of construction. List those required to maintain orderly progress of the work, and those required early because of long lead time for manufacture or fabrication.

(5) Distribute the preliminary network diagram to all parties that need to know about construction activities that are scheduled early, including the Architect, DPSCS and the using agency.

C. Completion Schedule.

(1) Within 30 days after Notice to Proceed, and at such other times as required by subsections E and H of this section, the contractor shall submit a schedule indicating the time allocated by the contractor for the performance of each portion of the work, the submittal information required by subsection D, the dollar value of each work item (dollar loading) properly and reasonably sequenced, and the contractor's labor requirements (labor loading) for achieving each task shown on the schedule. The schedule shall show completion of the work within the contract time. The State may decline to issue a Notice to Proceed until contractor has submitted the required schedule in accordance with subsection B.(2) and it is approved by DPSCS. Nothing in this section shall be construed to require the State to issue Notice to Proceed when the required schedule has been submitted and approved.

(2) (a) Contractor shall also submit, with the schedule required under (1) above,

(i) a written narrative explaining the bases of contractor's determinations of durations and prices for major work activities and describing contractor's approach for meeting the interim and final completion dates for major work activities and contract completion;
(ii) a listing of the major items of construction equipment planned for use on the project (including type, number of units, unit capacities, and a schedule showing the proposed time each piece of equipment will be on the job, keyed to the activities on which the equipment will be used);
(iii) identification of activities which may be expedited by use of overtime or additional shifts;
(iv) identification of sequencing and other restraints such as manpower, material, and equipment;
(v) a listing of the proposed work days, holidays and any special non-work days being used for the computer reports (schedules and updates).

(b) If required by DPSCS, such explanation shall include (at no additional cost to the State) estimated quantities and production rates, hours per shift which are proposed, unit prices of materials, and prices of installed equipment.

D. The contractor's schedule shall include as separate work activities, all necessary activities relating to submittals, including but not limited to the work or materials covered by the submittal, the Subcontractor involved, the submittal required, the activity or event number as shown in the CPM schedule (if required), and all necessary dates for submittal, review and response, resubmittal (if necessary), and final approval by the architect and/or DPSCS.

E. Subject to the requirements of subsection J, contractor shall submit with each application for payment a revised schedule accurately updated to reflect all:

(1) revisions to the schedule;
(2) changes made or planned in the construction sequence;
(3) actual construction activities to date including
(i) commencement and completion dates for activities started or completed during the reporting period,
(ii) current progress of activities started in prior reporting periods including completion dates for activities completed during the reporting period;

(4) delays and their effects on the critical path (whether or not a CPM schedule is required);
(5) extensions of time granted by the State;
(6) the contractor's planned schedule for completing remaining activities; and
(7) adjustments to the dollar loading and labor loading associated with items (1) through (5) above. This required schedule update shall be furnished monthly whether or not contractor submits an application for payment in that month.

F. All of contractor's schedules, including monthly schedule updates and recovery schedules under subsection H, shall be reviewed by the architect and DPSCS and shall be approved or disapproved by DPSCS. Approval by DPSCS of any schedule submitted under this Section 7.06 shall constitute approval of the schedule only for general conformity with contract requirements and shall not constitute approval, acceptance, or admission of the reasonableness, accuracy, achievability, or feasibility of the schedule or of the contractor's ability to meet the schedule, or waiver or excuse of default or delay by the contractor, extension of the time for completion, waiver or modification of contract requirements, admission of fault or responsibility for delay on the part of the State or the architect, or acceptance or admission on the part of the State of any liability or responsibility for the schedule or for acceleration or other costs or delay damages of the contractor which are inferable from the contractor's schedule or update.

G. Contractor agrees that accurate schedules and updates are critical to the State's ability to complete the project efficiently and economically; to judge the impact of alleged delays, differing site conditions, change orders and other events; and to deal fairly with the contractor. If the contractor fails to submit reasonable and accurate preliminary network diagrams, schedules, or revisions, including recovery schedules under subsection H, as required by the contract: (1) the State is not obligated to pay the contractor for work completed until proper, accurate diagrams, schedules, and updates are furnished as required; and (2) the State is not liable for and contractor is not entitled to damages, compensation, or time extensions for delays starting, occurring or continuing during the period when an accurate and reasonable schedule or update was due but not furnished by the contractor.

H. Whenever the project shall be behind schedule or alleged by either party to be behind schedule, the Procurement Officer may require the contractor to furnish, at no additional cost to the State, a revised schedule (hereinafter called a recovery schedule) showing how the contractor will finish the project by the contract completion date. This revised schedule shall include all of the information required under subsection E above, subject to the requirements of subsection J.

I. The contractor's construction schedule shall begin with the date of issuance of Notice to Proceed and conclude with the required date of final completion of the project as stated in the contract documents. Except as provided in Section 7.06B(2), float or slack time available in the schedule at any time shall not be for the exclusive use or benefit of either the contractor or the State, but is jointly owned. Delay for which the State is responsible in any portion of the work shall not automatically mean that the extension

of the completion date is warranted or due the contractor. contractor agrees that a delay in any given activity at any given time may not necessarily affect critical activities and may not necessarily cause non-critical activities to become critical. The effect of any given delay may be only to absorb float and may not necessarily delay critical activities. Subject to Section 7.06B(2), extensions of time for delays for which the State is responsible will be granted only to the extent that affected activities exceed the total float along their paths on the current approved CPM schedule.

J. CPM Scheduling.

(1) Unless the contract documents expressly permit the contractor to use a schedule other than a CPM schedule, the schedules to be furnished by the contractor under this Section 7.06 shall be CPM schedules. Contractor's CPM schedule must be submitted within 30 days after the contract is executed, or after the Notice to Proceed is given. Following rejection by DPSCS or conditional approval subject to correction, contractor shall make the necessary corrections, and resubmit proper schedules within 14 calendar days. contractor may use only CPM schedule software approved by the State.

(2) (a) Scheduling of construction is the responsibility of the Contractor. CPM scheduling is required to assure adequate planning and execution of the work and to assist DPSCS, the architect and the contractor in evaluating the progress of the work and the impact on the schedule of events which could affect the completion date.

(b) Logic or network diagrams shall show the order and interdependence of activities and the sequence in which the work is to be accomplished as planned by the contractor. These diagrams must show how the start of a given activity is dependent on preceding activities and how its completion restricts the start of following activities.

(c) Detailed logic or network activities shall include, in addition to construction activities, the submittal and approval of samples of materials and shop drawings, the procurement of critical materials and equipment and their installation and testing. All activities of DPSCS and the architect that affect progress, and contract required dates for completion of all or part of the work will be shown.

(d) The selection and number of activities shall be subject to DPSCS approval. Logic or network diagrams need not be time scaled but shall be drafted to show continuous flow from left to right with no arrows from right to left. The following information shall be shown on the diagrams for each activity: preceding and following event number, description of the activity, cost loading, labor loading, and activity duration in calendar days. Schedules shall be plotted so they can be displayed on a wall eight feet high. A summary schedule, plotted on a single sheet, shall be provided also.

(e) The mathematical analysis of the network shall include a tabulation of each activity. The following information will be furnished, at a minimum, for each activity:

(i) I, J numbers if Arrow Diagramming Method (ADM) is used.
(ii) Activity and (ii) Precedence relationships if Precedence Diagramming Method (PDM) is used.
(iii) Activity Description.
(iv) Estimated duration of activity (in calendar days).
(v) Percent of activity completed.
(vi) Earliest start date (by calendar date).
(vii) Earliest finish date (by calendar date).
(viii) Actual start date (by calendar date).
(ix) Actual finish date (by calendar date).
(x) Latest start date (by calendar date).
(xi) Latest finish date (by calendar date).
(xii) Float or slack (in calendar days).
(xiii) A monetary value of each activity.
(xiv) Subcontractor responsible for each activity.
(xv) Labor requirements for each activity.

(f) Work elements should be broken down into activities of durations of from 1 to 21 calendar days. No activity should ever represent more work than can be accomplished in 21 calendar days.

(g) The analysis shall list the activities in sorts or groups as follows:

(i) By the preceding event number from lowest to highest and then in order of the following event number;
(ii) By the amount of float, then in order of preceding event number;
(iii) In order of latest allowable start dates, then in order of preceding event numbers; and
(iv) In order of latest allowable finish dates, then in order of preceding event numbers.

(h) In addition to the requirements of subsection E, updates shall show the activities or portions of activities completed during the reporting period and their total value as basis for the contractor's periodic request for payment. Payments made to the contractor will be based on the total value of such activities completed or partially completed after verification by DPSCS and the architect, and this updated schedule analysis shall be used as a basis for partial payment. The update will state the percentage of the work actually completed and scheduled as of the report date and the progress along the critical path in terms of days ahead or behind the allowable dates. If the project is behind schedule, progress along other paths with negative float shall also be reported. The contractor also shall submit a narrative report with the updated analysis which shall include but not be limited to a description of the problem areas, current and anticipated, delaying factors and their impact, and an explanation of corrective actions taken or proposed.

(i) Sheet size of diagrams shall be 30 by 42 inches. Each updated copy shall show a date of the latest revision, and the date of the latest updating.

(j) All schedules, including the initial schedule, recovery schedules, and monthly updates, shall be submitted in three (3) paper copies and one (1) copy on CD/DVD.

(k) The contractor shall be prepared to effect schedule revisions in the network in response to changes to the contract under the terms thereof, at the direction of DPSCS. In the event that change orders are experienced, they shall be reflected as new activities in the network, or as changes in logic and/or time framing of existing activities. They shall be introduced at the next updating after receipt of a change order, and shall be subject to the approval of DPSCS. Change order logic shall affect only those intermediate activities and performance dates directly concerned. Adjustments required in completion dates for those intermediate dates, or for the contract as a whole, will be considered only to the extent that there is not sufficient remaining float to absorb the additional time which may be authorized for completion of individual activities.

(l) When the first schedule is furnished, contractor shall also furnish to DPSCS, for the State's permanent use and retention, the CPM scheduling software used by the contractor for scheduling the project and one copy of an operating or user's manual for using the software.

(3) (a) CPM schedules and updates, including recovery schedules, shall include the following: (a) lists of activities showing early and late start and finish dates; (b) a brief time-impact comparison in graph form (preferably on one page) comparing the critical path as-built to date and as-planned for the remainder of the work (as shown on contractor's last schedule or update) with the critical path as-built and as-planned as of the time of the schedule or update currently being submitted; and (c) all other information normally provided in a reasonable CPM schedule or update.

(b) Logic or network diagrams must be furnished (1) with the first schedule submitted under this subsection J, (2) with recovery schedules submitted under subsection H, (3) if requested by DPSCS with each monthly update submitted under subsection E, and (4) whenever the contractor changes the sequence of work, whether diagrams are requested by DPSCS or not.

K. Delays set forth in Section 7.07D(1) shall be non-compensable even if an extension of time is granted.

L. Except as may be expressly agreed otherwise by the Procurement Officer in writing, no action or inaction by the State or its representatives shall constitute a grant of an extension of the completion date or the waiver of a delay or other default by the contractor or agreement of the State to pay for alleged delays or acceleration of construction, including:

(1) a request for a revised schedule, a recovery schedule, or an anticipated completion date from contractor;
(2) allowance, approval or acceptance of any schedule;
(3) failure to terminate for default at an earlier date; or
(4) demand that the contractor finish the project by the required completion date or by any subsequent date promised by the contractor.

M. Contractor must take all reasonable action to avoid or to mitigate the effects of delays, including but not limited to:

(1) rescheduling or re-sequencing the work,
(2) accepting other work and
(3) reassigning personnel.

When the contractor is responsible for any delay, the State may order the contractor to accelerate construction, work overtime, add additional shifts or manpower, work on weekends, or to do anything else reasonably necessary in order to finish on time, at no additional cost to the State. The contractor does not have the unilateral right to complete the work late and pay liquidated or other damages.

N. Failure of the contractor to request, as required by Section 3.06B and this Section 7.06, a time extension to which he might otherwise be entitled, shall constitute a waiver of contractor's right to an extension of the required completion date.

O. Liquidated Damages

(1) (**COMAR 21.07.02.08**) - Time is an essential element of the contract and it is important that the work be vigorously prosecuted until completion. For each day that any work shall remain uncompleted beyond the time(s) specified elsewhere in the contract, the Contractor shall be liable for liquidated damages in the amount(s) provided for in the solicitation, provided, however, that due account shall be taken of any adjustment of specified completion time(s) for completion of work as granted by approved change orders.

(2) Prior to and after the contract completion date, the State may withhold an amount equal to liquidated damages whenever the progress of construction is such that, due to the fault or responsibility of the Contractor, the Contractor, in the judgment of the State, is behind schedule so as not reasonably to be able to complete the contract on time. Due account may be taken of excusable delays and for delays for which the State is responsible, provided that the Contractor has properly requested time extensions therefor. After submission of a bid, the Contractor may not contest the reasonableness of the amount of liquidated damages stated in the contract.

P. (1) The term "delay" shall mean any act, omission, occurrence, event, or other factor which necessarily extends the time reasonably required for completion of the contract. This Section 7.06 covers every such act, omission, occurrence, event, or other factor, whether called delay, disruption, interference, impedance, hindrance, suspension, constructive suspension, extension or otherwise.

(2) Whenever the State shall be liable to the contractor for an equitable adjustment for delay, the amount of the equitable adjustment shall be determined in accordance with this subsection P and other applicable provisions of this Section 7.06.

(3) Only the following items may be recoverable by the contractor as compensation or damages for delay:

(a) direct costs, consisting of
(i) actual additional salaried and non-salaried on-site labor expenses;

(ii) actual additional costs of materials;
(iii) actual additional equipment costs, based solely on actual ownership costs of owned equipment or actual reasonable costs of rented or leased equipment;
(iv) actual additional extended field office expenses, excluding those which are to be included in overhead;
(v) actual additional reasonable costs of Subcontractors and suppliers at any tier for which the contractor is liable, subject to §3.07C(7)(a);

(b) actual additional costs, proven by clear and convincing evidence, resulting from labor or other inefficiencies proven by clear and convincing evidence; and
(c) an additional percentage, determined in accordance with Section 3.07C(6) and (7)(b), of the total of items (a)(i) through (v) above, for overhead and profit.

(4) No other compensation or damages are recoverable by Contractor for compensable delays or extensions of the completion time except as expressly stated in this subsection P. In particular, the State will not be liable for the following (by way of example and not of limitation) whether claimed by the Contractor or by a Subcontractor or supplier at any tier:
(a) profit in excess of that provided herein;
(b) loss of profit;
(c) home office or other overhead in excess of that provided herein;
(d) overhead calculated by use of the Eichleay formula or similar formulae;
(e) consequential damages of any kind, including loss of additional bonding capacity, loss of bidding opportunities, and insolvency;
(f) indirect costs or expenses of any nature except those expressly provided for herein; and
(g) attorneys fees, costs of claims preparation and presentation, and costs of litigation.

(5) There shall be deducted from the compensation payable to the contractor under this section for delay any and all costs, expenses, and overhead recovered or recoverable by the contractor under change orders issued to the contractor or otherwise recovered or recoverable by the contractor.

(6) Contractor shall be entitled to no compensation or damages for delay unless, within ten (10) calendar days of the act, omission, occurrence, event or other factor alleged to have caused the delay, the contractor notifies the Procurement Officer in writing of
(a) the alleged delay and its anticipated duration, and
(b) the act, omission, occurrence, event or other factor allegedly causing the delay.

Knowledge on the part of the State of the act, omission, occurrence, event, or other factor, or of the delay allegedly resulting there from, shall not excuse contractor's failure to give the State the notice required by this subsection P(6).

Q. (1) Except as provided in paragraph 2 below, if the Department fails to issue a Notice to Proceed within 90 days following execution of the contract by the Department, or by such date later than 90 days as may be contemplated by the solicitation documents, the Contractor will have as its sole remedy the option of:
(a) declaring the contract void without any liability or obligation on the part of the State except that if the Department fails to issue a Notice to Proceed for reasons unrelated to submission, review, and acceptance of the submittals required by Section 7.06(B)&(C), the Department shall reimburse the Contractor its actual costs of developing same; or
(b) accepting an extended period, at no additional cost to the State, for issuance of a Notice to Proceed.

(2) If the failure of the Department to issue a Notice to Proceed within 90 days following execution of the contract by the Department, or by such date later than 90 days as may be contemplated by the solicitation documents, is caused, wholly or in part, by breach or default of the Contractor or other fault of the Contractor or his Subcontractors or suppliers at any tier, the Contractor shall be entitled to no relief under paragraph (1) above based on delay in issuance of the Notice to Proceed. In such a case, the Contractor shall be bound to perform the contract within the time allowed following actual issuance of the Notice to Proceed, at no additional cost to the State.

R. Requests for time extensions must be filed and supported as provided in Section 3.06 and other applicable provisions of the contract.

S. Weather

(1) Department has determined that the following table will be used to determine allowable non-compensable time extensions to the contract for "unusually severe weather" at the construction site.

Month	No. of work day delays that may be expected to occur under normal weather conditions
January	3
February	3
March	2
April	2
May	2
June	2
July	2
August	2
September	1
October	1
November	1
December	2
Annual Total	**23**

(2) Non-compensable time extensions for working day delays during the months as listed above will only be allowed for working day delays in excess of those numbers listed above and only when those excess days of delay affect the critical path of the work required to meet the specified contract times or dates. It is understood and agreed that the table above is not for the exclusive use of either the Contractor or the State. Modifications of the time for performance under any and all of the provisions of the contract will be granted only to the extent that equitable time adjustments are made for the activities on the critical path. Any request from the contractor for a weather caused time extension shall include a credit to the State for the previous time allowed in the table and not used because the anticipated weather conditions did not occur. The calendar days or dates adjustments will be developed by multiplying the allowable day's extension by one of the following factors, as applicable.

(a) Factor of 1.4 for those activities scheduled for five day work week.
(b) Factor of 1.2 for those activities for six day work week.
(c) Factor of 1.0 for those activities scheduled for a seven day work week.

T. Scheduling Meetings

The contractor shall meet with the State and the architect (unless the architect's absence is excused by the State) at least monthly to discuss in detail the contractor's updating of the schedule, the necessity for revisions or corrections in the schedule or updates, and all other issues or matters relating to the scheduling of the project and the contractor's obligations under the project respecting scheduling. This meeting shall be in addition to the progress meetings required by §4.11.

7.07 TERMINATION FOR DEFAULT, DAMAGES FOR DELAY, TIME EXTENSIONS (COMAR 21.07.02.07):

A. If the contractor refuses or fails to prosecute the work, or any separable part thereof, with such diligence as shall ensure its completion within the time specified in this contract, or any extension thereof, or fails to complete said work within this time, the State may, by written notice to the contractor, terminate his right to proceed with the work or the part of the work as to which there has been delay. In this event the State may take over the work and prosecute the same to completion, by contract or otherwise, and may take possession of and utilize in completing the work the materials, appliances, and plant as may be on the site of the work and necessary therefor. Whether or not the contractor's right to proceed with the

work is terminated, he and his sureties shall be liable for any damage to the State resulting from his refusal or failure to complete the work within the specified time.

B. If fixed and agreed liquidated damages are provided in the contract and if the State so terminates the contractor's right to proceed, the resulting damage shall consist of such liquidated damages until a reasonable time as may be required for final completion of the work together with any increased costs occasioned the State in completing the work.

C. If fixed and agreed liquidated damages are provided in the contract and if the State does not so terminate the contractor's right to proceed, the resulting damage shall consist of these liquidated damages until the work is completed or accepted.

D. The contractor's right to proceed may not be so terminated nor the contractor charged with resulting damages if:

(1) The delay in the completion of the work arises from unforeseeable causes beyond the control and without the fault or negligence of the contractor, including but not restricted to, acts of God, acts of the public enemy, acts of the State in either its sovereign or contractual capacity, acts of another contractor in the performance of a contract with the State, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, unusually severe weather, or delays of Subcontractors or suppliers arising from unforeseeable causes beyond the control and without the fault or negligence of both the contractor and the Subcontractors or suppliers, and

(2) The contractor, within ten (10) days from the beginning of any such delay (unless the Procurement Officer grants a further period of time before the date of final payment under the contract), notifies the Procurement Officer in writing of the causes of delay. The Procurement Officer shall ascertain the facts and the extent of the delay and extend the time for completing the work when, in his judgment, the findings of fact justify such an extension, and his findings of fact shall be final and conclusive on the parties, subject only to appeal as provided in the "Disputes" clause of this contract.

E. If, after notice of termination of the Contractor's right to proceed under the provisions of this clause, it is determined for any reason that the Contractor was not in default under the provisions of this clause, or that the delay was excusable under the provisions of this clause, the rights and obligations of the parties shall, if the contract contains a clause providing for termination for convenience of the State, be the same as if the notice of termination had been issued pursuant to the clause. If, in the foregoing circumstances, this contract does not contain a clause providing for termination for convenience of the State, the contract shall be equitably adjusted to compensate for the termination and the contract modified accordingly; failure to agree to any such adjustment shall be a dispute concerning a question of fact within the meaning of the clause of this contract entitled "Disputes".

F. The rights and remedies of the State provided in this clause are in addition to any other rights and remedies provided by law or under this contract.

G. As used in paragraph (D)(1) of this clause, the term Subcontractors or suppliers means Subcontractors or suppliers at any tier.

H. The State may terminate for default under this Section 7.07 at any time when the contractor is in default or breach of any material obligation of the contract, including after substantial completion, such as for failure in a timely manner to complete a punch list, to perform warranty work, or to perform any other substantial requirement of the contract.

Time extension requests due to inclement weather impact on the critical path activities must be determined and issued on a monthly basis. The State is not obligated to grant the requests on a monthly basis but will review the requests and determine whether the contractor's justifications for the requests are appropriate for the circumstances.

7.08 TERMINATION FOR DEFAULT -- GROUNDS OTHER THAN FOR LACK OF DILIGENCE:

A. If the contractor fails to perform any provisions of the contract not governed by Section 7.07 of these General Conditions, the State may terminate the whole or any part of the contract for default by written notice of default to the contractor. Termination for default in such a case shall be governed by subsections (2) through (7) of **COMAR 21.07.01.11B**, which are incorporated into and made a part of the contract.

B. Except as may be expressly agreed otherwise by the Procurement Officer in writing, no action or inaction by the State or its representatives or the architect shall constitute waiver of any default by the contractor.

C. The State may terminate for default under this Section 7.08 at any time when the contractor is in default or breach of any material obligation of the contract, including after substantial completion.

7.09 SUSPENSION OF THE WORK (COMAR 21.07.02.04):

A. The Procurement Officer unilaterally may order the contractor in writing to suspend, delay, or interrupt all or any part of the work for a period of time as he may determine to be appropriate for the convenience of the State.

B. If the performance of all or any part of the work is for an unreasonable period of time suspended, delayed, or interrupted by an act of the Procurement Officer in the administration of the contract, or by his failure to act within the time specified in this contract (or if no time is specified, within a reasonable time), an adjustment shall be made for any increase in the cost of performance of this contract (excluding profit) necessarily caused by an unreasonable suspension, delay, or interruption and the contract modified in writing accordingly. However, no adjustment shall be made under this clause for any suspension, delay, or interruption to the extent (1) that performance would have been so suspended, delayed, or interrupted by any other cause, including the fault or negligence of the contractor; or (2) for which an equitable adjustment is provided for or excluded under any other provision of this contract.

C. No claim under this clause shall be allowed (1) for any costs incurred more than twenty (20) days before the contractor shall have notified the Procurement Officer in writing of the act or failure to act involved (but this requirement shall not apply as to a claim, resulting from a suspension order), and (2) unless the claim, in an amount stated, is asserted in writing as soon as practicable after the termination of a suspension, delay, or interruption, but not later than the date of final payment under the contract.

7.10 STATE'S RIGHT TO TERMINATE FOR CONVENIENCE:

The provisions of **COMAR 21.07.02.09** respecting the State's right to terminate the contract for convenience are incorporated into and made a part of this contract.

7.11 PARTIAL ACCEPTANCE:

A. If, in its sole discretion, the Department desires to accept any portion of the project, then the Department shall have the right to accept and use those portions of the project which in the opinion of the Department can be used for their intended purpose. The conditions of occupancy, use, and the responsibilities of the Contractor and the State for maintenance, heat, light, utilities, and insurance shall be established. The State has no obligation to accept the project in portions.

B. Partial occupancy or acceptance shall in no way relieve the contractor of his responsibilities under the contract.

C. Partial occupancy may require contractor to perform work in the secure occupied area. contractor shall perform all work at no additional compensation to the contractor.

D. If the State accepts the work in portions then warranties on the accepted portions do not being to run until substantial completion of the whole project is deemed to be achieved.

7.12 SUBSTANTIAL COMPLETION AND FINAL INSPECTION:

A. When the Contractor reasonably believes the work satisfies the requirements of 7.12B, the Contractor shall notify the Procurement Officer and the architect in writing that the work will be ready for Substantial Completion Inspection and testing on a definite date. Reasonable notice shall be given by the Contractor to permit the Department to schedule the Substantial Completion Inspection. The Contractor shall not request Substantial Completion Inspection until the work is in fact substantially complete. The Contractor shall deliver to the Procurement Officer, on the scheduled Substantial Completion Inspection date, a complete, comprehensive set of field mark-up drawings accurately documenting the As-Built Project and all of the Operation and Maintenance (O&M) Manuals required under the contract and shall have completed all required training and demonstration of equipment as required by the contract documents.

B. The Department shall establish the date of substantial completion and shall fix the time(s) at which the warranties will begin if, on the basis of the Substantial Completion Inspection, the Department determines that, at a minimum and in accordance with the contract documents:

(1) all electrical, mechanical, and life safety systems have been completed and successfully tested and successfully inspected for conformity to all requirements of the contract documents and all applicable codes and standards;
(2) complete, comprehensive field mark-up drawings of the As-Built Project, and all of the Operation and Maintenance (O&M) Manuals required under the contract, have been delivered to the Department;
(3) all other requirements for substantial completion, including the completion of required training and demonstration of equipment, have been met; and
(4) the project appears able to be occupied and usable for its intended purpose.

C. The work shall not be deemed substantially complete if, in the absolute discretion of DPSCS, completion of unfinished work, whether called punch list work or otherwise, would cause inconvenience to or interfere with the use of the premises by using agency personnel or others using the premises.

D. If the Department determines that substantial completion has been achieved, the Department shall fix the time within which the Contractor shall complete any remaining items of work which will be indicated on a list (the “punch list”). All punch list work shall be completed within thirty (30) days after the date of substantial completion determined by DPSCS, unless DPSCS establishes a different period for completion of the punch list work. If the Contractor fails to complete the remaining items so listed in the time stipulated the State shall have the undisputed right to complete the work at the Contractor’s expense. The Contractor may be required to complete multiple punch lists, which may be prepared by DPSCS, by the architect, or by the using agency, until the contract is performed in its entirety. Failure to complete punch list work in a timely manner shall constitute grounds for termination of the contract for default.

E. Prior to the granting of substantial completion by DPSCS, the architect, DPSCS, and/or the using agency may prepare lists of work requiring completion or requiring completion as a prerequisite to the granting of substantial completion. These “work lists” shall not constitute punch lists and shall not be construed as indicating that the work has been completed to the extent that it is substantially complete.

F. Final payment shall not be made until all contract work including all punch list work is complete to the satisfaction of the Department.

G. Acceptance of the work as substantially complete shall not excuse or waive any failure of the Contractor to complete the contract as required by the contract documents.

7.13 CLEANING UP:

The contractor shall at all times keep the construction area, including storage areas used by him, free from accumulations of waste material or rubbish and prior to completion of the work shall remove any rubbish from the premises and all tools, scaffolding, equipment, and materials not the property of the

State. Upon completion of the construction, the contractor shall leave the work and premises in a clean, neat and workmanlike condition satisfactory to the State.

7.14 WARRANTY:

A. Except to the extent that the contract documents impose greater warranty obligations on the contractor for all or any part of the work, the contractor warrants for a two year period (unless another period is specified) commencing on the date of substantial completion of the project as a whole or on such other date agreed between the parties:

(1) that the work contains no faulty or imperfect material or equipment or any imperfect, careless, or unskilled workmanship;

(2) that all mechanical and electrical equipment, machines, devices, etc., shall be adequate for the use to which they are intended, and shall operate with ordinary care and attention in a satisfactory and efficient manner;

(3) that he will promptly re-execute, correct, repair, or remove and replace with proper work, without cost to the State, any work found not to be as guaranteed by this section or otherwise not in conformity with the contract and that he will make good all damages caused to other work or materials in the process of complying with this section;

(4) that the entire work shall be water-tight and leak-proof in every particular.

B. This Section 7.14 provides for a period during which the contractor is bound to replace work in addition to being liable for failure to perform the contract in accordance with its terms. Nothing herein releases or limits the contractor's liability for latent defects or for any substantial failure to perform the work in accordance with the contract, even if such defects or failure are discovered after the expiration of the warranty period provided by this section.

7.15 NOTICE TO STATE OF LABOR DISPUTES:

A. Whenever the contractor has knowledge that any actual or potential labor dispute is delaying or threatens to delay the timely performance of this contract, the contractor shall immediately give notice thereof, including all relevant information with respect thereto, to the Procurement Officer.

B. The contractor must insert the substance of this clause, including this subsection B, in any subcontract hereunder as to which a labor dispute may delay the timely performance of this contract; except that each such subcontract shall provide that in the event its timely performance is delayed or threatened by delay by any actual or potential labor dispute, the Subcontractor shall immediately notify his next higher tier Subcontractor, or the prime contractor, as the case may be, of all relevant information with respect to such dispute.

SECTION 8 - PAYMENTS:

8.01 SCOPE OF PAYMENT:

A. Payments are made on the valuation of work accomplished and on account of materials delivered to the site for incorporation in the work which are suitably stored and protected.

B. Payments shall also be made on account of materials or equipment for incorporation in the work but stored at some off-site location agreed upon by the State, such payment to be conditioned upon submission by the contractor of bills of sale or such other documentation satisfactory to the Department to establish the State's title to such materials or equipment or otherwise to protect the State's interest, including proof of applicable insurance, transportation to site, and freedom from liens and security interests.

C. Prior to the application for first payment, the contractor shall submit to the State and the architect a schedule of values of the various parts of the work, including quantities, aggregating the total sum of the

contract, and based upon the dollar loadings of the approved schedule. This schedule shall be so divided as to facilitate payments to Subcontractors. This submission shall be in a form acceptable to the State and shall be supported by such evidence as to its correctness as the State may direct. This schedule shall be used as a basis for certificates of payments unless at a later date the schedule is found to be in error, in which case the schedule will be corrected.

Prior to the application for the first payment, the contractor shall also submit the subcontracting (MBE and non-MBE) information to consist of the names and addresses of the Subcontractors, trades and subcontract amounts. The information shall be updated and, at the end of the project, shall be provided for the final contract amount as actually awarded. The State may not make the final payment until this subcontracting information is received.

D. Application for progress payments shall be submitted on or about the 25th day of each month except that the first payment shall not be submitted prior to ten days into the project.

E. In applying for payments the contractor shall submit a requisition, based upon the dollar loadings of the approved schedule, itemized in such form and supported by such evidence as the State may require, showing the contractor's right to the payment claimed. Each requisition shall prominently display the contractor's Federal Employers Tax Identification Number or Social Security number.

(1) In applying for all payments, or final payment, the contractor shall submit in addition to the above a certificate that he has paid:

(a) All labor to date,

(b) All vendors and material suppliers in full for all items received, and

(c) All Subcontractors in full, less the retained amount.

(2) In applying for the final payment, the contractor shall also submit the following:

(a) Such evidence as the State may demand to establish the State's title to materials and to give reasonable assurance that liens and security interests of others do not exist. Nothing in this subsection shall be construed to allow anyone to obtain a lien on State property.

(b) An electrical certificate from an independent (non-governmental) electrical inspection agency approved or licensed required by law. The contractor must make application for the inspection, coordinate same, and pay the required inspection fees. The independent electrical inspection agencies are not considered local authorities. (See also General Conditions section 4.06B.)

(c) All other guarantees as called for by the contract.

(d) All required equipment, operation, training, maintenance, and other manuals and parts lists.

(e) A complete set of all drawings indicating as-built conditions, submitted to the architect.

8.02 FORCE ACCOUNT WORK:

A. When the contractor is required to perform work as a result of or alleged by the contractor to be an addition or change to the contract for which there are no applicable unit prices in the contract, the Department and contractor shall attempt to agree upon a price for the performance of such work. If an agreement cannot be reached, the Department may require the contractor to do such work on a force account basis to be compensated as follows:

(1) Labor. The Contractor shall be paid as follows:

(a) The actual wages for each and every hour work is performed.
(b) The actual costs paid to or on behalf of workmen by reason of subsistence and travel allowances, health and welfare benefits, pension fund benefits or other benefits, when such amounts are required by collective bargaining agreement or other employment contract generally applicable to the classes of labor employed on the work; and
(c) An equitable percentage, to be determined by the Contractor and Procurement Officer, applied against the labor cost (premium pay and fringes excluded) for liability and worker's compensation insurance premiums, unemployment insurance contributions and FICA taxes on such labor cost.

(2) Materials. For materials in accordance with the contract, accepted by the State and used, the contractor shall receive the actual cost of such materials delivered to the work, including transportation paid by him (exclusive of machinery rentals as hereinafter set forth).

(3) Equipment. For any machinery or special equipment (other than small tools, whether rented or owned), the contractor shall receive the rates agreed upon in writing before such work is begun, or those rates which may be specified elsewhere in the contract, or reasonable rates,
whichever are less. For purpose of definition, equipment with a new cost of $500 or less will be considered small tools.

(4) Materials and Supplies Not Incorporated in the Work. For materials and supplies expended in the performance of the work (excluding those required for rented equipment), the contractor shall receive the actual cost of such materials and supplies used.

(5) Bond - Whenever the Contractor is entitled to an increase in the contract price, the amount of the increase shall not include any amount for increased costs or premiums of bonds unless: (1) DPSCS requires an increase in the amount of the penal sum of the bond or bonds, (2) the Contractor actually incurs such cost, (3) the surety actually increases the penal sum of the bonds, and (4) DPSCS receives proof in satisfactory form that the surety has increased the penal sum of the bonds.

(6) Superintendence. No additional allowance shall be made for general superintendence, the use of small tools, or other costs for which no specific allowance is herein provided. The cost of foremen may be added only when the modification makes necessary the hiring of additional supervisory personnel or makes necessary their employment for time additional to that required by the contract.

(7) The mark-up allowable to the contractor for combined overhead and profit for work performed solely by the contractor with his own forces shall be a reasonable amount not to exceed fifteen percent (15%) of the contractor's costs (excluding items includable in overhead).

(8) Subcontractors. For work done solely by a Subcontractor, the Subcontractor's costs shall be determined as stated in subsections A(1) through (6) above.

(9) (a) The mark-up allowable to a Subcontractor for overhead and profit for work performed solely with his own forces shall be a reasonable amount not to exceed ten percent (10%) for the Subcontractor's overhead and five percent (5%) for the Subcontractor's profit, based upon the Subcontractor's costs of labor, materials, and equipment.

(b) For work performed by a Subcontractor solely with his own forces, the contractor is entitled to a reasonable mark-up for combined overhead and profit, not to exceed five percent (5%) of the cost of the Subcontractor's materials, equipment, and labor.

B. Compensation. The compensation as set forth above shall be received by the contractor as payment in full for the work done on a force account basis. At the end of each day, the contractor's representative and the State shall compare records of the cost of work as ordered on a force account basis.

C. Statements. No payment will be made for work performed on a force account basis until the contractor furnishes the State duplicate itemized statements of the cost of such force account work detailed as to the following:

(1) Name, classification, date, daily hours, total hours, rate, and extension for such laborer, foreman.

(2) Designation, dates, daily hours, total hours, rental rate, and extension for each unit of machinery and equipment.

(3) Quantities of materials, prices, and extensions.

(4) Transportation of materials.

(5) Cost of property damage, liability and worker's compensation insurance premiums, unemployment insurance contributions, and social security tax.

(6) Payments of items under (3) and (4) above shall be accompanied by original receipted invoices for materials used and transportation charges. If, however, the materials used in the force account work are not specifically purchased for such work but are taken from the contractor's stock, then in lieu of the original invoices, the statements shall contain or be accompanied by an affidavit of the contractor which shall certify that such materials were taken from his stock, that the quantity claimed was actually used, and that the price and transportation of the material as claimed represent actual cost. The State may require additional proof as to costs, ownership, title, non-existence of liens, etc., to the same extent as provided in Section 8.01E(2)(a).

D. Any other claims of the contractor arising from work done on a force account basis that are not expressly addressed in this Section 8.02, including (but not limited to) requests for time extensions, are subject to other applicable provisions of the contract.

8.03 CASH ALLOWANCES:

Whenever an allowance is mentioned in the specifications, then the contractor shall include in his contract sum the entire amount of such specified allowances. The expenditure of these allowances is to be at the Procurement Officer's direction. However, the allowance expenditure is limited to items properly inferable from the title and description of the allowance. Unexpended balances are to be credited to the State. Compensation payable to the contractor for expenditure of allowances directed by the Procurement Officer shall be based on the cost to the contractor as shown by actual invoices or receipts, and no additional overhead or profit shall be payable to the contractor for such allowances.

8.04 CERTIFICATES OF PAYMENT; RETAINAGE:

A. If the contractor has made application as above, the State shall, not later than the date when such payment falls due, issue to the contractor a certificate for such amount as it decides to be properly due. In approving such partial payments, there shall be retained five percent (5%) of the estimated amount due until completion and acceptance of all work covered by the contract. Payment may be withheld in accordance with **COMAR 21.06.06.01**.

B. This contract is subject to the provisions of **COMAR 21.06.06.02**, Escrow of Retainage. If retainage is to be placed in an interest bearing account, the contractor shall be required to complete the Internal Revenue Service's Form W-9, Payer's Request for Taxpayer Identification Number.

C. No certificate issued nor payment made to the contractor, nor partial or entire use or occupancy of the work by the State, shall be an acceptance of any work or materials not in accordance with this contract.

8.05 DEDUCTIONS FOR UNCORRECTED WORK:

If the State deems it inexpedient to correct work not in accordance with the contract, an equitable deduction from the contract price shall be made therefor.

8.06 PAYMENTS WITHHELD:

A. The State may withhold payment or, on account of subsequently discovered evidence, nullify or reduce the whole or part of any certificate or payment on account of:

(1) the cost (measured by the contract value or fair market value, whichever is greater) of completing unfinished or defective work not remedied or deductions or amounts due the State under the contract;

(2) failure of the contractor to perform any material contract requirement;

(3) claims filed or likely to be filed against the State for which the contractor may be liable to the State;

(4) failure of the contractor to make payments properly to Subcontractors or suppliers for material or labor (see, however, Section 9.03C) or amounts claimed by the contractor's surety or insurer under any right of subrogation;

(5) a reasonable doubt that the contract can be completed for the balance then unpaid;

(6) damage to another contractor;

(7) liquidated damages or other damages or compensation due the State for claims of the State against the contractor;

(8) any claim of the State or debt owed to the State arising from any other cause;

(9) retainage as provided in Section 8.04A;

(10) failure to maintain as-built drawings as required by Section 2.01(B)(2);

(11) failure to update schedules properly as required by Section 7.06; and

(12) the cost of completing unfinished warranty work.

B. The failure of contractor to complete the construction by the required completion date shall be prima facie evidence of the State's right to withhold liquidated damages after the expiration of the contract time for completion. Nothing in this subsection shall be construed to limit the State's right to withhold liquidated damages prior to the expiration of the completion time as provided in subsection 7.06 O.

8.07 CORRECTION OF WORK BEFORE FINAL PAYMENT:

A. The contractor shall promptly remove from the premises all work failing to conform to the contract, whether or not incorporated in the structure or premises. The contractor shall promptly replace and re-execute such work in accordance with the contract and without expense to the State and shall bear the expense of making good all work of other contractors destroyed or damaged by such removal or replacement.

B. If the contractor does not remove such condemned work within a reasonable time, the State may remove it and may store materials at the expense of the contractor. If the contractor does not pay the expense of such removal or storage within ten days time thereafter, the State may sell such materials and shall account for the net proceeds thereof, after deducting all the costs and expenses incurred by the State.

8.08 FINAL PAYMENT:

A. (1) Upon completion of the Work, the Contractor shall prepare final payment forms and submit them. (2) The State will promptly proceed to make any necessary final surveys, to complete any necessary computations of quantities, and to complete other activities necessary to determine the Contractor's right to final payment. The Department will then reply to the Contractor's request for final payment, informing the Contractor of the amount of final payment considered to be due the Contractor. Such reply shall inform the Contractor of all deductions, damages, costs, back charges, and other charges assessed against the Contractor by the State and the reasons therefore.

B. Notwithstanding subsection A(1) above, prior to or in the absence of a request from contractor for final payment, the State may determine under subsection A(2) the amount of the final payment it considers to be due the contractor.

C. If the contractor disputes the amount determined by the State to be due him, he shall initiate a claim under the disputes procedures.

D. Acceptance by the contractor of any payment identified by the State as being final payment shall operate as an accord and satisfaction and a general release of all claims of the contractor against the State arising out of or connected with the contract, except as may be expressly agreed otherwise in writing between the contractor and the Procurement Officer.

E. No claims by the contractor may be asserted for the first time after application is made by the contractor for final payment or after final payment is made by the State.

8.09 PAYMENT AND INTEREST:

A. Payment of State Obligations (**COMAR 21.07.01.18**) – Payments to the Contractor pursuant to this Contract shall be made no later than 30 days after the State's receipt of a proper invoice from the Contractor. Charges for late payment of invoices, other than as prescribed by Title 15, Subtitle 1, of the State Finance and Procurement Article, Annotated Code of Maryland, or by the Public Service Commission of Maryland with respect to regulate public utilities, as applicable, are prohibited

B. A proper invoice or requisition shall include a description of items or services provided; the date the goods were received by the ordering agency/department; or the inclusive dates the services were rendered; the price agreed upon pursuant to the contract; the basis for the billing; the purchase order or contract identification number; the contractor's Federal Employers Identification Number or Social Security Number; and the name and address of the proper invoice recipient for the state agency, as specified in the contract.

C. For purposes of this contract, an amount will not be deemed due and payable and interest payments will not be authorized for late payments unless the following conditions have been met:

(1) The amount invoiced is consistent with the amount agreed upon by the parties to the contract pursuant to the contractual agreement.

(2) The goods and/or services have been received by the State and the quantity received agrees with the quantity ordered.

(3) The goods and/or services meet the qualitative requirements of the contract and have been accepted by the State, subject to Section 6.09 hereof.

(4) The proper invoice has been received by the party or unit of government specified in the agreement.

(5) The invoice is not in dispute.

(6) If the contract provides for progress payments, the proper invoice for the progress payment has been submitted pursuant to the approved schedule of values.

(7) All conditions for release of retainage have been met.

8.10 RETENTION OF RECORDS -- AUDITS BY THE STATE:

A. In accordance with **COMAR 21.07.01.21**, the Contractor and his Subcontractors and suppliers at any tier shall retain and maintain all records and documents relating to this contract for three years after final payment by the State hereunder or any applicable statute of limitations whichever is longer, and shall make them available for inspection and audit by authorized representatives of the State, including the Procurement Officer or designee, at all reasonable times.

B. If contractor or his Subcontractors or suppliers at any tier fail to retain for the period of time required by this section original documents used, made, or relating to the preparation or calculation of contractor's bid to the State or of bids, quotes or estimates of Subcontractors or suppliers at any tier, contractor shall be entitled to no damages, compensation, or equitable adjustments (including time extensions) for any claims based on calculations, assumptions, understandings, or beliefs allegedly made at the time of preparation of such bids, quotes, or estimates.

C. In the event a claim is initiated by either party under Section 6.13, contractor and his Subcontractors or suppliers at any tier shall retain such books, papers, records and other documents until expiration of the aforesaid three-year period or until final, unappealable resolution of the claim, whichever is later.

8.11 CONTRACT COST PRINCIPLES AND PROCEDURES:

The contract is subject to the applicable contract cost principles and procedures set forth in **COMAR 21.09.**

8.12 FINANCIAL DISCLOSURE (COMAR 21.07.01.19):

The Contractor shall comply with the provisions of Section 13-221 of the State Finance and Procurement Article of the Annotated Code of Maryland, which requires that every business that enters into contracts, leases, or other agreements with the State of Maryland or its agencies during a calendar year under which the business is to receive in the aggregate $100,000 or more, shall, within 30 days of the time when the aggregate value of these contracts, leases or other agreements reaches $100,000, file with the Secretary of State of Maryland certain specified information to include disclosure of beneficial ownership of the business.

8.13 POLITICAL CONTRIBUTION DISCLOSURE (COMAR 21.07.01.20):

The Contractor shall comply with Election Law Article, §§14-101—14-108, Annotated Code of Maryland, which requires that every person that enters into contracts, leases, or other agreements with the State, a county, or an incorporated municipality, or their agencies, during a calendar year in which the person receives in the aggregate $100,000 or more, shall file with the State Board of Elections a statement disclosing contributions in excess of $500 made during the reporting period to a candidate for elective office in any primary or general election. The statement shall be filed with the State Board of Elections:

(1) before a purchase or execution of a lease or contract by the State, a county, an incorporated municipality, or their agencies, and shall cover the preceding two calendar years; an

(2) if the contribution is made after the execution of a lease or contract, then twice a year, throughout the contract term, on:

(a) February 5, to cover the 6-month period ending January 31; and
(b) August 5, to cover the 6-month period ending July 31.

SECTION 9 - EMPLOYEES, SUBCONTRACTORS AND WORK CONDITIONS:

9.01 EMPLOYEES AND WORKMANSHIP:

A. Qualification of Employees. Only personnel thoroughly trained and skilled in the tasks assigned them may be employed on any portion of the work. Any employee found to be unskilled or untrained in his work shall be removed from the work.

B. Licensed Employees. When municipal, county, State or federal laws require that certain personnel (electricians, plumbers, etc.) be licensed, then all such personnel employed on the work shall be so licensed.

C. Quantity of Labor. The contractor shall employ on the work, at all times, sufficient personnel to complete the work within the time stated in the contract.

D. Work Areas. The contractor shall confine the operations of his employees to the limits as provided by law, ordinance, permits or directions of the Department. Generally, the work area will be the same as the Limit of Contract line indicated in the construction documents.

E. Methods and Quality.

(1) Whenever the method of the work or manner of procedure is not specifically stated in the contract documents, the best practice shall be followed. Unless the contract documents expressly require stricter standards for application, installation, connection, erection, use, cleaning or conditioning, recommendations of the manufacturers of approved materials shall be considered as a part of these specifications and all materials shall be applied, installed, connected, erected, used, cleaned and conditioned as so called for thereby. If any such manufacturer's recommendations are defective, faulty, inaccurate, or negligently made, contractor shall be responsible for all loss resulting there from, including liability for loss incurred by the State.

(2) All materials shall be accurately assembled, set, etc., and when so required in good construction, shall be true to line, even, square, plumb, level and regularly spaced, coursed, etc. Under no circumstances, either in new or old work shall any material be applied over another which has not been thoroughly cleaned, sanded, or otherwise treated so as not to impair the finish, adhesion, or efficiency of the next applied item.

(3) All methods, procedure and results are subject to the approval of the architect and the Procurement Officer as to the quality of the finished result to be obtained; provided that this is not to be interpreted as placing upon the architect or the Procurement Officer any responsibility for management of the contractor or his work.

F. Scheduling and Coordination.

(1) The contractor shall so schedule and coordinate the work as to ensure efficient and uninterrupted progress and to hold to an absolute minimum the cutting and patching of new work. All cutting, patching and digging necessary to the execution of the work is included.

(2) The contractor shall so schedule the construction performed by each group or trade that each installation or portion of the construction shall member with and join with every other new or old work as required for a complete installation, all according to accepted good construction practice.

G. Field Management

(1) Resident Project Manager – For construction projects in excess of $10 million contract value and for projects under $10 million if required by the project specifications for the construction contract, the contractor shall provide a competent full-time on-site Resident Project Manager fluent in English, during the entire duration of the contract, approved by the Department prior to commencement of work. The contractor shall submit in writing to the Department the name of the person it intends to employ as Resident Project Manager for the execution of the contract work with a statement of the proposed Resident Project Manager's qualifications. The information will be reviewed by the Department and approval or rejection given in writing. A person designated for this position shall have at least 7 years experience as full-time construction project manager on similar comparable projects. Project Manager's past performance and workload/commitments including whether or not the Project Manager can handle

two state projects located nearby shall be considered by the Department in review and approval of the Project Manager. The Department reserves the right to reject the Resident Project Manager at any time during the duration of the contract based on his performance including but not limited to inexperience, incompetence, failure to cooperate reasonably with the State and/or failure to follow contract requirements. In the event of such rejection, the contractor shall replace immediately the Resident Project Manager with another competent one acceptable to the State at no additional cost to the State following the same procedure of approval mentioned above.

(2) Superintendent: The contractor shall have on the work site, at all times during its progress, a competent, Superintendent fluent in English and other assistants, all approved by the Department prior to commencement of the work. The contractor shall submit in writing to the Department the name of the person it intends to employ as superintendent for the execution of this contract with a statement of the proposed superintendent's qualifications. This data will be reviewed by the Department and an approval or rejection given in writing. A person designated for this position should have at least eight (8) years experience as Construction Superintendent performed in this capacity at least on two similar projects. Persons who have previously proved unsatisfactory on work executed for the State of Maryland, or who are without proper qualifications, will not be approved. Should it be necessary to change the superintendent, this procedure will be repeated. A separate superintendent will be required for each DPSCS project unless otherwise approved by the Department in writing. The Superintendent shall represent the contractor when there is no on-site Resident Project Manager assigned to the project. All directions to the Superintendent shall be as binding as if given to the Contractor. All directions to the contractor shall be confirmed in writing by the Contractor. Should the Superintendent be complained of by the Department for cause (including but not limited to inexperience; incompetence; failure to properly perform his duties, manage, or coordinate the work; threats to State personnel or to others; failure to follow contract requirements, and failure to cooperate reasonably with the State) he shall be removed from the work and a new Superintendent obtained and approved as described above, at no cost to the State.

H. Discipline. The contractor shall at all times enforce strict discipline and good order among his employees and shall not employ or permit to remain on the work any unfit person. He shall enforce all instructions relative to use of water, heat, power, no smoking, and control and use of fires as required by law and the State. Employees must not be allowed to loiter on the premises before or after working hours.

I. Employee Safety. The contractor shall designate a responsible member of his organization on the work site whose duty it shall be, in addition to his other duties, to prevent accidents and to enforce the standards of Section 9.06. The name and position of the person so designated shall be reported to the Department, with a copy to the architect, by the contractor prior to commencement of the work.

J. The contractor, Subcontractors, and agents of both insofar as possible, shall secure labor through the Maryland Job Service of the Maryland Department of Business and Economic Development, except where the contractor has entered into a collective bargaining agreement under which labor is to be provided by the union. In that case, the contractor is not required to conform to these provisions unless the contractor and the union arrange with the Maryland Job Service for referral of such labor as they may mutually agree shall be referred. The contractor shall be the sole judge of the competency or fitness and for satisfactory service of any laborer referred to him by the Maryland Job Service.

K. This contract may be identified, in other parts of the solicitation documents, for inclusion in the hiring agreement program of the Department of Human Resources under Section 13-224 of the State Finance and Procurement Article of the Annotated Code of Maryland. If this contract is so identified, contractor shall comply with the hiring agreement requirements provide in the solicitation documents.

9.02 NON-DISCRIMINATION IN EMPLOYMENT (COMAR 21.07.01.08 and AFFIRMATIVE ACTION):

A. Contractor agrees:

(1) not to discriminate in any manner against an employee or applicant for employment because of race, color, religion, creed, age, sex, marital status, national origin, ancestry or disability of a qualified individual with a disability.

(2) to include a provision similar to that contained in subsection (1) above, in any subcontract except a subcontract for standard commercial supplies or raw materials; and

(3) to post and to cause Subcontractors to post in conspicuous places available to employees and applicants for employment, notices setting forth the substance of this clause.

A. Contractor shall be subject to and shall comply with all other requirements of §13-219 of the SF & P, which are incorporated into and made a part of the contract.

B. Contractor shall comply with all other applicable Federal, State, and local laws, regulations and ordinances respecting illegal discrimination and civil rights.

9.03 SUBCONTRACTS:

A. The contractor shall, as soon as practicable and before the execution of the contract, notify the architect and the Department in writing, of the names of Subcontractors proposed for the principal parts of the work and for such others as the Construction Division or the architect may direct. contractor shall not employ any Subcontractor that the architect or Department may object to as incompetent, unfit, or unsatisfactory.

B. The contractor is fully responsible to the State for the acts and omissions of its Subcontractors and suppliers at any tier and persons either directly or indirectly employed by them, as well as for the acts and omissions of itself and persons directly employed by it.

C. Nothing contained in the contract documents shall create any contractual relation between any Subcontractor or supplier at any tier and the State, and nothing in the contract documents is intended to make any such entity a beneficiary of the contract between the State and the contractor. No Subcontractor or supplier at any tier shall have or make any claim or cause of action directly against the State.

D. The contractor shall not subcontract the contract as a whole or by trades or other portions in an amount of more than 85% of the monetary value of the contract. The remaining 15% shall be executed by the contractor with labor and materials directly purchased and paid for by the contractor. Costs of bonds, insurance, overhead, supervision, mobilization, etc., shall not be claimed as a portion of the 15% mentioned above. **Only when the project is a deconstruction project** the contractor shall not subcontract the contract as a whole or by trades or other portions in an amount of more than 90% of the monetary value of the contract and therefore the remaining 10% shall be executed by the contractor with labor and materials directly purchased and paid for by the contractor.

The execution of the work by a subsidiary of the contractor will not be considered direct employment unless the Procurement Officer agrees otherwise.

9.04 RELATION OF CONTRACTOR TO SUBCONTRACTORS AND SUPPLIERS:

A. The contractor must bind every Subcontractor and supplier and will see that every Subcontractor agrees to be bound by the terms of the contract, as far as applicability to his work, unless specifically noted to the contrary in a subcontract approved in writing by the Procurement Officer.

B. The contractor must include the following provisions in all subcontracts and supply contracts applicable to the work:

(1) Subcontractor or supplier agrees to be bound to the contractor by the terms of the contract between the contractor and the State, and to assume toward him all obligations and responsibilities that the contractor, by those documents, assumes toward the State.

(2) The Subcontractor or supplier agrees to submit to the contractor applications for payment in such reasonable time as to enable the contractor to apply for payment under Section 8 of these General Conditions.

(3) The Subcontractor or supplier agrees to make all claims for extras, for extensions of time, and for damages for delays or otherwise, to the contractor in the manner provided in the General Conditions for like claims by the contractor upon the State, except that the time for making claims by the Subcontractor or supplier to the contractor for extra cost shall be five days.

(4) The Subcontractor or supplier agrees, upon completion of his work, to promptly pay all labor, material suppliers, vendors, Subcontractors and others, to permit simultaneous final payment by the contractor.

(5) The provisions required by §9.06A through D.

C. (1) Except as provided in (2) below, contractor shall not be relieved of any obligation to the State under the contract by any action, inaction, delay, default, breach, omission, or neglect, on the part of contractor's Subcontractors and suppliers at any tier or by any defect in their materials, whether the Subcontractors, suppliers, or materials were selected or specified by the State or by the contractor.

(2) If the contract or the Procurement Officer requires the contractor to furnish a certain product or material and no other, then and only then will the State be responsible for damages and delays caused by a design defect or other defect in the product; provided, however, that in such event the State shall be subrogated to all rights and claims of the contractor and his Subcontractors and suppliers at any tier against the seller, the manufacturer, the designer of the product, and any other entity which may be liable for the defect.

D. The contractor also agrees:

(1) To pay the Subcontractor or supplier promptly upon the payment of certificates, if issued under the schedule of values described in Section 8 of these General Conditions, the amount allowed to the contractor on account of the Subcontractor's or supplier's work to the extent of the Subcontractor's or supplier's interest therein.

(2) To pay the Subcontractor or supplier, upon the payment by the State, so that at all times the Subcontractor's or supplier's total payments shall be as large in proportion to the value of the work done by him as the total amount certified to the contractor is to the value of the work done by him.

(3) To pay the Subcontractor or supplier promptly to such extent as may be provided by the contract documents or the contract between the contractor and the Subcontractor or supplier, if either of these provides for earlier or larger payments than the above.

(4) To pay the Subcontractor or supplier on demand for his work or materials as far as executed and fixed in place, less the retained percentage, at the time payment is due from the State, whether or not payment is made wholly or in part by the State, unless the State's failure to issue payment wholly or in part is due to the fault or unsatisfactory work or materials of the Subcontractor or supplier.

(5) To pay the Subcontractor or supplier an equitable share of any insurance money received by the contractor on account of damage to the work.

(6) To make no demand for liquidated damages or penalty for delay in any sum in excess of such amount as may be specifically named in the contract between the contractor and the Subcontractor or supplier.

(7) To give the Subcontractor or supplier an opportunity to be present and to submit evidence in any matter involving his rights.

(8) To fulfill contractor's obligations under §§9-201 et seq., and 9-301 et seq. of the Real Property Article of the Annotated Code of Maryland.

E. Every Subcontractor, supplier, or other entity at any tier furnishing any work, labor, services, materials or supplies to or for use in the project, by virtue of furnishing same shall be bound to and does accept and agree to all terms and provisions of the contract between contractor and the State.

F. The State will not be liable to the contractor for any loss or additional cost suffered as a result of the inability of any Subcontractor or supplier at any tier to continue work on the contract as a result of debarment of the Subcontractor or supplier under Title 16 or Title 17, Subtitle 2 of the SF & P, or regulations adopted thereunder.

G. Contractor may not withhold from any Subcontractor or supplier, wholly or in part, any payment otherwise due and owing to the Subcontractor or supplier for labor or material furnished for this contract, on account of:

(1) any claim of the contractor against the Subcontractor or supplier or

(2) any debt owed or claimed to be owed by the Subcontractor or supplier to the contractor to the extent the claim or debt arose out of contracts, disputes, or other transactions between the contractor and the Subcontractor or supplier which did not arise out of this contract between the State and the contractor.

H. When the State withholds money from the contractor under Section 8.06 for delays or other causes, the Contractor may withhold payment from a Subcontractor or supplier, on account of the amount withheld by the State from the contractor, only to the extent that the Subcontractor or supplier contributed to the delay or other cause for which the State withheld payment from the contractor. For example, of the State withholds from the contractor liquidated damages for delay, the contractor may withhold payment only from those Subcontractors and suppliers who caused or contributed to the delays; all other Subcontractors and suppliers shall be paid promptly by the contractor notwithstanding the State's withholding from the contractor.

I. This contract is subject to the provisions of **COMAR 21.07.02.05-3**, Retainage.

9.05 PREVAILING WAGE RATES:

A. All contracts in the amount of $500,000 or more shall be subject to the provisions of §§17-201, et seq., of SF & P and **COMAR 21.11.11**, respecting prevailing wages. Where an original contract is in an amount less than $500,000, this section shall not apply, even where subsequent change orders increase the total contract to be in excess of $500,000. Wage rates applicable to projects of $500,000 or more are attached to the specifications. Federal wage rates shall be in effect where applicable.

B. When prevailing wage rates apply, the contractor shall submit a copy of his payroll records and the payroll records of each of his Subcontractors to the Department of Labor, Licensing and Regulation, Division of Labor and Industry, 1100 North Eutaw Street, Baltimore, Maryland 21202, where they will be available for inspection during regular business hours. In addition, the contractor shall submit a copy of his payroll records and the payroll records of each of his Subcontractors to the DPSCS Program Manager or Building Construction Engineer for the contract. These payroll records must be submitted within two weeks after each payroll period, and shall contain the following employee information: name, address and social security number, work classifications, hours straight time and overtime worked each day, total hours worked, rate of pay and gross amount earned. The contractor shall be responsible for the submission of all Subcontractors' payroll records covering work performed directly at the work site. Each copy of the payroll records shall be accompanied by a statement signed by the contractor or the Subcontractor indicating that the payroll records are correct, that the wage rates contained therein are not less than those established by the Commissioner as set forth in the contract, that the classification set forth for each workman or apprentice conforms with the work he performed and that the contractor or the Subcontractor has complied with the provisions of this section. In the event of any conflict between this Section and Title 17, Subtitle 2 of the State Finance and Procurement Article of the Annotated Code of Maryland, or regulations adopted there under, the provisions of Title 17, Subtitle 2 of the regulations will prevail.

9.06 CONSTRUCTION SAFETY AND HEALTH STANDARDS:

A. The contractor shall provide and maintain work environments and procedures which will:

(1) Safeguard the public, workers on the site, and State personnel, property, materials, supplies, and equipment exposed to contractor operations and activities;

(2) Avoid interruptions of State operations and delays in project completion dates; and

(3) Control costs in the performance of this contract.

B. For these purposes, the contractor shall:

(1) Provide appropriate safety barricades, signs, and signal lights;

(2) Comply with the provisions of the Maryland Occupational Safety and Health Act;

(3) Comply with the standards issued by the Secretary of Labor at 29 CFR Part 1926 and 29 CFR Part 1910; and

(4) Comply with all requirements of the contract and any additional safety measures the Procurement Officer determines to be reasonably necessary.

C. Whenever the Procurement Officer becomes aware of any noncompliance with these requirements or any condition which poses a serious or imminent danger to the health or safety of the public, workers on the site, or State personnel, the Procurement Officer shall notify the contractor orally, with written confirmation, and demand immediate initiation of corrective action. This notice, when delivered to the contractor or the contractor's representatives at the work site, shall be deemed sufficient notice of the noncompliance and that corrective action is required. After receiving the notice, the contractor shall immediately take corrective action. If the contractor fails or refuses to promptly take corrective action, the Procurement Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. The contractor shall not be entitled to any equitable adjustment of the contract price or extension of the performance schedule on any stop work order issued under this clause.

D. Contractor shall include in all subcontracts a provision imposing on all Subcontractors the same obligations to the contractor as the contractor has to the State under subsections A through D of this Section 9.06.

E. (1) This subsection E applies to all contracts in the amount of $500,000 or greater and to all other contracts determined by the Procurement Officer to pose higher than normal safety or health risks.

(2) Before commencing the work, the contractor shall:

(a) Submit to the Procurement Officer a written Employer Safety and Health Program for implementing this clause, following the MOSH "Suggested Employee Safety and Health Program" format and including an analysis of the significant hazards to life, limb, and property inherent in contract work performance and a plan for controlling these hazards; and

(b) Meet with the Procurement Officer to discuss and develop a mutual understanding of the overall safety and health program for the project.

9.07 PROMPT PAYMENT OF SUBCONTRACTORS(COMAR 21.07.02.05-2):

A. This contract and all subcontracts issued under this contract are subject to the provisions of State Finance and Procurement Article, §15-226, Annotated Code of Maryland, and **COMAR 21.10.08**. In §§A—D, the terms "undisputed amount", "prime contractor", "contractor", and "Subcontractor" have the meanings stated in **COMAR 21.10.08.01**.

B. A contractor shall promptly pay its Subcontractors an undisputed amount to which a Subcontractor is entitled for work performed under this contract within 10 days after the contractor receives a progress payment or final payment for work under this contract.

C. If a contractor fails to make payment within the period prescribed in §B, a Subcontractor may request a remedy in accordance with **COMAR 21.10.08**.

D. A contractor shall include in its subcontracts for work under this contract, wording that incorporates the provisions, duties, and obligations of §§A—D, State Finance and Procurement Article, §15-226, Annotated Code of Maryland, and **COMAR 21.10.08.**

10.00 MINORITY BUSINESS ENTERPRISE UTILIZATION (MBE)

This contract includes a Minority Business Enterprise ("MBE") participation goal for subcontracting, and/or procurement of materials, and/or services. Bidder/offerors must make a good faith effort to meet the MBE participation goal before bids or proposals are due.

10.01 ESTABLISHMENT OF GOAL AND SUBGOALS:

An overall MBE subcontractor participation goal of **30%** of the total contract dollar amount has been established for this procurement.

In addition, the following subgoals have been established for this procurement:

- **7%** for African-American MBEs,
- **4%** for Asian-American MBEs,

Notwithstanding any subgoals established above, the Contractor is encouraged to use a diverse group of subcontractors and suppliers from any/all of the various MBE classifications to meet the remainder of the overall MBE participation goal.

10.02 MBE Forms– The following Minority Business Enterprise participation instructions, and forms are provided to assist Bidders/Offerors:

DPSCS OS 01A MBE	MBE Utilization and Fair Solicitation Affidavit and Participation Schedule
DPSCS OS 01B MBE	MBE Participation Waiver Guidance
DPSCS OS 01C MBE	Good Faith Efforts Documentation to Support Waiver Request
DPSCS OS 03A MBE	MBE Subcontractor Project Participation Certification
DPSCS OS 03B MBE	MBE Prime Project Participation Certification
DPSCS OS 04 MBE	Outreach Efforts Compliance Statement
DPSCS OS 06A MBE	Prime Contractor Paid/Unpaid MBE Invoice Report
DPSCS OS 06B MBE	MBE Prime Contractor Report for Self Performance
DPSCS OS 06C MBE	Prime Contractor Paid Unpaid MBE VSBE Invoice Report for Multiple MBEs/VSBEs
DPSCS OS 07 MBE	VSBE Subcontractor Monthly Invoice Report
DPSCS OS 08 MBE	MBE Subcontractor/Contractor Unpaid MBE Invoice Report
DPSCS OS 11A MBE	VSBE Utilization Fair Solicitation Affidavit Participation Schedule with Instructions
DPSCS OS 11B MBE	VSBE Waiver Guidance
DPSCS OS 11C MBE	VSBE Good Faith Effort Documentation to Support Waiver Request

DPSCS OS 13A MBE VSBE Subcontractor Participation Certification
DPSCS OS 14 MBE VSBE Outreach Efforts Compliance Statement

10.03 CONTRACTOR'S BID RESPONSIBILITIES

A Bidder/Offeror shall include with its Bid/Proposal a completed MBE Utilization and Fair Solicitation Affidavit (form DPSCS OS 01A MBE) whereby:

(a) The Bidder/Offeror acknowledges the certified MBE participation goal and commits to make a good faith effort to achieve the goal and any applicable subgoals, or requests a waiver, and affirms that MBE subcontractors were treated fairly in the solicitation process; and

(b) The Bidder/Offeror responds to the expected degree of MBE participation, as stated in the solicitation, by identifying the specific commitment of certified MBEs at the time of Bid/Proposal submission. The Bidder/Offeror shall specify the percentage of total contract value associated with each MBE subcontractor identified on the MBE participation schedule, including any work performed by the MBE prime (including a prime participating as a joint venture) to be counted towards meeting the MBE participation goals.

A Bidder/Offeror requesting a waiver should review Form DPSCS OS 01B MBE (Waiver Guidance) and DPSCS OS 01C MBE (Good Faith Efforts Documentation to Support Waiver Request) prior to submitting its request.

If a Bidder/Offeror fails to submit a completed* DPSCS OS 01A MBE *or* DPSCS OS 01B MBE and DPSCS OS 01C MBE *forms with the Bid/Proposal as required, the Procurement Officer shall determine that the Bid is non-responsive or the Proposal is not reasonably susceptible of being selected for award.

Bidders/Offerors are responsible for verifying that each of the MBE(s) (including any MBE primes and/or MBE primes participating in a joint venture), selected to meet the goal and any subgoals and subsequently identified in form DPSCS OS 01A MBE is appropriately certified and has the correct NAICS codes allowing it to perform the committed work.

Within ten (10) Working Days from notification that it is the recommended awardee or from the date of the actual award, whichever is earlier, the Bidder/Offeror must provide the following documentation to the Procurement Officer**.**

(a) Outreach Efforts Compliance Statement (**form DPSCS OS 04 MBE**).
(b) MBE Prime/Subcontractor Project Participation Certification (**form DPSCS OS 03B MBE**) and MBE Subcontractor Participation Certification (**form DPSCS OS 03A MBE**).(c) If the recommended awardee believes a waiver (in whole or in part) of the overall MBE goal or of any applicable subgoal is necessary, the recommended awardee must submit a fully-documented waiver request that complies with **COMAR 21.11.03.11.**
(d) Any other documentation required by the Procurement Officer to ascertain Bidder/Offeror responsibility in connection with the certified MBE subcontractor participation goal or any applicable subgoals.

If the recommended awardee fails to return each completed document within the required time, the Procurement Officer may determine that the recommended awardee is not responsible and, therefore, not eligible for Contract award. If the Contract has already been awarded, the award is voidable.

A current directory of certified MBEs is available through the Maryland State Department of Transportation (MDOT), Office of Minority Business Enterprise, 7201 Corporate Center Drive, Hanover, Maryland 21076. The phone numbers are (410) 865-1269, 1-800-544-6056, or TTY (410) 865-1342. The directory is also available on the MDOT website at:

http://mbe.mdot.state.md.us/directory/. The most current and up-to-date information on MBEs is available via this website. **Only MDOT-certified MBEs may be used to meet the MBE subcontracting goals.**The Contractor, once awarded a Contract, will be responsible for submitting or requiring its subcontractor(s) to submit the following forms to provide the State with ongoing monitoring of MBE Participation:

(a) **Form DPSCS OS 06A MBE** (Prime Contractor Paid/Unpaid MBE Invoice Report).

(b) **Form DPSCS OS 06B MBE** (MBE Prime Contractor Report for Self Performance).

(c) **Form DPSCS OS 06C MBE** (Prime Contractor Paid/Unpaid MBE/VSBE Invoice Report for Multiple MBEs/VSBEs).

(d) **Form DPSCS OS 08 MBE** (MBE Subcontractor/Contractor Unpaid MBE Invoice Report).

A Bidder/Offeror that requested a waiver of the goal or any of the applicable subgoals will be responsible for submitting the Good Faith Efforts Documentation to Support Waiver Request (form DPSCS OS 01C MBE) and all documentation within ten (10) Working Days from notification that it is the recommended awardee or from the date of the actual award, whichever is earlier, as required in **COMAR 21.11.03.11.**

All documents, including the MBE Utilization and Fair Solicitation Affidavit & MBE Participation Schedule (Form DPSCS OS 01A MBE**)**, completed and submitted by the Bidder/Offeror in connection with its certified MBE participation commitment shall be considered a part of the resulting Contract and are hereby expressly incorporated into the Contract by reference thereto. All of the referenced documents will be considered a part of the Bid/Proposal.

The Bidder/Offeror is advised that liquidated damages will apply in the event the Contractor fails to comply in good faith with the requirements of the MBE program and pertinent Contract provisions.

As set forth in **COMAR 21.11.03.12-1(D)** when a certified MBE firm participates on a contract as a prime contractor (including a joint-venture where the MBE firm is a partner), a procurement agency may count the distinct, clearly defined portion of the work of the contract that the certified MBE firm performs with its own work force towards fulfilling up to fifty-percent (50%) of the MBE participation goal (overall) and up to one hundred percent (100%) of not more than one of the MBE participation sub-goals, if any, established for the contract.

In order to receive credit for self-performance, an MBE prime must list its firm in Section 4A of the MBE Participation Schedule (Form DPSCS OS 01A MBE) and include information regarding the work it will self-perform. For the remaining portion of the overall goal and the sub-goals, the MBE prime must also identify other certified MBE subcontractors (see Section 4B of the MBE Participation Schedule (Form DPSCS OS 01A MBE)) used to meet those goals. If dually-certified, the MBE prime can be designated as only one of the MBE classifications but can self-perform up to 100% of the stated sub-goal.

As set forth in **COMAR 21.11.03.12-1**, once the Contract work begins, the work performed by a certified MBE firm, including an MBE prime, can only be counted towards the MBE participation goal(s) if the MBE firm is performing a commercially useful function on the Contract.

If at any time after submission of a bid or proposal and before execution of a contract, the apparent successful bidder/offeror determines that a certified MBE listed on the Certified MBE Utilization and Fair Solicitation Affidavit (Form DPSCS OS 01A MBE), has become or will become unavailable, the apparent successful bidder/offeror shall immediately notify the Procurement Officer and the MBE Director. Any desired change in the MBE participation must be approved in advance by the Procurement Officer after consultation with the MBE Director. The request for a change to the MBE participation schedule shall indicate the contractor's efforts to substitute another certified MBE subcontractor to perform the work. Desired changes occurring after the

date of contract execution may occur only upon written approval by the agency head and subsequently by contract amendment (**COMAR 21.11.03.12**).

10.04 MBE COMPLIANCE MEETING:

A mandatory MBE Compliance Meeting will be conducted to review the responsibilities of the Department, the general contractor and the MBE's personnel relative to MBE compliance and documentation. If at all possible, the meeting will be held in conjunction with the pre-work meeting, or not more than three (3) weeks after starting work on the contract.

The Contract Monitor will schedule the meeting with concurrence from the MBE Office. The Contract Monitor will notify the following of the date, time and location. At least one (1) week advanced notice will be required.

(a) Department Representation.

(1) Director, MBE Office or Designee
(2) Procurement Officer or Designee
(3) Contract Monitor

(b) Contract Representatives.

(1) Superintendent - Prime Contractor
(2) MBE Officer - Prime Contractor
(3) Owner/Superintendent/Foreman representing each MBE firm listed on the DPSCS OS MBE 01A form at the time of bid.

The Contract Monitor and DPSCS MBE Representative will jointly conduct the meeting. The general contractor is to ensure the attendance of the MBE Representatives and relay to them that the meeting is mandatory and failure to appear is considered non-compliance with the contract requirements.

10.05 RECORDS AND REPORTS:

If awarded the contract, the general contractor shall submit an MBE Monthly Payment Report showing each MBE firm that was listed on the MBE Participation Packet (DPSCS OS 01A MBE) at the time of bid.

All records concerning MBE participation must be retained by the general contractor and all subcontractors and shall be available for inspection by the Department for a period of three (3) years after final payment has been received by the general contractor.

With respect to Contract administration, the Contractor shall:

(a) Submit by the 10th of each month to the Department's designated representative:
i. A Prime Contractor Paid/Unpaid MBE Invoice Report (Form DPSCS OS 06A MBE or DPSCS OS 06C MBE) listing any unpaid invoices, over 45 days old, received from any certified MBE subcontractor, the amount of each invoice and the reason payment has not been made; and

ii. (If Applicable) MBE Prime Contractor Report for Self Performance (Form DPSCS OS 06B MBE) identifying an MBE prime's self-performing work to be counted towards the MBE participation goals.

(b) Include in its agreements with its certified MBE subcontractors a requirement that those subcontractors submit by the 10th of each month to the Department's designated representative an MBE Subcontractor Paid/Unpaid Invoice Report (Form DPSCS OS 08 MBE) that identifies the Contract and lists all payments to the MBE subcontractor received from the Contractor in the preceding 30 days, as well as any outstanding invoices, and the amounts of those invoices.

(c) Maintain such records as are necessary to confirm compliance with its MBE participation obligations. These records must indicate the identity of certified minority and non-minority

subcontractors employed on the Contract, the type of work performed by each, and the actual dollar value of work performed. Subcontract agreements documenting the work performed by all MBE participants must be retained by the Contractor and furnished to the Procurement Officer on request.

(d) Consent to provide such documentation as reasonably requested and to provide right-of-entry at reasonable times for purposes of the State's representatives verifying compliance with the MBE participation obligations. Contractor must retain all records concerning MBE participation and make them available for State inspection for three years after final completion of the Contract.

(e) Upon completion of the Contract and before final payment and/or release of retainage, submit a final report in affidavit form and under penalty of perjury, of all payments made to, or withheld from MBE subcontractors.

10.06 DPSCS MBE Liquidated Damages Contract Provisions:

(a) This contract requires the contractor to make good faith efforts to comply with the Minority Business Enterprise ("MBE") Program and contract provisions.

(b) The State and the Contractor acknowledge and agree that the State will incur damages, including but not limited to loss of goodwill, detrimental impact on economic development, and diversion of internal staff resources, if the Contractor does not make good faith efforts to comply with the requirements of the MBE Program and MBE contract provisions.

(c) The parties further acknowledge and agree that the damages the State might reasonably be anticipated to accrue as a result of such lack of compliance are difficult to ascertain with precision.

(d) Therefore, upon a determination by the State that the Contractor failed to make good faith efforts to comply with one (1) or more of the specified MBE Program requirements or contract provisions, the Contractor agrees to pay liquidated damages to the State at the rates set forth below. The Contractor expressly agrees that the State may withhold payment on any invoices as a set-off against liquidated damages owed. The Contractor further agrees that for each specified violation, the agreed upon liquidated damages are reasonably proximate to the loss the State is anticipated to incur as a result of such violation.

i. Failure to submit each monthly payment report in full compliance with COMAR 21.11.03.13B (3): **$ 33.30** per day until the monthly report is submitted as required.

ii. Failure to include in its agreements with MBE subcontractors a provision requiring submission of payment reports in full compliance with COMAR 21.11.03.13B (4): **$ 116.54** per MBE subcontractor.

iii. Failure to comply with COMAR 21.11.03.12 in terminating, canceling, or changing the scope of work/value of a contract with an MBE subcontractor and/or amendment of the MBE participation schedule: the difference between the dollar value of the MBE participation commitment on the MBE participation schedule for that specific MBE firm and the dollar value of the work performed by that MBE firm for the contract.

iv. Failure to meet the Contractor's total MBE participation goal and subgoal commitments: the difference between the dollar value of the total MBE participation commitment on the MBE participation schedule and the MBE participation actually achieved.

v. Failure to promptly pay all undisputed amounts to an MBE subcontractor in full compliance with the prompt payment provisions of this contract: **$ 124.86** per day until the undisputed amount due to the MBE subcontractor is paid.

Notwithstanding the use of liquidated damages, the State reserves the right to terminate the contract and exercise all other rights and remedies provided in the contract or by law.

10.07 ENFORCEMENT:

The Department is responsible for ensuring compliance with the terms of the MBE Program. All of the above referenced MBE documents will be made a part of the contract file and will be subject to compliance reviews, formal and informal, by the Department. The Department has the authority to conduct informal on-site project compliance reviews at any time without prior notification.

When conducting a formal compliance review, either at the general contractor or MBE's office, the Department will provide written notification to the general contractor and/or MBE of a pending compliance review at least ten (10) calendar days prior to the formal compliance review. This notification will inform the general contractor and/or MBE of the date, time and location of the review. The general contractor and/or MBE will have the following available for inspection:

(1) Copies of purchase orders, invoices and subcontracts between the general contractor and MBE containing Equal Opportunity clauses;

(2) Records to indicate the number, names, dollar value of the MBE subcontracts, and the scheduled times for each certified MBE to be on the job site;

(3) Any other appropriate documents required to determine compliance.

If the Department determines that the general contractor or MBE is not in compliance with this section:

(1) Except as provided in (2) below, the Department will notify the general contractor of measures which must be taken to restore the general contractor and/or MBE to a state of compliance and the time within which these measures must be taken. If the general contractor or MBE fails to take corrective action, within the time required, the Department's representative will make a final report of noncompliance to the general contractor and direct the imposition of one (1) or more of the sanctions listed below, where appropriate:

(a) Suspension of work on the project, pending correction;

(b) Withholding payment or a percentage thereof, pending correction;

(c) Initiation of suspension in accordance with COMAR regulations;

(d) Referral to the Office of the Attorney General for review/initiation of debarment or for review and possible referral for criminal prosecution;

(e) Referral to the Governor's Office of Minority Affairs Fraud Hotline;

(f) Termination of the contract;

(g) Any other action as appropriate, within the discretion of the Secretary.

(2) When circumstances warrant such action, in the judgment of the Department, it may take action to enforce the contractual obligations regarding MBE participation without notice to the general contractor and without giving the general contractor any opportunity to cure.

If the documentary material submitted by the general contractor and/or MBE to determine compliance status contains false, misleading information or other misrepresentations, the matter will be referred to the Office of the Attorney General for appropriate legal action and to the Governor's Office of Minority Affairs for investigation of potential fraud. The Department may request any and all other documents and information and may take any and all other actions permitted or required by Title 14, Subtitle 3 of the State Finance and Procurement Article and by **COMAR 21.11.03** to enforce and ensure compliance with the law and the contract.

10.08 MBE MODIFICATIONS:

During the life of the contract, all plans to modify the approved MBE Participation Packet will require the approval of the Procurement Officer, with concurrence from the MBE Director and written approval of agency head. This will include any decreases to items of work to be sublet or materials and services to be obtained which differs from those in the original MBE Participation Packet (DPSCS OS 01A MBE). All requests for revisions shall be directed to the appropriate Procurement Officer, with a copy to the MBE Director, for disposition.

Once the MBE office approves a contractor's request for modification, the MBE modification forms (DPSCS OS 02 MBE) should be forwarded to the procurement officer so that he or she can draft a formal contract modification that references the MBE forms and includes them as attachments. The procurement officer will follow the same process as any other contract modification to obtain AG review and the Secretary's approval (including the MBE Modification memo), and in some instances, BPW approval could be required as well. The procurement officer will then forward the final modification back to the MBE office for record and file and submission to GOMA.

In addition, when directed by the Department, the general contractor shall terminate, without liability to the Department, its contract with a firm, which for any reason, or no longer eligible to do business in the State. The general contractor is required to submit promptly a plan to the MBE office for maintaining the required participation on the project or appropriate request for revision of all or part of the contract goal with appropriate documentation to support good faith efforts as stated above.

10.09 CONTRACTOR ASSISTANCE:

Contractors requiring assistance in obtaining MBE Program information should contact the Governor's Office of Minority Affairs (GOMA), 6 St. Paul Street, Suite 1502, Baltimore, Maryland 21202 or phone (410) 767-8232, Toll Free: (877) 558-0998. GOMA's website address is http://www.mdminoritybusiness.com/index.html.

Contractors requiring assistance in locating certified MBEs are encouraged to search the MBE Directory on the Maryland Department of Transportation's (MDOT) website. Contractors can contact the MDOT, Minority Business Enterprise Office at 7201 Corporate Center Drive, P.O. Box 548, Hanover, MD 21076, or phone In State (410) 865-1142 or toll free 1-888-713-1414. MDOT's website is http://www.mdot.state.md.us/.

Contractors requiring assistance in completing the Department's MBE Forms should contact the MBE Office. The contact information is 6776 Reisterstown Road, Suite 208, Baltimore, Maryland 21215, phone (410) 585-3743or by email at mbe@dpscs.state.md.us.

11.0 VETERAN-OWNED SMALL BUSINESS ENTERPRISE UTILIZATION (VSBE)

Contractor shall exercise all good faith efforts structured in an attempt to attain **Veteran-Owned Small Business Enterprise** (VSBE) participation.

A VSBE subcontract participation goal of 1% has been established for this procurement. However if the bidder/offeror is successful in obtaining VSBE participation a completed Veteran-Owned Small Business Enterprise (VSBE) Utilization Fair Solicitation Affidavit and Participation Schedule (**DPSCS OS 11A MBE**) shall be included with the bid/proposal:

(1) the bidder or offeror responds to the expected degree of VSBE participation as stated in the solicitation, by identifying the specific commitment of VSBEs at the time of submission. The bidder or offeror shall specify the percentage of contract value associated with each VSBE subcontractor identified on the VSBE Participation Schedule (form **DPSCS OS 11A MBE**).

(2) A Bidder/Offeror requesting a waiver should review Form DPSCS OS 11B MBE (Waiver Guidance) and DPSCS OS 11C MBE (Good Faith Efforts Documentation to Support Waiver Request) prior to submitting its request.

(3) ***If a Bidder/Offeror fails to submit a completed DPSCS OS 11A MBE or DPSCS OS 11B MBE and DPSCS OS 11C MBE forms with the Bid/Proposal as required, the Procurement Officer shall determine that the Bid is non-responsive or the Proposal is not reasonably susceptible of being selected for award***

Within 10 working days from notification that it is the apparent awardee, the awardee must provide the following additional documentation to the Procurement Officer (if applicable):

(1) VSBE Subcontractor Project Participation Statement (DPSCS OS 13A MBE)
(2) VSBE Outreach Efforts Compliance Statement (DPSCS OS 14 MBE)
(3) Any other documentation required by the Procurement Officer to ascertain bidder or offeror responsibility in connection with the VSBE participation.

Contractor shall:

(1) Submit monthly to the Department a report listing any unpaid invoices, over 45 days old, received from any VSBE subcontractor, the amount of each invoice and the reason payment has not been made using form DPSCS OS 06C (Prime Contractor Paid/Unpaid MBE/VSBE Invoice Report for Multiple MBEs/VSBEs).
(2) Include in its agreements with its VSBE subcontractors a requirement that those subcontractors submit monthly to the Department a report that identifies the prime contract and lists all payments received from Contractor in the preceding 30 days, as well as any outstanding invoices over 45 days, and the amount of those invoices, using form DPSCS OS 07 MBE VSBE Subcontractor Monthly Invoice Report.
(3) Maintain such records as are necessary to confirm compliance with its VSBE participation obligations. These records must indicate the identity of VSBE and non-VSBE subcontractors employed on the contract, the type of work performed by each, and the actual dollar value of work performed. Subcontract agreements documenting the work performed by all VSBE participants must be retained by the Contractor and furnished to the Procurement Officer on request.
(4) Consent to provide such documentation as reasonably requested and to provide right-of-entry at reasonable times for purposes of the State's representatives verifying compliance with the VSBE participation obligations. Contractor must retain all records concerning VSBE participation and make them available for State inspection for three years after final completion of the contract.
(5) At the option of the procurement agency, upon completion of the contract and before final payment and/or release of retainage, submit a final report in affidavit form and under penalty of perjury, of all payments made to, or withheld from VSBE subcontractors.

DEPARTMENT OF PUBLIC SAFETY & CORRECTIONAL SERVICES
MBE UTILIZATION AND FAIR SOLICITATION AFFIDAVIT
& MBE PARTICIPATION SCHEDULE

INSTRUCTIONS
PLEASE READ BEFORE COMPLETING THIS DOCUMENT

This form includes Instructions and the MBE Utilization and Fair Solicitation Affidavit & MBE Participation Schedule which must be submitted with the bid/proposal. If the bidder/offeror fails to accurately complete and submit this Affidavit and Schedule with the bid or proposal as required, the Procurement Officer shall deem the bid non-responsive or shall determine that the proposal is not reasonably susceptible of being selected for award.

1. Contractor shall structure its procedures for the performance of the work required in this Contract to attempt to achieve the minority business enterprise (MBE) subcontractor participation goal stated in the Invitation for Bids or Request for Proposals. Contractor agrees to exercise good faith efforts to carry out the requirements set forth in these Instructions, as authorized by the Code of Maryland Regulations (COMAR) 21.11.03.

2. MBE Goals and Subgoals: Please review the solicitation for information regarding the Contract's MBE overall participation goals and subgoals. After satisfying the requirements for any established subgoals, the Contractor is encouraged to use a diverse group of subcontractors and suppliers from any/all of the various MBE classifications to meet the remainder of the overall MBE participation goal.

3. MBE means a minority business enterprise that is certified by the Maryland Department of Transportation ("MDOT"). Only entities certified by MDOT may be counted for purposes of achieving the MBE participation goals. In order to be counted for purposes of achieving the MBE participation goals, the MBE firm, including a MBE prime, must be MDOT-certified for the services, materials or supplies that it is committed to perform on the MBE Participation Schedule.

4. Please refer to the MDOT MBE Directory at www.mdot.state.md.us to determine if a firm is certified with the appropriate North American Industry Classification System ("NAICS") Code **and** the product/services description (specific product that a firm is certified to provide or specific areas of work that a firm is certified to perform). For more general information about NAICS, please visit www.naics.com. Only those specific products and/or services for which a firm is certified in the MDOT Directory can be used for purposes of achieving the MBE participation goals. **NOTICE:** If the firm's NAICS Code is in **graduated status**, such services/products **may not be counted** for purposes of achieving the MBE participation goals. A NAICS Code is in the graduated status if the term "Graduated" follows the Code in the MDOT MBE Directory.

5. **NOTE: New Guidelines Regarding MBE Prime Self-Performance.** Please note that when a certified MBE firm participates as a prime contractor on a contract, a procurement agency may count the distinct, clearly defined portion of the work of the contract that the certified MBE firm performs with its own forces toward fulfilling up to fifty-percent (50%) of the MBE participation goal (overall) and up to one hundred percent (100%) of not more than one of the MBE participation subgoals, if any, established for the contract. In order to receive credit for self-performance, an MBE prime must list its firm in Section 4A of the MBE Participation Schedule, including the certification category under which the MBE prime is self-performing and include information regarding the work it will self-perform. For the remaining portion of the overall goal and the subgoals, the MBE prime must also identify other certified MBE subcontractors (see Section 4B of the MBE Participation Schedule) used to meet those goals or request a waiver.

For example, for a construction contract that has a 27% MBE overall participation goal and subgoals of 7% for African American firms and 4% for Asian American firms, subject to Section 4 above and this Section 5, a certified African American MBE prime can self-perform (a) up to 13.5 % of the overall goal and (b) up to 7% of the African American subgoal. The remainder of the overall goal and subgoals would have to be met with other certified MBE firms or a waiver request.

For example, a services contract with a 30% percent MBE participation goal (overall) and subgoals of 7% for African-American firms, 4% for Asian American firms and 12% for women-owned firms, subject to Sections 4 above and this Section 5, a dually-certified Asian American/Woman MBE prime can self-perform (a) up to 15% of the overall goal and (b) up to four percent (4%) of the Asian American subgoal OR up to twelve percent (12%) of the women subgoal. Because it is dually-certified, the company can be designated as only ONE of the MBE classifications (Asian American or women) but can self-perform up to one hundred percent (100%) of the stated subgoal for the single classification it selects.

6. Subject to the restrictions stated in Section 5 above, when a certified MBE that performs as a participant in a joint venture, a procurement agency may count a portion of the total dollar value of the contract equal to the distinct, clearly-defined portion of the work of the contract that the certified MBE performs with its own forces toward fulfilling the contract goal, and not more than one of the contract subgoals, if any.

   For example, if a MBE firm is a joint venture partner and the State determines that it is performing with its own forces 35 percent of the work in the contract, it can use this portion of the work towards fulfilling up to fifty percent (50%) of the overall goal and up to one hundred percent (100%) of one of the stated subgoals, if applicable.

7. As set forth in COMAR 21.11.03.12-1, once the Contract work begins, the work performed by a certified MBE firm, including an MBE prime, can only be counted towards the MBE participation goal(s) if the MBE firm is performing a commercially useful function on the Contract. Please refer to COMAR 21.11.03.12-1 for more information regarding these requirements.

8. If you have any questions as to whether a firm is certified to perform the specific services or provide specific products, please contact MDOT's Office of Minority Business Enterprise at 1-800-544-6056 or via email to mbe@mdot.state.md.us sufficiently prior to the submission due date.

9. Worksheet: The percentage of MBE participation, calculated using the percentage amounts for all of the MBE firms listed on the Participation Schedule **MUST** at least equal the MBE participation goal **and** subgoals (if applicable) set forth in the solicitation. If a bidder/offeror is unable to achieve the MBE participation goal and/or any subgoals (if applicable), the bidder/offeror must request a waiver in Item 1 of the MBE Utilization and Fair Solicitation Affidavit (Attachment D-1A) or the bid will be deemed not responsive, or the proposal determined to be not susceptible of being selected for award. You may wish to use the Subgoal summary below to assist in calculating the percentages and confirm that you have met the applicable MBE participation goal and subgoals, if any.

Subgoals (if applicable)

Total African American MBE Participation:	_____%
Total Asian American MBE Participation:	_____%
Total Hispanic American MBE Participation:	_____%
Total Women-Owned MBE Participation:	_____%

Overall Goal

Total MBE Participation (include all categories): _____%

MBE UTILIZATION AND FAIR SOLICITATION AFFIDAVIT & MBE PARTICIPATION SCHEDULE

This MBE Utilization and Fair Solicitation Affidavit & MBE Participation Schedule must be included with the bid/proposal. If the bidder/offeror fails to accurately complete and submit this Affidavit and Schedule with the bid or proposal as required, the Procurement Officer shall deem the bid non-responsive or shall determine that the proposal is not reasonably susceptible of being selected for award.

In connection with the bid/proposal submitted in response to Solicitation No. MDQ0031018235, I affirm the following:

1. MBE Participation (PLEASE CHECK ONLY ONE)

☐ I acknowledge and intend to meet the overall certified Minority Business Enterprise (MBE) participation goal of _____ percent and, if specified in the solicitation, the following subgoals (complete for only those subgoals that apply):

_____ percent for African American-owned MBE firms

_____ percent for Asian American-owned MBE firms

Therefore, I am not seeking a waiver pursuant to COMAR 21.11.03.11.

OR

☐ I conclude that I am unable to achieve the MBE participation goal and/or subgoals. I hereby request a waiver, in whole or in part, of the overall goal and/or subgoals. Within 10 Working days of receiving notice that our firm is the apparent awardee or as requested by the Procurement Officer, I will submit the completed Good Faith Efforts Documentation to Support Waiver Request (Attachment D-1C) and all required waiver documentation in accordance with COMAR 21.11.03.

2. Additional MBE Documentation

I understand that if I am notified that I am the apparent awardee or as requested by the Procurement Officer, I must submit the following documentation within 10 business days of receiving notice of the potential award or from the date of conditional award (per COMAR 21.11.03.10), whichever is earlier:

(a) Outreach Efforts Compliance Statement (Attachment D-2);

(b) MBE Subcontractor/MBE Prime Project Participation Statement (Attachments D-3A and 3B);

(c) Any other documentation, including waiver documentation if applicable, required by the Procurement Officer to ascertain bidder or offeror responsibility in connection with the certified MBE participation goal and subgoals, if any.

I understand that if I fail to return each completed document within the required time, the Procurement Officer may determine that I am not responsible and therefore not eligible for contract award. If the contract has already been awarded, the award is voidable.

3. Information Provided to MBE firms

In the solicitation of subcontract quotations or offers, MBE firms were provided not less than the same information and amount of time to respond as were non-MBE firms.

MBE PARTICIPATION SCHEDULE
CONTINUED ON NEXT PAGE

4. MBE Participation Schedule

Set forth below are the (i) certified MBEs I intend to use, (ii) the percentage of the total Contract amount allocated to each MBE for this project and, (iii) the items of work each MBE will provide under the Contract. I have confirmed with the MDOT database that the MBE firms identified will be performing work activities for which they are MDOT certified.

Prime Contractor	Project Description	Project/Contract Number
	Youth Detention Center at Baltimore City Detention Center (BCDC), Baltimore, Maryland	KT-000-150-C01

List information for each certified MBE firm you agree to use to achieve the MBE participation goal and Subgoals, if any. MBE primes: Please complete both sections A and B below.

SECTION A: For MBE Prime Contractors ONLY (including MBE Primes in a Joint Venture)

MBE Prime Firm Name:_____ MBE Certification Number: _____ (If dually certified, check only one box.) ☐ African American-Owned ☐ Hispanic American- Owned ☐ Asian American-Owned ☐ Women-Owned ☐ Other MBE Classification	Percentage of total Contract Value to be performed with own forces and counted towards the MBE overall participation goal (up to 50% of the overall goal): _____% Percentage of total Contract Value to be performed with own forces and counted towards the subgoal, if any, for my MBE classification (up to 100% of not more than one subgoal): _____% Description of the Work to be performed with MBE prime's own forces: _____ _____

SECTION B: For all Contractors (including MBE Primes and MBE Primes in a Joint Venture)

MBE Firm Name:_____ MBE Certification Number: _____ (If dually certified, check only one box.) ☐ African American-Owned ☐ Hispanic American- Owned ☐ Asian American-Owned ☐ Women-Owned ☐ Other MBE Classification	Percentage of Total Contract to be performed by this MBE: _____% Description of the Work to be Performed to include NAICS codes: _____ _____ _____ _____
MBE Firm Name:_____ MBE Certification Number: _____ (If dually certified, check only one box.) ☐ African American-Owned ☐ Hispanic American- Owned ☐ Asian American-Owned ☐ Women-Owned ☐ Other MBE Classification	Percentage of Total Contract to be performed by this MBE: _____% Description of the Work to be Performed to include NAICS codes: _____ _____ _____ _____
MBE Firm Name:_____ MBE Certification Number: _____ (If dually certified, check only one box.) ☐ African American-Owned ☐ Hispanic American- Owned ☐ Asian American-Owned ☐ Women-Owned	Percentage of Total Contract to be performed by this MBE: _____% Description of the Work to be Performed to include NAICS codes: _____ _____ _____

☐ Other MBE Classification	______________________________
MBE Firm Name:______________________________ MBE Certification Number: ______________________________ (If dually certified, check only one box.) ☐ African American-Owned ☐ Hispanic American- Owned ☐ Asian American-Owned ☐ Women-Owned ☐ Other MBE Classification	Percentage of Total Contract to be performed by this MBE: ________% Description of the Work to be Performed to include NAICS codes: ______________________________ ______________________________ ______________________________ ______________________________
MBE Firm Name:______________________________ MBE Certification Number: ______________________________ (If dually certified, check only one box.) ☐ African American-Owned ☐ Hispanic American- Owned ☐ Asian American-Owned ☐ Women-Owned ☐ Other MBE Classification	Percentage of Total Contract to be performed by this MBE: ________% Description of the Work to be Performed to include NAICS codes: ______________________________ ______________________________ ______________________________ ______________________________
MBE Firm Name:______________________________ MBE Certification Number: ______________________________ (If dually certified, check only one box.) ☐ African American-Owned ☐ Hispanic American- Owned ☐ Asian American-Owned ☐ Women-Owned ☐ Other MBE Classification	Percentage of Total Contract to be performed by this MBE: ________% Description of the Work to be Performed to include NAICS codes: ______________________________ ______________________________ ______________________________ ______________________________
MBE Firm Name:______________________________ MBE Certification Number: ______________________________ (If dually certified, check only one box.) ☐ African American-Owned ☐ Hispanic American- Owned ☐ Asian American-Owned ☐ Women-Owned ☐ Other MBE Classification	Percentage of Total Contract to be performed by this MBE: ________% Description of the Work to be Performed to include NAICS codes: ______________________________ ______________________________ ______________________________ ______________________________
MBE Firm Name:______________________________ MBE Certification Number: ______________________________ (If dually certified, check only one box.) ☐ African American-Owned ☐ Hispanic American- Owned ☐ Asian American-Owned ☐ Women-Owned ☐ Other MBE Classification	Percentage of Total Contract to be provided by this MBE: ________% Description of the Work to be Performed: ______________________________ ______________________________ ______________________________ ______________________________

You may wish to use the Subgoal summary below to assist in calculating the percentages and confirm that you have met the applicable MBE participation goal and subgoals, if any.

Subgoals (if applicable)

Total African American MBE Participation: ____________%
Total Asian American MBE Participation: ____________%
Total Hispanic American MBE Participation: ____________%
Total Women-Owned MBE Participation: ____________%

Overall Goal

Total MBE Participation (include all categories): ____________%

I solemnly affirm under the penalties of perjury that I have reviewed the instructions for the MBE Utilization & Fair Solicitation Affidavit and MBE Schedule and that the information included in the Schedule is true to the best of my knowledge, information and belief.

_____	_____
Bidder/Offeror Name *(PLEASE PRINT OR TYPE)*	Signature of Authorized Representative
_____	_____
Address	Printed Name and Title
_____	_____
City, State and Zip Code	Date

SUBMIT THIS
MBE UTILIZATION AND FAIR SOLICITATION AFFIDAVIT
& MBE PARTICIPATION SCHEDULE
WITH BID/PROPOSAL

DEPARTMENT OF PUBLIC SAFETY & CORRECTIONAL SERVICES
MBE WAIVER GUIDANCE

GUIDANCE FOR DOCUMENTING GOOD FAITH EFFORTS TO MEET MBE PARTICIPATION GOALS

In order to show that it has made good faith efforts to meet the Minority Business Enterprise (MBE) participation goal (including any MBE subgoals) on a contract, the bidder/offeror must either (1) meet the MBE Goal(s) and document its commitments for participation of MBE Firms, or (2) when it does not meet the MBE Goal(s), document its Good Faith Efforts to meet the goal(s).

I. Definitions

Good Faith Efforts – The "Good Faith Efforts" requirement means that when requesting a waiver, the bidder/offeror must demonstrate that it took all necessary and reasonable steps to achieve the MBE Goal(s), which, by their scope, intensity, and appropriateness to the objective, could reasonably be expected to obtain sufficient MBE participation, even if those steps were not fully successful. Whether a bidder/offeror that requests a waiver made adequate good faith efforts will be determined by considering the quality, quantity, and intensity of the different kinds of efforts that the bidder/offeror has made. The efforts employed by the bidder/offeror should be those that one could reasonably expect a bidder/offeror to take if the bidder/offeror were actively and aggressively trying to obtain MBE participation sufficient to meet the MBE contract goal and subgoals. Mere *pro forma* efforts are not good faith efforts to meet the MBE contract requirements. The determination concerning the sufficiency of the bidder's/offeror's good faith efforts is a judgment call; meeting quantitative formulas is not required.

Identified Firms – "Identified Firms" means a list of the MBEs identified by the procuring agency during the goal setting process and listed in the procurement as available to perform the Identified Items of Work. It also may include additional MBEs identified by the bidder/offeror as available to perform the Identified Items of Work, such as MBEs certified or granted an expansion of services after the procurement was issued. If the procurement does not include a list of Identified Firms, this term refers to all of the MBE Firms (if State-funded) the bidder/offeror identified as available to perform the Identified Items of Work and should include all appropriately certified firms that are reasonably identifiable.

Identified Items of Work – "Identified Items of Work" means the bid items identified by the procuring agency during the goal setting process and listed in the procurement as possible items of work for performance by MBE Firms. It also may include additional portions of items of work the bidder/offeror identified for performance by MBE Firms to increase the likelihood that the MBE Goal(s) will be achieved. If the procurement does not include a list of Identified Items of Work, this

term refers to all of the items of work the bidder/offeror identified as possible items of work for performance by MBE Firms and should include all reasonably identifiable work opportunities.

MBE Firms – "MBE Firms" refers to a firm certified by the Maryland Department of Transportation ("MDOT") under COMAR 21.11.03. Only MDOT-certified MBE Firms can participate in the State's MBE Program.

MBE Goal(s) – "MBE Goal(s)" refers to the MBE participation goal and MBE participation subgoal(s).

II. Types of Actions Agency will Consider

The bidder/offeror is responsible for making relevant portions of the work available to MBE subcontractors and suppliers and to select those portions of the work or material needs consistent with the available MBE subcontractors and suppliers, so as to facilitate MBE participation. The following is a list of types of actions the procuring agency will consider as part of the bidder's/offeror's Good Faith Efforts when the bidder/offeror fails to meet the MBE Goal(s). This list is not intended to be a mandatory checklist, nor is it intended to be exclusive or exhaustive. Other factors or types of efforts may be relevant in appropriate cases.

A. Identify Bid Items as Work for MBE Firms

1. Identified Items of Work in Procurements

   (a) Certain procurements will include a list of bid items identified during the goal setting process as possible work for performance by MBE Firms. If the procurement provides a list of Identified Items of Work, the bidder/offeror shall make all reasonable efforts to solicit quotes from MBE Firms to perform that work.

   (b) Bidders/Offerors may, and are encouraged to, select additional items of work to be performed by MBE Firms to increase the likelihood that the MBE Goal(s) will be achieved.

2. Identified Items of Work by Bidders/Offerors

   (a) When the procurement does not include a list of Identified Items of Work or for additional Identified Items of Work, bidders/offerors should reasonably identify sufficient items of work to be performed by the MBE Firms

   (b) Where appropriate, bidders/offerors should break out contract work items into economically feasible units to facilitate MBE participation, rather than perform these work items with their own forces. The ability or desire of a prime contractor to perform the work of a contract with its own organization does not relieve the bidder/offeror of the responsibility to make Good Faith Efforts.

B. Identify MBE Firms to Solicit

1. MBE Firms Identified in Procurements

   (a) Certain procurements will include a list of the MBE Firms identified during the goal setting process as available to perform the items of work. If the procurement provides a list of Identified MBE Firms, the bidder/offeror shall make all reasonable efforts to solicit those MBE firms.

   (b) Bidders/offerors may, and are encouraged to; search the MBE Directory to identify additional MBEs who may be available to perform the items of work, such as MBEs certified or granted an expansion of services after the solicitation was issued.

2. MBE Firms Identified by Bidders/Offerors

   (a) When the procurement does not include a list of Identified MBE Firms, bidders/offerors should reasonably identify the MBE Firms that are available to perform the Identified Items of Work.

   (b) Any MBE Firms identified as available by the bidder/offeror should be certified to perform the Identified Items of Work.

C. Solicit MBEs

1. Solicit <u>all</u> Identified Firms for all Identified Items of Work by providing written notice. The bidder/offeror should:

   (a) provide the written solicitation at least 10 days prior to bid opening to allow sufficient time for the MBE Firms to respond;

   (b) send the written solicitation by first-class mail, facsimile, or email using contact information in the MBE Directory, unless the bidder/offeror has a valid basis for using different contact information; and

   (c) provide adequate information about the plans, specifications, anticipated time schedule for portions of the work to be performed by the MBE, and other requirements of the contract to assist MBE Firms in responding. (This information may be provided by including hard copies in the written solicitation or by <u>electronic means</u> as described in C.3 below.)

2. "<u>All</u>" Identified Firms includes the MBEs listed in the procurement and any MBE Firms you identify as potentially available to perform the Identified Items of Work, but it does not include MBE Firms who are no longer certified to perform the work as of the date the bidder/offeror provides written solicitations.

3. "Electronic Means" includes, for example, information provided *via* a website or file transfer protocol (FTP) site containing the plans, specifications, and other requirements of the contract. If an interested MBE cannot access the information provided by electronic means, the bidder/offeror must make the information available in a manner that is accessible to the interested MBE.

4. Follow up on initial written solicitations by contacting MBEs to determine if they are interested. The follow up contact may be made:

   (a) by telephone using the contact information in the MBE Directory, unless the bidder/offeror has a valid basis for using different contact information; or

   (b) in writing *via* a method that differs from the method used for the initial written solicitation.

5. In addition to the written solicitation set forth in C.1 and the follow up required in C.4, use all other reasonable and available means to solicit the interest of MBE Firms certified to perform the work of the contract. Examples of other means include:

   (a) attending any pre-bid meetings at which MBE Firms could be informed of contracting and subcontracting opportunities; and

   (b) if recommended by the procurement, advertising with or effectively using the services of at least two (2) minority focused entities or media, including trade associations, minority/women community organizations, minority/women contractors' groups, and local, state, and federal minority/women business assistance offices listed on the MDOT Office of Minority Business Enterprise website.

D. Negotiate With Interested MBE Firms

Bidders/Offerors must negotiate in good faith with interested MBE Firms.

1. Evidence of negotiation includes, without limitation, the following:

   (a) the names, addresses, and telephone numbers of MBE Firms that were considered;

   (b) a description of the information provided regarding the plans and specifications for the work selected for subcontracting and the means used to provide that information; and

   (c) evidence as to why additional agreements could not be reached for MBE Firms to perform the work.

2. A bidder/offeror using good business judgment would consider a number of factors in negotiating with subcontractors, including MBE subcontractors, and would take a firm's price and capabilities as well as contract goals into consideration.

3. The fact that there may be some additional costs involved in finding and using MBE Firms is not in itself sufficient reason for a bidder's/offeror's failure to meet the contract MBE goal(s), as long as such costs are reasonable. Factors to take into consideration when determining whether a MBE Firm's quote is excessive or unreasonable include, without limitation, the following:

   (a) the dollar difference between the MBE subcontractor's quote and the average of the other subcontractors' quotes received by the bidder/offeror; (The "average of the other subcontractors' quotes received" by the bidder/offeror refers to the average of the quotes received from all subcontractors. Bidder/offeror should attempt to receive quotes from at least three (3) subcontractors, including one (1) quote from a MBE and one (1) quote from a Non-MBE.)

   (b) the percentage difference between the MBE subcontractor's quote and the average of the other subcontractors' quotes received by the bidder/offeror;

   (c) the percentage that the MBE subcontractor's quote represents of the overall contract amount;

   (d) the number of MBE firms that the bidder/offeror solicited for that portion of the work;

   (e) whether the work described in the MBE and Non-MBE subcontractor quotes (or portions thereof) submitted for review is the same or comparable; and

   (f) the number of quotes received by the bidder/offeror for that portion of the work.

4. The above factors are not intended to be mandatory, exclusive, or exhaustive, and other evidence of an excessive or unreasonable price may be relevant.

5. The bidder/offeror may not use its price for self-performing work as a basis for rejecting a MBE Firm's quote as excessive or unreasonable.

6. A bidder/offeror shall not reject a MBE Firm as unqualified without sound reasons based on a thorough investigation of the firm's capabilities. For each certified MBE that is rejected as unqualified or that placed a subcontract quotation or offer that the bidder/offeror concludes is not acceptable, the bidder/offeror must provide a written detailed statement listing the reasons for this conclusion. The bidder/offeror also must document the steps taken to verify the capabilities of the MBE and Non-MBE Firms quoting similar work.

(a) The factors to take into consideration when assessing the capabilities of a MBE Firm, include, but are not limited to the following: financial capability, physical capacity to perform, available personnel and equipment, existing workload, experience performing the type of work, conduct and performance in previous contracts, and ability to meet reasonable contract requirements.

(b) The MBE Firm's standing within its industry, membership in specific groups, organizations, or associations and political or social affiliations (for example union vs. non-union employee status) are not legitimate causes for the rejection or non-solicitation of bids in the efforts to meet the project goal.

E. Assisting Interested MBE Firms

When appropriate under the circumstances, the decision-maker will consider whether the bidder/offeror:

1. made reasonable efforts to assist interested MBE Firms in obtaining the bonding, lines of credit, or insurance required by the procuring agency or the bidder/offeror; and

2. made reasonable efforts to assist interested MBE Firms in obtaining necessary equipment, supplies, materials, or related assistance or services.

III. Other Considerations

A. In making a determination of Good Faith Efforts the decision-maker may consider engineering estimates, catalogue prices, general market availability and availability of certified MBE Firms in the area in which the work is to be performed, other bids or offers and subcontract bids or offers substantiating significant variances between certified MBE and Non-MBE costs of participation, and their impact on the overall cost of the contract to the State and any other relevant factors.

B. The decision-maker may take into account whether a bidder/offeror decided to self-perform subcontract work with its own forces, especially where the self-performed work is Identified Items of Work in the procurement.

The decision-maker also may take into account the performance of other bidders/offerors in meeting the contract.

For example, when the apparent successful bidder/offeror fails to meet the contract goal, but others meet it, this reasonably raises the question of whether, with additional reasonable efforts, the apparent successful bidder/offeror could have met the goal. If the apparent successful bidder/offeror fails to meet the

goal, but meets or exceeds the average MBE participation obtained by other bidders/offerors, this, when viewed in conjunction with other factors, could be evidence of the apparent successful bidder/offeror having made Good Faith Efforts.

IV. Documenting Good Faith Efforts

At a minimum, a bidder/offeror seeking a waiver of the MBE Goal(s), Subgoal, or a portion thereof must provide written documentation of its Good Faith Efforts, in accordance with COMAR 21.11.03.11, within ten (10) business days after receiving notice that it is the apparent awardee. The written documentation shall include the following:

A. Items of Work (Complete Good Faith Efforts Documentation Attachment D-1C, Part 1)

A detailed statement of the efforts made to select portions of the work proposed to be performed by certified MBE Firms in order to increase the likelihood of achieving the stated MBE Goal(s).

B. Outreach/Solicitation/Negotiation

1. The record of the bidder's/offeror's compliance with the outreach efforts prescribed by COMAR 21.11.03.09C(2)(a). **(Complete Outreach Efforts Compliance Statement – Attachment D-2).**

2. A detailed statement of the efforts made to contact and negotiate with MBE Firms including:

   (a) the names, addresses, and telephone numbers of the MBE Firms who were contacted, with the dates and manner of contacts (letter, fax, email, telephone, etc.) **(Complete Good Faith Efforts Attachment D-1C, Part 2,** and submit letters, fax cover sheets, emails, etc. documenting solicitations**)**; and

   (b) a description of the information provided to MBE Firms regarding the plans, specifications, and anticipated time schedule for portions of the work to be performed and the means used to provide that information.

C. Rejected MBE Firms (Complete Good Faith Efforts Attachment D-1C, Part 3)

1. For each MBE Firm that the bidder/offeror concludes is not acceptable or qualified, a detailed statement of the reasons for the bidder's/offeror's conclusion, including the steps taken to verify the capabilities of the MBE and Non-MBE Firms quoting similar work.

2. For each certified MBE Firm that the bidder/offeror concludes has provided an excessive or unreasonable price, a detailed statement of the reasons for the bidder's/offeror's conclusion, including the quotes received from all MBE and

Non-MBE firms bidding on the same or comparable work. **(Include copies of all quotes received.)**

3. A list of MBE Firms contacted but found to be unavailable. This list should be accompanied by a MBE Unavailability Certificate **(see Exhibit A to this Part 1)** signed by the MBE Firm or a statement from the bidder/offeror that the MBE Firm refused to sign the MBE Unavailability Certificate.

D. Other Documentation

1. Submit any other documentation requested by the Procurement Officer to ascertain the bidder's/offeror's Good Faith Efforts.

2. Submit any other documentation the bidder/offeror believes will help the Procurement Officer ascertain its Good Faith Efforts.

Exhibit A

DPSCS MBE Subcontractor Unavailability Certificate

1. It is hereby certified that the firm of _____
(Name of MBE firm)

located at _____
(Number) (Street) (City) (State) (Zip)

was offered an opportunity to bid on Solicitation No. MDQ0031018235 by

_____
(Name of Prime Contractor's Firm)

****

2. _____ (MBE Firm) is either unavailable for the work/service or unable to prepare a bid for this project for the following reason(s):

_____

_____

_____

Printed Name of MBE's Representative **Title**

Signature of MBE's Representative **Date**

MDOT Certification # **Telephone Phone**

3. To be completed by the prime contractor if Section 2 of this form is not completed by the minority firm.

To the best of my knowledge and belief, said Certified MBE is either unavailable for the work/service for this project, is unable to prepare a bid, or did not respond to a request for a price proposal and has not completed the above portion of this submittal.

Printed Name of Prime Contractor's Representative **Title**

Signature of Prime Contractor's Representative **Date**

DEPARTMENT OF PUBLIC SAFETY & CORRECTIONAL SERVICES

GOOD FAITH EFFORT DOCUMENTATION TO SUPPORT WAIVER REQUEST

PAGE __ OF ___

Prime Contractor	Project Description	Solicitation Number
	Youth Detention Center at Baltimore City Detention Center (BCDC), Baltimore, Maryland	MDQ0031018235

PARTS 1, 2, AND 3 MUST BE INCLUDED WITH THIS CERTIFICATE ALONG WITH ALL DOCUMENTS SUPPORTING YOUR WAIVER REQUEST.

I affirm that I have reviewed Attachment D-1B, Waiver Guidance. I further affirm under penalties of perjury that the contents of Parts 1, 2, and 3 of this Attachment D-1C Good Faith Efforts Documentation Form are true to the best of my knowledge, information, and belief.

_____ Company Name

_____ Signature of Representative

_____ Address

_____ Printed Name and Title

_____ City, State and Zip Code

_____ Date

GOOD FAITH EFFORT DOCUMENTATION
TO SUPPORT WAIVER REQUEST

PART 1 – IDENTIFIED ITEMS OF WORK BIDDER/OFFEROR MADE AVAILABLE TO MBE FIRMS

PAGE __ OF ___

Prime Contractor	Project Description	Solicitation Number
	Youth Detention Center at Baltimore City Detention Center (BCDC), Baltimore, Maryland	MDQ0031018235

Identify those items of work that the bidder/offeror made available to MBE Firms. This includes, where appropriate, those items the bidder/offeror identified and determined to subdivide into economically feasible units to facilitate the MBE participation. For each item listed, show the anticipated percentage of the total contract amount. It is the bidder's/offeror's responsibility to demonstrate that sufficient work to meet the goal was made available to MBE Firms, and the total percentage of the items of work identified for MBE participation equals or exceeds the percentage MBE goal set for the procurement. Note: If the procurement includes a list of bid items identified during the goal setting process as possible items of work for performance by MBE Firms, the bidder/offeror should make all of those items of work available to MBE Firms or explain why that item was not made available. If the bidder/offeror selects additional items of work to make available to MBE Firms, those additional items should also be included below.

Identified Items of Work	Was this work listed in the procurement?	Does bidder/offeror normally self-perform this work?	Was this work made available to MBE Firms? If no, explain why?
	□ Yes □ No	□ Yes □ No	□ Yes □ No
	□ Yes □ No	□ Yes □ No	□ Yes □ No
	□ Yes □ No	□ Yes □ No	□ Yes □ No
	□ Yes □ No	□ Yes □ No	□ Yes □ No
	□ Yes □ No	□ Yes □ No	□ Yes □ No
	□ Yes □ No	□ Yes □ No	□ Yes □ No
	□ Yes □ No	□ Yes □ No	□ Yes □ No
	□ Yes □ No	□ Yes □ No	□ Yes □ No
	□ Yes □ No	□ Yes □ No	□ Yes □ No
	□ Yes □ No	□ Yes □ No	□ Yes □ No

□ Please check if Additional Sheets are attached.

GOOD FAITH EFFORT DOCUMENTATION
TO SUPPORT WAIVER REQUEST
PART 2 – IDENTIFIED MBE FIRMS AND RECORD OF SOLICITATIONS

PAGE __ OF ___

Prime Contractor	Project Description	Solicitation Number
	Youth Detention Center at Baltimore City Detention Center (BCDC), Baltimore, Maryland	MDQ0031018235

Identify the MBE Firms solicited to provide quotes for the Identified Items of Work made available for MBE participation. Include the name of the MBE Firm solicited, items of work for which bids/quotes were solicited, date and manner of initial and follow-up solicitations, whether the MBE provided a quote, and whether the MBE is being used to meet the MBE participation goal. MBE Firms used to meet the participation goal must be included on the MBE Participation Schedule. Note: If the procurement includes a list of the MBE Firms identified during the goal setting process as potentially available to perform the items of work, the bidder/offeror should solicit all of those MBE Firms or explain why a specific MBE was not solicited. If the bidder/offeror identifies additional MBE Firms who may be available to perform Identified Items of Work, those additional MBE Firms should also be included below. Copies of all written solicitations and documentation of follow-up calls to MBE Firms must be attached to this form. This list should be accompanied by a Minority Contractor Unavailability Certificate signed by the MBE contractor or a statement from the bidder/offeror that the MBE contractor refused to sign the Minority Contractor Unavailability Certificate (see Exhibit A to MBE Attachment 1-B). If the bidder/offeror used a Non-MBE or is self-performing the identified items of work, Part 4 must be completed.

Name of Identified MBE Firm & MBE Classification	Describe Item of Work Solicited	Initial Solicitation Date & Method	Follow-up Solicitation Date & Method	Details for Follow-up Calls	Quote Rec'd	Quote Used	Reason Quote Rejected
Firm Name: _____ **MBE Classification (Check only if requesting waiver of MBE subgoal.)** ☐ African American-Owned ☐ Hispanic American-Owned ☐ Asian American-Owned ☐ Women-Owned ☐ Other MBE Classification _____		Date: □ Mail □ Facsimile □ Email	Date: □ Phone □ Mail □ Facsimile □ Email	Time of Call: Spoke With: □ Left Message	□ Yes □ No	□ Yes □ No	□ Used Other MBE □ Used Non-MBE □ Self-performing
Firm Name: _____ **MBE Classification (Check only if requesting waiver of MBE subgoal.)** ☐ African American-Owned ☐ Hispanic American-Owned ☐ Asian American-Owned ☐ Women-Owned ☐ Other MBE Classification _____		Date: □ Mail □ Facsimile □ Email	Date: □ Phone □ Mail □ Facsimile □ Email	Time of Call: Spoke With: □ Left Message	□ Yes □ No	□ Yes □ No	□ Used Other MBE □ Used Non-MBE □ Self-performing

☐Please check if Additional Sheets are attached.

GOOD FAITH EFFORT DOCUMENTATION
TO SUPPORT WAIVER REQUEST

PART 3 – ADDITIONAL INFORMATION REGARDING REJECTED MBE QUOTES

PAGE __ OF ___

Prime Contractor	Project Description	Solicitation Number
	Youth Detention Center at Baltimore City Detention Center (BCDC), Baltimore, Maryland	MDQ0031018235

This form must be completed if Part 1 indicates that a MBE quote was rejected because the bidder/offeror is using a Non-MBE or is self-performing the Identified Items of Work. Provide the Identified Items Work, indicate whether the work will be self-performed or performed by a Non-MBE, and if applicable, state the name of the Non-MBE. Also include the names of all MBE and Non-MBE Firms that provided a quote and the amount of each quote.

Describe Identified Items of Work Not Being Performed by MBE (Include spec/section number from bid)	Self-performing or Using Non-MBE (Provide name)	Amount of Non-MBE Quote	Name of Other Firms who Provided Quotes & Whether MBE or Non-MBE	Amount Quoted	Indicate Reason Why MBE Quote Rejected & Briefly Explain
	□ Self-performing □ Using Non-MBE _____	$_____	_____ □ MBE □ Non-MBE	$_____	□ Price □ Capabilities □ Other
	□ Self-performing □ Using Non-MBE _____	$_____	_____ □ MBE □ Non- MBE	$_____	□ Price □ Capabilities □ Other
	□ Self-performing □ Using Non-MBE _____	$_____	_____ □ MBE □ Non- MBE	$_____	□ Price □ Capabilities □ Other
	□ Self-performing □ Using Non- MBE _____	$_____	_____ □ MBE □ Non- MBE	$_____	□ Price □ Capabilities □ Other
	□ Self-performing □ Using Non- MBE _____	$_____	_____ □ MBE □ Non- MBE	$_____	□ Price □ Capabilities □ Other
	□ Self-performing □ Using Non- MBE _____	$_____	_____ □ MBE □ Non- MBE	$_____	□ Price □ Capabilities □ Other

☐Please check if Additional Sheets are attached.

DEPARTMENT OF PUBLIC SAFETY & CORRECTIONAL SERVICES
MBE SUBCONTRACTOR PROJECT PARTICIPATION CERTIFICATION

PLEASE COMPLETE AND SUBMIT ONE FORM FOR EACH CERTIFIED MBE FIRM LISTED ON THE MBE PARTICIPATION SCHEDULE (ATTACHMENT D-1A) WITHIN 10 WORKING DAYS OF NOTIFICATION OF APPARENT AWARD. IF THE BIDDER/OFFEROR FAILS TO RETURN THIS AFFIDAVIT WITHIN THE REQUIRED TIME, THE PROCUREMENT OFFICER MAY DETERMINE THAT THE BIDDER/OFFEROR IS NOT RESPONSIBLE AND THEREFORE NOT ELIGIBLE FOR CONTRACT AWARD.

Provided that _____ (Prime Contractor's Name) is awarded the State contract in conjunction with Solicitation No. _____MDQ0031018235_____, such Prime Contractor intends to enter into a subcontract with _____(Subcontractor's Name) committing to participation by the MBE firm _____ (MBE Name) with MDOT Certification Number _____ which will receive at least $_____ which equals to___% of the Total Contract Amount for performing the following products/services for the Contract:_____.

NAICS CODE	WORK ITEM, SPECIFICATION NUMBER, LINE ITEMS OR WORK CATEGORIES (IF APPLICABLE)	DESCRIPTION OF SPECIFIC PRODUCTS AND/OR SERVICES

Each of the Contractor and Subcontractor acknowledges that, for purposes of determining the accuracy of the information provided herein, the Procurement Officer may request additional information, including, without limitation, copies of the subcontract agreements and quotes. Each of the Contractor and Subcontractor solemnly affirms under the penalties of perjury that: (i) the information provided in this MBE Subcontractor Project Participation Affidavit is true to the best of its knowledge, information and belief, and (ii) has fully complied with the State Minority Business Enterprise law, State Finance and Procurement Article §14-308(a)(2), Annotated Code of Maryland which provides that, except as otherwise provided by law, a contractor may not identify a certified minority business enterprise in a Bid/Proposal and:

(1) fail to request, receive, or otherwise obtain authorization from the certified minority business enterprise to identify the certified Minority Business Enterprise in its Bid/Proposal;

(2) fail to notify the certified Minority Business Enterprise before execution of the Contract of its inclusion of the Bid/Proposal;

(3) fail to use the certified Minority Business Enterprise in the performance of the Contract; or

(4) pay the certified Minority Business Enterprise solely for the use of its name in the Bid/Proposal.

PRIME CONTRACTOR

Signature of Representative:_____

Printed Name and Title:_____

_____

Firm's Name: _____

Federal Identification Number: _____

Address: _____

_____

Telephone: _____ Email: _____

Date: _____

SUBCONTRACTOR

Signature of Representative:_____

Printed Name and Title:_____

_____

Firm's Name: _____

Federal Identification Number: _____

Address: _____

_____

Telephone: _____ Email: _____

Date: _____

DEPARTMENT OF PUBLIC SAFETY & CORRECTIONAL SERVICES

MBE PRIME PROJECT PARTICIPATION CERTIFICATION

PLEASE COMPLETE AND SUBMIT THIS FORM TO ATTEST EACH SPECIFIC ITEM OF WORK THAT YOUR MBE FIRM HAS LISTED ON THE MBE PARTICIPATION SCHEDULE (ATTACHMENT D-1A) FOR PURPOSES OF MEETING THE MBE PARTICIPATION GOALS. THIS FORM MUST BE SUBMITTED WITHIN 10 WORKING DAYS OF NOTIFICATION OF APPARENT AWARD. IF THE BIDDER/OFFEROR FAILS TO RETURN THIS AFFIDAVIT WITHIN THE REQUIRED TIME, THE PROCUREMENT OFFICER MAY DETERMINE THAT THE BIDDER/OFFEROR IS NOT RESPONSIBLE AND THEREFORE NOT ELIGIBLE FOR CONTRACT AWARD.

Provided that _____ (Prime Contractor's Name) with Certification Number _____ is awarded the State contract in conjunction with Solicitation No. _____MDQ0031018235____, such MBE Prime Contractor intends to perform with its own forces at least $_____ which equals to___% of the Total Contract Amount for performing the following products/services for the Contract:_____.

NAICS CODE	WORK ITEM, SPECIFICATION NUMBER, LINE ITEMS OR WORK CATEGORIES (IF APPLICABLE). FOR CONSTRUCTION PROJECTS, GENERAL CONDITIONS MUST BE LISTED SEPARATELY.	DESCRIPTION OF SPECIFIC PRODUCTS AND/OR SERVICES	VALUE OF THE WORK

MBE PRIME CONTRACTOR

Signature of Representative:_____

Printed Name and Title:_____

_____

Firm's Name: _____

Federal Identification Number: _____

Address: _____

_____

Telephone: _____

Date: _____

DEPARTMENT OF PUBLIC SAFETY & CORRECTIONAL SERVICES
OUTREACH EFFORTS COMPLIANCE STATEMENT

Complete and submit this form within ten (10) working days of notification of apparent award or actual award, whichever is earlier.

In conjunction with the bid/proposal submitted in response to Solicitation No. MDQ0031018235, I state the following:

1. Bidder/Offeror identified subcontracting opportunities in these specific work categories:
_____
_____
_____

2. Attached to this form are copies of written solicitations (with bidding/proposal instructions) used to solicit certified MBE firms for these subcontract opportunities.

3. Bidder/Offeror made the following attempts to personally contact the solicited MDOT-certified MBE firms: _____

_____

4. **Please Check One:**

☐ This project does not involve bonding requirements.

☐ Bidder/Offeror assisted MDOT-certified MBE firms to fulfill or seek waiver of bonding requirements. (DESCRIBE EFFORTS): _____
_____
_____

5. **Please Check One:**

☐ Bidder/Offeror did attend the pre-bid/pre-proposal conference.

☐ No pre-bid/pre-proposal meeting/conference was held.

☐ Bidder/Offeror did not attend the pre-bid/pre-proposal conference.

_____	_____
Company Name	Signature of Representative
_____	_____
Address	Printed Name and Title
_____	_____
City, State and Zip Code	Date

Submit this form within 10 working days of notification of apparent award.

DEPARTMENT OF PUBLIC SAFETY & CORRECTIONAL SERVICES
Minority Business Enterprise Participation
Prime Contractor Paid/Unpaid MBE Invoice Report

Report #: _____ Reporting Period (Month/Year): _____ **Prime Contractor: Report is due to the MBE Office via email by the 10th of the month following the month the services were provided.** **Note: Please number reports in sequence**	Contract #: KT-000-150-C01 Contracting Office: _____ Contract Amount: _____ MBE Subcontract Amt: _____ Project Begin Date: _____ Project End Date: _____ Services Provided: _____

Prime Contractor:	Contact Person:	
Address:		
City:	State:	ZIP:
Phone:	Fax:	E-mail:
MBE Subcontractor Name:	Contact Person:	
Phone:	Fax:	E-mail:
Subcontractor Services Provided:		

List all payments made to MBE subcontractor named above during this reporting period:		**List dates and amounts of any outstanding invoices:**	
Invoice#	**Amount**	**Invoice #**	**Amount**
1.		**1.**	
2.		**2.**	
3.		**3.**	
4.		**4.**	
Total Dollars Paid: $_____		**Total Dollars Unpaid: $_____**	

- Information regarding payments that the MBE prime will use for purposes of meeting the MBE participation goals must be reported separately in Attachment D-4B
- **Return two (2) copies of this form to the following addresses (electronic copy with signature and date is preferred):**

Signature:_____ Date:_____

DEPARTMENT OF PUBLIC SAFETY & CORRECTIONAL SERVICES

One Copy to: _____, Contract Monitor
Email:_____ Address:_____
OR to Contracting Unit:_____Email:_____
Address:_____

One Copy to: Office of Equal Opportunity – MBE Division
Email: MBE@dpscs.state.md.us OR Fax: 410-318-8905 Or Mail to: 6776 Reisterstown Road
Baltimore, MD 21215mailto:

Attachment D-4B

Department of Public Safety & Correctional Services

Minority Business Enterprise Participation

MBE Prime Contractor Self Performance Report

MBE Prime Contractor:_____ Certification Number: _____ Report #: _____ Reporting Period (Month/Year): _____ **MBE Prime Contractor: Report is due to the MBE Office by the 10th of the month following the month the services were provided.** **Note: Please number reports in sequence**	Contract #: KT-000-150-C01 Contracting Unit: _____ Contract Amount: _____ Total Value of the Work to the Self-Performed for purposes of Meeting the MBE participation goal/subgoals: _____ Project Begin Date: _____ Project End Date: _____

Contact Person:		
Address:		
City:	State:	Zip:
Phone:	Fax:	E-mail:

Invoice Number	Value of the Work	NAICS Code	Description of the Work

Return two (2) copies (hard or electronic) of this form to the following addresses (electronic copy with signature and date is preferred):

Signature:_____ Date:_____
(Required)

DEPARTMENT OF PUBLIC SAFETY & CORRECTIONAL SERVICES

One Copy to: _____, DPSCS Contract Monitor
Email:_____
Address:_____

OR to DPSCS Contracting Unit:_____
Email:_____
Address:_____

AND One Copy to: Office of Equal Opportunity- MBE Division
Email: MBE@dpscs.state.md.us OR Fax: 410-318-8905 OR Mail to: 6776 Reisterstown Road
mailto: Baltimore, MD 21215

Attachment D-4C

Maryland Department of Public Safety & Correctional Services

Prime Contractor Paid/Unpaid MBE/VSBE Invoice Report for Multiple MBEs/VSBEs

BPO/PO No.:_____

Prime Total $ Amount	Project / Contract Number **KT-000-150-C01**	Reporting Period Start / End Dates
Prime Contractor	Project / Contract Title Youth Detention Center at Baltimore City Detention Center (BCDC), Baltimore, Maryland	Approved: MBE Goal % VSBE Goal%
Contracting Office	Project Start / End Dates	Percent Project Complete

MBE/VSBE Subcontractor Name & Contact Person	MBE or VSBE	MBE/VSBE Subcontractor Service(s) Provided	Total MBE/VSBE Subcontract $	Amount Paid This Period	Check No. / Date of Check	Total Dollars Paid To Date	Percent Complete To Date	Outstanding Invoices Date / $
	TOTAL							

To the best of my knowledge, I affirm that the proceeding reported information is true and correct:

Reviewed:

Prime Contractor Contact (Signature) Date

DPSCS Representative Date

(Print Name and Title)

Office of Equal Opportunity- MBE Division Date
mbe@dpscs.state.md.us

DPSCS OS 06C MBE
Revised 6/13/2014

SUBMIT THIS FORM WITH THE MONTHLY INVOICE STATEMENT TO THE OFFICE OF EQUAL OPPORTUNITY - MBE DIVISION & CONTRACT MONITOR

Attachment M-4

DEPARTMENT OF PUBLIC SAFETY & CORRECTIONAL SERVICES

Veteran-Owned Small Business Enterprise (VSBE) Participation
Subcontractor Paid/Unpaid VSBE Invoice Report

Report#: ____ Reporting Period (Month/Year): _____ **Report is due by the 10th of the month following the month the services were performed.**	Contract #: KT-000-150-C01 Contracting Unit: _____ VSBE Subcontract Amount:_____ Project Begin Date:_____ Project End Date: _____ Services Provided: _____
VSBE Subcontractor Name:	
DUNS #:	
Contact Person: E-mail:	
Address:	
City: State: Zip:	
Phone: Fax:	
Subcontractor Services Provided:	

List all payments received from Prime Contractor during reporting period indicated above.			**List dates and amounts of any unpaid invoices over 30 days old.**		
Invoice #	**Invoice Amount**	**Date Paid**	**Invoice #**	**Invoice Amount**	**Invoice Date**
1.			**1.**		
2.			**2.**		
3.			**3.**		
4.			**4.**		
Total Dollars Paid: $_____			**Total Dollars Unpaid: $_____**		

Prime Contractor: Contact Person:

Return two (2) copies (hard or electronic) of this form to the following addresses (electronic copy with signature and date is preferred):

Signature:_____ Date:_____

1. Send one copy to The Department of Public Safety & Correctional Services(DPSCS)
_____Contract Monitor OR Contracting Unit:_____

2. Send one copy to the DPSCS- Office of Equal Opportunity MBE Division
Email: MBE@dpscs.state.md.us OR Fax to: 410-318-8905

OR mail to: DPSCS- Office of Equal Opportunity – MBE Division
6776 Reisterstown Road
Baltimore, MD 21215 mailto:

Attachment D-5

DEPARTMENT OF PUBLIC SAFETY & CORRECTIONAL SERVICES

Minority Business Enterprise Participation
Subcontractor Paid/Unpaid MBE Invoice Report

Report#: ____ Reporting Period (Month/Year): _____ **Report is due by the 10th of the month following the month the services were performed.**	Contract #: KT-000-150-C01 Contracting Unit: _____ MBE Subcontract Amount: _____ Project Begin Date: _____ Project End Date: _____ Services Provided: _____

MBE Subcontractor Name:

MDOT Certification #:

Contact Person: E-mail:

Address:

City: State: Zip:

Phone: Fax:

Subcontractor Services Provided:

List all payments received from Prime Contractor during reporting period indicated above.			**List dates and amounts of any unpaid invoices over 30 days old.**		
Invoice #	**Invoice Amount**	**Date Paid**	**Invoice #**	**Invoice Amount**	**Invoice Date**
1.			**1.**		
2.			**2.**		
3.			**3.**		
4.			**4.**		
Total Dollars Paid: $_____			**Total Dollars Unpaid: $_____**		

Prime Contractor: Contact Person:

Return two (2) copies (hard or electronic) of this form to the following addresses (electronic copy with signature and date is preferred):

Signature:_____ Date:_____

1. Send one copy to The Department of Public Safety & Correctional Services(DPSCS)
   _____Contract Monitor OR Contracting Unit:_____
2. Send one copy to the DPSCS- Office of Equal Opportunity MBE Division
   Email: MBE@dpscs.state.md.us OR Fax to: 410-318-8905

   OR mail to: DPSCS- Office of Equal Opportunity – MBE Division
   6776 Reisterstown Road
   Baltimore, MD 21215 mailto:

DEPARTMENT OF PUBLIC SAFETY & CORRECTIONAL SERVICES
Veteran-Owned Small Business Enterprise (VSBE)
UTILIZATION AND FAIR SOLICITATION AFFIDAVIT
& VSBE PARTICIPATION SCHEDULE

INSTRUCTIONS
PLEASE READ BEFORE COMPLETING THIS DOCUMENT

This form includes Instructions and the VSBE Utilization and Fair Solicitation Affidavit & VSBE Participation Schedule which must be submitted with the bid/proposal. If the bidder/offeror fails to accurately complete and submit this Affidavit and Schedule with the bid or proposal as required, the Procurement Officer shall deem the bid non-responsive or shall determine that the proposal is not reasonably susceptible of being selected for award.

1. Contractor shall structure its procedures for the performance of the work required in this Contract to attempt to achieve the Veteran-Owned Small Business Enterprise (VSBE) subcontractor participation goal stated in the Invitation for Bids or Request for Proposals. Contractor agrees to exercise good faith efforts to carry out the requirements set forth in these Instructions, as authorized by the Code of Maryland Regulations (COMAR) 21.11.03.

2. VSBE Goals: Please review the solicitation for information regarding the Contract's VSBE overall participation goals. After satisfying the requirements for any established MBE goals, the Contractor is encouraged to use subcontractors and suppliers from the VSBE list on the Vetbiz website (https://www.vip.vetbiz.gov/) to meet the overall VSBE participation goal.

3. VSBE means a Veteran Owned Small Business Enterprise that is certified by the US Department of Veterans Affairs. Only entities certified by US Dept. of Veteran Affairs may be counted for purposes of achieving the VSBE participation goals. In order to be counted for purposes of achieving the VSBE participation goals, the VSBE firm, must be VA-certified for the services, materials or supplies that it is committed to perform on the VSBE Participation Schedule and the VSBE firm must have an active DUNS Number.

4. Please refer to the VSBE Directory at (https://www.vip.vetbiz.gov/) to determine if a firm is certified with the appropriate North American Industry Classification System ("NAICS") Code **and** the product/services description (specific product that a firm is certified to provide or specific areas of work that a firm is certified to perform). For more general information about NAICS, please visit www.naics.com. Only those specific products and/or services for which a firm is certified in the VSBE Directory can be used for purposes of achieving the VSBE participation goals.

5. Worksheet: The percentage of VSBE participation, calculated using the percentage amounts for all of the VSBE firms listed on the Participation Schedule **MUST** at least equal the VSBE participation goal set forth in the solicitation. If a bidder/offeror is unable to achieve the VSBE participation goal and, the bidder/offeror must request a waiver in Item 1 of the VSBE Utilization and Fair Solicitation Affidavit (Attachment M-1) or the bid will be deemed not responsive, or the proposal determined to be not susceptible of being selected for award.

Veteran-Owned Small Business Enterprise Overall Goal

Total VSBE Participation: _____%

VSBE UTILIZATION AND FAIR SOLICITATION AFFIDAVIT & VSBE PARTICIPATION SCHEDULE

This VSBE Utilization and Fair Solicitation Affidavit & VSBE Participation Schedule must be included with the bid/proposal. If the bidder/offeror fails to accurately complete and submit this Affidavit and Schedule with the bid or proposal as required, the Procurement Officer shall deem the bid non-responsive or shall determine that the proposal is not reasonably susceptible of being selected for award.

In connection with the bid/proposal submitted in response to Solicitation No. MDQ0031018235, I affirm the following:

1. VSBE Participation (PLEASE CHECK ONLY ONE)

☐ I acknowledge and intend to meet the overall certified Veteran-Owned Small Business Enterprise (VSBE) participation goal of _____ percent):

Therefore, I am not seeking a waiver pursuant to COMAR 21.11.03.11.

OR

☐ I conclude that I am unable to achieve the VSBE participation goal. I hereby request a waiver, in whole or in part, of the overall goal. Within 10 Working days of receiving notice that our firm is the apparent awardee or as requested by the Procurement Officer, I will submit the completed Good Faith Efforts Documentation to Support Waiver Request (Attachment M-1C) and all required waiver documentation in accordance with COMAR 21.11.03.

2. Additional VSBE Documentation

I understand that if I am notified that I am the apparent awardee or as requested by the Procurement Officer, I must submit the following documentation within 10 business days of receiving notice of the potential award or from the date of conditional award (per COMAR 21.11.03.10), whichever is earlier:

(a) Outreach Efforts Compliance Statement (Attachment D-2);

(b) VSBE Subcontractor/VSBE Prime Project Participation Statement (Attachments D-3A and 3B);

(c) Any other documentation, including waiver documentation if applicable, required by the Procurement Officer to ascertain bidder or offeror responsibility in connection with the certified VSBE participation goal.

I understand that if I fail to return each completed document within the required time, the Procurement Officer may determine that I am not responsible and therefore not eligible for contract award. If the contract has already been awarded, the award is voidable.

3. Information Provided to VSBE firms

In the solicitation of subcontract quotations or offers, VSBE firms were provided not less than the same information and amount of time to respond as were non-VSBE firms.

VSBE PARTICIPATION SCHEDULE ON NEXT PAGE

4. VSBE Participation Schedule

Set forth below are the (i) certified VSBEs I intend to use, (ii) the percentage of the total Contract amount allocated to each VSBE for this project and, (iii) the items of work each VSBE will provide under the Contract. I have confirmed with the MDOT database that the VSBE firms identified will be performing work activities for which they are MDOT certified.

Prime Contractor	Project Description	Project/Contract Number
	Youth Detention Center at Baltimore City Detention Center (BCDC), Baltimore, Maryland	KT-000-150-C01

List information for each certified VSBE firm you agree to use to achieve the VSBE participation goal.

SECTION A: For all VSBE Contractors:

VSBE Firm Name:____ VSBE DUNS Number: ________________________________ Percentage of Total Contract to be performed by this VSBE:________%	Description of the Work to be Performed to include NAICS codes: ____ ____ ____ ____
VSBE Firm Name:____ VSBE DUNS Number: ________________________________ Percentage of Total Contract to be performed by this VSBE:________%	Description of the Work to be Performed to include NAICS codes: ____ ____ ____ ____
VSBE Firm Name:____ VSBE DUNS Number: ________________________________ Percentage of Total Contract to be performed by this VSBE:________%	Description of the Work to be Performed to include NAICS codes: ____ ____ ____ ____
VSBE Firm Name:____ VSBE DUNS Number: ________________________________ Percentage of Total Contract to be performed by this VSBE:________%	Description of the Work to be Performed to include NAICS codes: ____ ____ ____ ____

VSBE Overall Goal

Total Veteran-Owned Small Business Enterprise Participation _____________%

I solemnly affirm under the penalties of perjury that I have reviewed the instructions for the VSBE Utilization & Fair Solicitation Affidavit and VSBE Schedule and that the information included in the Schedule is true to the best of my knowledge, information and belief.

_____	_____
Bidder/Offeror Name *(PLEASE PRINT OR TYPE)*	Signature of Authorized Representative
_____	_____
Address	Printed Name and Title
_____	_____
City, State and Zip Code	Date

SUBMIT THIS
VSBE UTILIZATION AND FAIR SOLICITATION AFFIDAVIT
& VSBE PARTICIPATION SCHEDULE
WITH BID/PROPOSAL

DEPARTMENT OF PUBLIC SAFETY & CORRECTIONAL SERVICES
VETERAN OWNED SMALL BUSINESS ENTERPRISE (VSBE)
WAIVER GUIDANCE

GUIDANCE FOR DOCUMENTING GOOD FAITH EFFORTS TO MEET VSBE PARTICIPATION GOALS

In order to show that it has made good faith efforts to meet the Veteran-Owned Small Business Enterprise (VSBE) participation goal on a contract, the bidder/offeror must either (1) meet the VSBE Goal(s) and document its commitments for participation of VSBE Firms, or (2) when it does not meet the VSBE Goal(s), document its Good Faith Efforts to meet the goal(s).

I. Definitions

Good Faith Efforts – The "Good Faith Efforts" requirement means that when requesting a waiver, the bidder/offeror must demonstrate that it took all necessary and reasonable steps to achieve the VSBE Goal(s), which, by their scope, intensity, and appropriateness to the objective, could reasonably be expected to obtain sufficient VSBE participation, even if those steps were not fully successful. Whether a bidder/offeror that requests a waiver made adequate good faith efforts will be determined by considering the quality, quantity, and intensity of the different kinds of efforts that the bidder/offeror has made. The efforts employed by the bidder/offeror should be those that one could reasonably expect a bidder/offeror to take if the bidder/offeror were actively and aggressively trying to obtain VSBE participation sufficient to meet the VSBE contract goal. Mere *pro forma* efforts are not good faith efforts to meet the VSBE contract requirements. The determination concerning the sufficiency of the bidder's/offeror's good faith efforts is a judgment call; meeting quantitative formulas is not required.

Identified Firms – "Identified Firms" means a list of the VSBEs identified by the procuring agency during the goal setting process and listed in the procurement as available to perform the Identified Items of Work. It also may include additional VSBEs identified by the bidder/offeror as available to perform the Identified Items of Work. If the procurement does not include a list of Identified Firms, this term refers to all of the VSBE Firms the bidder/offeror identified as available to perform the Identified Items of Work and should include all appropriately certified firms that are reasonably identifiable.

Identified Items of Work – "Identified Items of Work" means the bid items identified by the procuring agency during the goal setting process and listed in the procurement as possible items of work for performance by VSBE Firms. It also may include additional portions of items of work the bidder/offeror identified for performance by VSBE Firms to increase the likelihood that the VSBE Goal will be achieved. If the procurement does not include a list of Identified Items of Work, this

term refers to all of the items of work the bidder/offeror identified as possible items of work for performance by VSBE Firms and should include all reasonably identifiable work opportunities.

VSBE Firms – "Veteran Owned Small Business Enterprise Firms" refers to a firm certified by the US Department of Veteran Affairs with an active DUNS number.

VSBE Goal(s) – "VSBE Goal(s)" refers to the VSBE participation goal.

II. Types of Actions Agency will Consider

The bidder/offeror is responsible for making relevant portions of the work available to VSBE subcontractors and suppliers and to select those portions of the work or material needs consistent with the available VSBE subcontractors and suppliers, so as to facilitate VSBE participation. The following is a list of types of actions the procuring agency will consider as part of the bidder's/offeror's Good Faith Efforts when the bidder/offeror fails to meet the VSBE Goal. This list is not intended to be a mandatory checklist, nor is it intended to be exclusive or exhaustive. Other factors or types of efforts may be relevant in appropriate cases.

A. Identify Bid Items as Work for VSBE Firms

1. Identified Items of Work in Procurements

   (a) Certain procurements will include a list of bid items identified during the goal setting process as possible work for performance by VSBE Firms. If the procurement provides a list of Identified Items of Work, the bidder/offeror shall make all reasonable efforts to solicit quotes from VSBE Firms to perform that work.

   (b) Bidders/Offerors may, and are encouraged to, select additional items of work to be performed by VSBE Firms to increase the likelihood that the VSBE Goal will be achieved.

2. Identified Items of Work by Bidders/Offerors

   (a) When the procurement does not include a list of Identified Items of Work or for additional Identified Items of Work, bidders/offerors should reasonably identify sufficient items of work to be performed by VSBE Firms.

   (b) (b) Where appropriate, bidders/offerors should break out contract work items into economically feasible units to facilitate VSBE participation, rather than perform these work items with their own forces. The ability or desire of a prime contractor to perform the work of a contract with its own organization does not relieve the bidder/offeror of the responsibility to make Good Faith Efforts.

B. Identify VSBE Firms to Solicit

1. VSBE Firms Identified in Procurements

   (a) Certain procurements will include a list of the VSBE Firms identified during the goal setting process as available to perform the items of work. If the procurement provides a list of Identified VSBE Firms, the bidder/offeror shall make all reasonable efforts to solicit those VSBE firms.

   (b) Bidders/offerors may, and are encouraged to; search the VSBE Directory (https://www.vip.vetbiz.gov/) to identify additional VSBEs who may be available to perform the items of work.

2. VSBE Firms Identified by Bidders/Offerors

   (a) When the procurement does not include a list of Identified VSBE Firms, bidders/offerors should reasonably identify the VSBE Firms that are available to perform the Identified Items of Work.

   (b) Any VSBE Firms identified as available by the bidder/offeror should be certified to perform the Identified Items of Work.

C. Solicit VSBEs

1. Solicit all Identified Firms for all Identified Items of Work by providing written notice. The bidder/offeror should:

   (a) provide the written solicitation at least 10 days prior to bid opening to allow sufficient time for the VSBE Firms to respond;

   (b) send the written solicitation by first-class mail, facsimile, or email using contact information in the VSBE Directory(https://www.vip.vetbiz.gov/), unless the bidder/offeror has a valid basis for using different contact information; and

   (c) provide adequate information about the plans, specifications, anticipated time schedule for portions of the work to be performed by the VSBE, and other requirements of the contract to assist VSBE Firms in responding. (This information may be provided by including hard copies in the written solicitation or by electronic means as described in C.3 below.)

2. "All" Identified Firms includes the VSBEs listed in the procurement and any VSBE Firms you identify as potentially available to perform the Identified Items of Work, but it does not include VSBE Firms who are no longer certified to perform the work as of the date the bidder/offeror provides written solicitations.

3. "Electronic Means" includes, for example, information provided *via* a website or file transfer protocol (FTP) site containing the plans, specifications, and other requirements of the contract. If an interested VSBE cannot access the information provided by electronic means, the bidder/offeror must make the information available in a manner that is accessible to the interested VSBE.

4. Follow up on initial written solicitations by contacting VSBEs to determine if they are interested. The follow up contact may be made:

   (a) by telephone using the contact information in the VSBE Directory, unless the bidder/offeror has a valid basis for using different contact information; or

   (b) in writing *via* a method that differs from the method used for the initial written solicitation.

5. In addition to the written solicitation set forth in C.1 and the follow up required in C.4, use all other reasonable and available means to solicit the interest of VSBE Firms certified to perform the work of the contract. Examples of other means include:

   (a) attending any pre-bid meetings at which VSBE Firms could be informed of contracting and subcontracting opportunities; and

   (b) if recommended by the procurement, advertising with or effectively using the services of at least two (2) minority focused entities or media, including trade associations, veteran community organizations, federal veteran business assistance offices listed on the US Dept of Veteran Affairs Veteran Owned Small Business Enterprise website.

D. Negotiate With Interested VSBE Firms

Bidders/Offerors must negotiate in good faith with interested VSBE Firms.

1. Evidence of negotiation includes, without limitation, the following:

   (a) the names, addresses, and telephone numbers of VSBE Firms that were considered;

   (b) a description of the information provided regarding the plans and specifications for the work selected for subcontracting and the means used to provide that information; and

   (c) evidence as to why additional agreements could not be reached for VSBE Firms to perform the work.

2. A bidder/offeror using good business judgment would consider a number of factors in negotiating with subcontractors, including VSBE subcontractors,

and would take a firm's price and capabilities as well as contract goals into consideration.

3. The fact that there may be some additional costs involved in finding and using VSBE Firms is not in itself sufficient reason for a bidder's/offeror's failure to meet the contract VSBE goal, as long as such costs are reasonable. Factors to take into consideration when determining whether a VSBE Firm's quote is excessive or unreasonable include, without limitation, the following:

   (a) the dollar difference between the VSBE subcontractor's quote and the average of the other subcontractors' quotes received by the bidder/offeror; (The "average of the other subcontractors' quotes received" by the bidder/offeror refers to the average of the quotes received from all subcontractors. Bidder/offeror should attempt to receive quotes from at least three (3) subcontractors, including one (1) quote from a VSBE and one (1) quote from a Non-VSBE.)

   (b) the percentage difference between the VSBE subcontractor's quote and the average of the other subcontractors' quotes received by the bidder/offeror;

   (c) the percentage that the VSBE subcontractor's quote represents of the overall contract amount;

   (d) the number of VSBE firms that the bidder/offeror solicited for that portion of the work;

   (e) whether the work described in the VSBE and Non-VSBE subcontractor quotes (or portions thereof) submitted for review is the same or comparable; and

   (f) the number of quotes received by the bidder/offeror for that portion of the work.

4. The above factors are not intended to be mandatory, exclusive, or exhaustive, and other evidence of an excessive or unreasonable price may be relevant.

5. The bidder/offeror may not use its price for self-performing work as a basis for rejecting a VSBE Firm's quote as excessive or unreasonable.

6. A bidder/offeror shall not reject a VSBE Firm as unqualified without sound reasons based on a thorough investigation of the firm's capabilities. For each certified VSBE that is rejected as unqualified or that placed a subcontract quotation or offer that the bidder/offeror concludes is not acceptable, the bidder/offeror must provide a written detailed statement listing the reasons for this conclusion. The bidder/offeror also must document the steps taken to verify the capabilities of the VSBE and Non-VSBE Firms quoting similar work.

(a) The factors to take into consideration when assessing the capabilities of a VSBE Firm, include, but are not limited to the following: financial capability, physical capacity to perform, available personnel and equipment, existing workload, experience performing the type of work, conduct and performance in previous contracts, and ability to meet reasonable contract requirements.

(b) The VSBE Firm's standing within its industry, membership in specific groups, organizations, or associations and political or social affiliations (for example union vs. non-union employee status) are not legitimate causes for the rejection or non-solicitation of bids in the efforts to meet the project goal.

E. Assisting Interested VSBE Firms

When appropriate under the circumstances, the decision-maker will consider whether the bidder/offeror:

1. made reasonable efforts to assist interested VSBE Firms in obtaining the bonding, lines of credit, or insurance required by the procuring agency or the bidder/offeror; and

2. made reasonable efforts to assist interested VSBE Firms in obtaining necessary equipment, supplies, materials, or related assistance or services.

III. Other Considerations

A. In making a determination of Good Faith Efforts the decision-maker may consider engineering estimates, catalogue prices, general market availability and availability of certified VSBE Firms in the area in which the work is to be performed, other bids or offers and subcontract bids or offers substantiating significant variances between certified VSBE and Non-VSBE costs of participation, and their impact on the overall cost of the contract to the State and any other relevant factors.

B. The decision-maker may take into account whether a bidder/offeror decided to self-perform subcontract work with its own forces, especially where the self-performed work is Identified Items of Work in the procurement.

The decision-maker also may take into account the performance of other bidders/offerors in meeting the contract.

For example, when the apparent successful bidder/offeror fails to meet the contract goal, but others meet it, this reasonably raises the question of whether, with additional reasonable efforts, the apparent successful bidder/offeror could have met the goal. If the apparent successful bidder/offeror fails to meet the

goal, but meets or exceeds the average VSBE participation obtained by other bidders/offerors, this, when viewed in conjunction with other factors, could be evidence of the apparent successful bidder/offeror having made Good Faith Efforts.

IV. Documenting Good Faith Efforts

At a minimum, a bidder/offeror seeking a waiver of the VSBE Goal, or a portion thereof must provide written documentation of its Good Faith Efforts, in accordance with COMAR 21.11.03.11, within ten (10) business days after receiving notice that it is the apparent awardee. The written documentation shall include the following:

A. Items of Work (Complete Good Faith Efforts Documentation Attachment M-1C, Part 1)

A detailed statement of the efforts made to select portions of the work proposed to be performed by certified VSBE Firms in order to increase the likelihood of achieving the stated VSBE Goal(s).

B. Outreach/Solicitation/Negotiation

1. The record of the bidder's/offeror's compliance with the outreach efforts prescribed by COMAR 21.11.03.09C(2)(a). **(Complete Outreach Efforts Compliance Statement – Attachment M-2).**

2. A detailed statement of the efforts made to contact and negotiate with VSBE Firms including:

   (a) the names, addresses, and telephone numbers of the VSBE Firms who were contacted, with the dates and manner of contacts (letter, fax, email, telephone, etc.) **(Complete Good Faith Efforts Attachment M-1C, Part 2,** and submit letters, fax cover sheets, emails, etc. documenting solicitations**)**; and

   (b) a description of the information provided to VSBE Firms regarding the plans, specifications, and anticipated time schedule for portions of the work to be performed and the means used to provide that information.

C. Rejected VSBE Firms (Complete Good Faith Efforts Attachment M-1C, Part 3)

1. For each VSBE Firm that the bidder/offeror concludes is not acceptable or qualified, a detailed statement of the reasons for the bidder's/offeror's conclusion, including the steps taken to verify the capabilities of the VSBE and Non-VSBE Firms quoting similar work.

2. For each certified VSBE Firm that the bidder/offeror concludes has provided an excessive or unreasonable price, a detailed statement of the reasons for the bidder's/offeror's conclusion, including the quotes received from all VSBE and Non-VSBE firms bidding on the same or comparable work. **(Include copies of all quotes received.)**

3. A list of VSBE Firms contacted but found to be unavailable. This list should be accompanied by a VSBE Unavailability Certificate **(see Exhibit A to this Part 1)** signed by the VSBE Firm or a statement from the bidder/offeror that the VSBE Firm refused to sign the VSBE Unavailability Certificate.

D. Other Documentation

1. Submit any other documentation requested by the Procurement Officer to ascertain the bidder's/offeror's Good Faith Efforts.

2. Submit any other documentation the bidder/offeror believes will help the Procurement Officer ascertain its Good Faith Efforts.

Exhibit A

DPSCS VSBE Subcontractor Unavailability Certificate

1. It is hereby certified that the firm of _____
(Name of VSBE firm)

located at _____
(Number) (Street) (City) (State) (Zip)

was offered an opportunity to bid on Solicitation No. _____ by

_____
(Name of Prime Contractor's Firm)

****

2. _____ (VSBE Firm) is either unavailable for the work/service or unable to prepare a bid for this project for the following reason(s):

_____

_____

_____

Printed Name of VSBE's Representative **Title**

Signature of VSBE's Representative **Date**

DUNS # **Telephone Phone**

3. To be completed by the prime contractor if Section 2 of this form is not completed by the minority firm.

To the best of my knowledge and belief, said Certified VSBE is either unavailable for the work/service for this project, is unable to prepare a bid, or did not respond to a request for a price proposal and has not completed the above portion of this submittal.

Printed Name of Prime Contractor's Representative **Title**

Signature of Prime Contractor's Representative **Date**

DEPARTMENT OF PUBLIC SAFETY & CORRECTIONAL SERVICES

GOOD FAITH EFFORT DOCUMENTATION TO SUPPORT WAIVER REQUEST

PAGE __ OF ___

Prime Contractor	Project Description	Solicitation Number
	Youth Detention Center at Baltimore City Detention Center (BCDC), Baltimore, Maryland	KT-000-150-C01

PARTS 1, 2, AND 3 MUST BE INCLUDED WITH THIS CERTIFICATE ALONG WITH ALL DOCUMENTS SUPPORTING YOUR WAIVER REQUEST.

I affirm that I have reviewed Attachment M-1B, Waiver Guidance. I further affirm under penalties of perjury that the contents of Parts 1, 2, and 3 of this Attachment M-1C Good Faith Efforts Documentation Form are true to the best of my knowledge, information, and belief.

_____ _____

Company Name Signature of Representative

_____ _____

Address Printed Name and Title

_____ _____

City, State and Zip Code Date

GOOD FAITH EFFORT DOCUMENTATION
TO SUPPORT WAIVER REQUEST

PART 1 – IDENTIFIED ITEMS OF WORK BIDDER/OFFEROR MADE AVAILABLE TO VETERAN-OWNED SMALL BUSINESS ENTERPRISE FIRMS

PAGE __ OF ___

Prime Contractor	Project Description	Solicitation Number
	Youth Detention Center at Baltimore City Detention Center (BCDC), Baltimore, Maryland	KT-000-150-C01

Identify those items of work that the bidder/offeror made available to VSBE Firms. This includes, where appropriate, those items the bidder/offeror identified and determined to subdivide into economically feasible units to facilitate the VSBE participation. For each item listed, show the anticipated percentage of the total contract amount. It is the bidder's/offeror's responsibility to demonstrate that sufficient work to meet the goal was made available to VSBE Firms, and the total percentage of the items of work identified for VSBE participation equals or exceeds the percentage VSBE goal set for the procurement. Note: If the procurement includes a list of bid items identified during the goal setting process as possible items of work for performance by VSBE Firms, the bidder/offeror should make all of those items of work available to VSBE Firms or explain why that item was not made available. If the bidder/offeror selects additional items of work to make available to VSBE Firms, those additional items should also be included below.

Identified Items of Work	Was this work listed in the procurement?	Does bidder/offeror normally self-perform this work?	Was this work made available to VSBE Firms? If no, explain why?
	□ Yes □ No	□ Yes □ No	□ Yes □ No
	□ Yes □ No	□ Yes □ No	□ Yes □ No
	□ Yes □ No	□ Yes □ No	□ Yes □ No
	□ Yes □ No	□ Yes □ No	□ Yes □ No
	□ Yes □ No	□ Yes □ No	□ Yes □ No
	□ Yes □ No	□ Yes □ No	□ Yes □ No
	□ Yes □ No	□ Yes □ No	□ Yes □ No
	□ Yes □ No	□ Yes □ No	□ Yes □ No
	□ Yes □ No	□ Yes □ No	□ Yes □ No
	□ Yes □ No	□ Yes □ No	□ Yes □ No

☐Please check if Additional Sheets are attached.

GOOD FAITH EFFORT DOCUMENTATION
TO SUPPORT WAIVER REQUEST
PART 2 – IDENTIFIED VSBE FIRMS AND RECORD OF SOLICITATIONS

PAGE __ OF ___

Prime Contractor	Project Description	Solicitation Number
	Youth Detention Center at Baltimore City Detention Center (BCDC), Baltimore, Maryland	KT-000-150-C01

Identify the VSBE Firms solicited to provide quotes for the Identified Items of Work made available for VSBE participation. Include the name of the VSBE Firm solicited, items of work for which bids/quotes were solicited, date and manner of initial and follow-up solicitations, whether the VSBE provided a quote, and whether the VSBE is being used to meet the VSBE participation goal. VSBE Firms used to meet the participation goal must be included on the VSBE Participation Schedule. Note: If the procurement includes a list of the VSBE Firms identified during the goal setting process as potentially available to perform the items of work, the bidder/offeror should solicit all of those VSBE Firms or explain why a specific VSBE was not solicited. If the bidder/offeror identifies additional VSBE Firms who may be available to perform Identified Items of Work, those additional VSBE Firms should also be included below. Copies of all written solicitations and documentation of follow-up calls to VSBE Firms must be attached to this form. This list should be accompanied by a VSBE Contractor Unavailability Certificate signed by the VSBE contractor or a statement from the bidder/offeror that the VSBE contractor refused to sign the VSBE Contractor Unavailability Certificate (see Exhibit A to VSBE Attachment M-1B). If the bidder/offeror used a Non-VSBE or is self-performing the identified items of work, Part 4 must be completed.

Name of Identified VSBE Firm & VSBE DUNS Number:	Describe Item of Work Solicited	Initial Solicitation Date & Method	Follow-up Solicitation Date & Method	Details for Follow-up Calls	Quote Rec'd	Quote Used	Reason Quote Rejected
Firm Name: ____________ **VSBE DUNS#:** ____________		Date: □ Mail □ Facsimile □ Email	Date: □ Phone □ Mail □ Facsimile □ Email	Time of Call: Spoke With: □ Left Message	□ Yes □ No	□ Yes □ No	□ Used Other VSBE □ Used Non-VSBE □ Self-performing
Firm Name: ____________ **VSBE DUNS#:** ____________		Date: □ Mail □ Facsimile □ Email	Date: □ Phone □ Mail □ Facsimile □ Email	Time of Call: Spoke With: □ Left Message	□ Yes □ No	□ Yes □ No	□ Used Other VSBE □ Used Non-VSBE □ Self-performing
Firm Name: ____________ **VSBE DUNS#:** ____________		Date: □ Mail □ Facsimile □ Email	Date: □ Phone □ Mail □ Facsimile □ Email	Time of Call: Spoke With: □ Left Message	□ Yes □ No	□ Yes □ No	□ Used Other VSBE □ Used Non-VSBE □ Self-performing
Firm Name: ____________ **VSBE DUNS#:** ____________		Date: □ Mail □ Facsimile □ Email	Date: □ Phone □ Mail □ Facsimile □ Email	Time of Call: Spoke With: □ Left Message	□ Yes □ No	□ Yes □ No	□ Used Other VSBE □ Used Non-VSBE □ Self-performing

☐Please check if Additional Sheets are attached.

GOOD FAITH EFFORT DOCUMENTATION
TO SUPPORT WAIVER REQUEST

PART 3 – ADDITIONAL INFORMATION REGARDING REJECTED VSBE QUOTES

PAGE __ OF ___

Prime Contractor	Project Description	Solicitation Number
	Youth Detention Center at Baltimore City Detention Center (BCDC), Baltimore, Maryland	KT-000-150-C01

This form must be completed if Part 1 indicates that a VSBE quote was rejected because the bidder/offeror is using a Non-VSBE or is self-performing the Identified Items of Work. Provide the Identified Items Work, indicate whether the work will be self-performed or performed by a Non-VSBE, and if applicable, state the name of the Non-VSBE. Also include the names of all VSBE and Non-VSBE Firms that provided a quote and the amount of each quote.

Describe Identified Items of Work Not Being Performed by VSBE (Include spec/section number from bid)	Self-performing or Using Non-VSBE (Provide name)	Amount of Non-VSBE Quote	Name of Other Firms who Provided Quotes & Whether VSBE or Non-VSBE	Amount Quoted	Indicate Reason Why VSBE Quote Rejected & Briefly Explain
	□ Self-performing □ Using Non-VSBE _____	$_____	_____ □ VSBE □ Non-VSBE	$_____	□ Price □ Capabilities □ Other
	□ Self-performing □ Using Non-VSBE _____	$_____	_____ □ VSBE □ Non- VSBE	$_____	□ Price □ Capabilities □ Other
	□ Self-performing □ Using Non-VSBE _____	$_____	_____ □ VSBE □ Non- VSBE	$_____	□ Price □ Capabilities □ Other
	□ Self-performing □ Using Non- VSBE _____	$_____	_____ □ VSBE □ Non- VSBE	$_____	□ Price □ Capabilities □ Other
	□ Self-performing □ Using Non- VSBE _____	$_____	_____ □ VSBE □ Non- VSBE	$_____	□ Price □ Capabilities □ Other
	□ Self-performing □ Using Non- VSBE _____	$_____	_____ □ VSBE □ Non- VSBE	$_____	□ Price □ Capabilities □ Other

☐Please check if Additional Sheets are attached.

DEPARTMENT OF PUBLIC SAFETY & CORRECTIONAL SERVICES
VSBE SUBCONTRACTOR PROJECT PARTICIPATION CERTIFICATION

PLEASE COMPLETE AND SUBMIT ONE FORM FOR EACH CERTIFIED VSBE FIRM LISTED ON THE VSBE PARTICIPATION SCHEDULE (ATTACHMENT M-1A) WITHIN 10 WORKING DAYS OF NOTIFICATION OF APPARENT AWARD. IF THE BIDDER/OFFEROR FAILS TO RETURN THIS AFFIDAVIT WITHIN THE REQUIRED TIME, THE PROCUREMENT OFFICER MAY DETERMINE THAT THE BIDDER/OFFEROR IS NOT RESPONSIBLE AND THEREFORE NOT ELIGIBLE FOR CONTRACT AWARD.

Provided that _____ (Prime Contractor's Name) is awarded the State contract in conjunction with Solicitation No. . _____MDQ0031018235_____, such Prime Contractor intends to enter into a subcontract with _____(Subcontractor's Name) committing to participation by the VSBE firm _____ (VSBE Name) with DUNS Number _____ which will receive at least $_____ which equals to___% of the Total Contract Amount for performing the following products/services for the Contract:_____.

NAICS CODE	WORK ITEM, SPECIFICATION NUMBER, LINE ITEMS OR WORK CATEGORIES (IF APPLICABLE)	DESCRIPTION OF SPECIFIC PRODUCTS AND/OR SERVICES

Each of the Contractor and Subcontractor acknowledges that, for purposes of determining the accuracy of the information provided herein, the Procurement Officer may request additional information, including, without limitation, copies of the subcontract agreements and quotes. Each of the Contractor and Subcontractor solemnly affirms under the penalties of perjury that: (i) the information provided in this VSBE Subcontractor Project Participation Affidavit is true to the best of its knowledge, information and belief, and (ii) has fully complied with the State Minority Business Enterprise law, State Finance and Procurement Article §14-308(a)(2), Annotated Code of Maryland which provides that, except as otherwise provided by law, a contractor may not identify a certified minority business enterprise in a Bid/Proposal and:

(1) fail to request, receive, or otherwise obtain authorization from the certified Veteran-Owned Small Business Enterprise to identify the Veteran-Owned Small Business Enterprise in its Bid/Proposal;

(2) fail to notify the Veteran-Owned Small Business Enterprise before execution of the Contract of its inclusion of the Bid/Proposal;

(3) fail to use the Veteran-Owned Small Business Enterprise in the performance of the Contract; or

(4) pay the Veteran-Owned Small Business Enterprise solely for the use of its name in the Bid/Proposal.

PRIME CONTRACTOR

Signature of Representative:_____

Printed Name and Title:_____

_____

Firm's Name: _____

Federal Identification Number: _____

Address: _____

_____

Telephone: _____ Email: _____

Date: _____

VSBE SUBCONTRACTOR

Signature of Representative:_____

Printed Name and Title:_____

_____

Firm's Name: _____

Federal Identification Number: _____

Address: _____

_____

Telephone: _____ Email: _____

Date: _____

DEPARTMENT OF PUBLIC SAFETY & CORRECTIONAL SERVICES
VSBE OUTREACH EFFORTS COMPLIANCE STATEMENT

Complete and submit this form within ten (10) working days of notification of apparent award or actual award, whichever is earlier.

In conjunction with the bid/proposal submitted in response to Solicitation No. MDQ0031018235, I state the following:

1. Bidder/Offeror identified subcontracting opportunities in these specific work categories:
_____
_____
_____

2. Attached to this form are copies of written solicitations (with bidding/proposal instructions) used to solicit certified VSBE firms for these subcontract opportunities.

3. Bidder/Offeror made the following attempts to personally contact the solicited VA Certified VSBE firms: _____

_____

4. **Please Check One:**

☐ This project does not involve bonding requirements.

☐ Bidder/Offeror assisted MDOT-certified VSBE firms to fulfill or seek waiver of bonding requirements. (DESCRIBE EFFORTS):
_____
_____
_____

5. **Please Check One:**

☐ Bidder/Offeror did attend the pre-bid/pre-proposal conference.

☐ No pre-bid/pre-proposal meeting/conference was held.

☐ Bidder/Offeror did not attend the pre-bid/pre-proposal conference.

_____ _____
Company Name Signature of Representative

_____ _____
Address Printed Name and Title

_____ _____
City, State and Zip Code Date

DPSCS OS 14 MBE

Submit this form within 10 working days of notification of apparent award.

PROPOSED CHANGE ORDER (PCO)
COVER SHEET

PCO No.: _____ Date: _____

From: _____(Contractor)

Project No.: _____

Project Title: _____

Facility: _____

1. PURPOSE OF PCO COVER SHEET; ISSUANCE OF ORDER BY PROCUREMENT OFFICER:

(a) The purpose of this Cover Sheet is to expedite payment to the contractor by making it necessary for DPSCS and the contractor to both sign a change order and send it through the mail after the contractor has submitted an acceptable Proposed Change Order ("PCO"). Contractor's submission of this PCO constitutes contractor's promise to perform the work or otherwise to adjust contract requirements in accordance with this PCO as it may be accepted by the Procurement Officer. As explained in (b) and (c) below, upon receipt of this PCO and all necessary approvals, the Procurement Officer may issue a change order to the Contractor in the form of a BPO Change Order (the "Change Order") to perform the work covered by this PCO subject to any modifications made by the Procurement Officer. No other signatures or documents will be required.

(b) If the Procurement Officer accepts the PCO without modification, the Procurement Officer may issue the Change Order accepting the PCO. The PCO signed by the contractor and the Change Order signed by the Procurement Officer then become the binding, bilateral change order between the parties under Section 3.06 of the General Conditions of the contract.

(c) If the PCO is not acceptable as submitted, the Procurement Officer may issue the Change Order modifying the PCO submitted by the contractor. Upon issuance of such a Change Order, it becomes a binding unilateral order or the Procurement Officer under Section 3.06 of the General Conditions of the Contract.

2. CERTIFICATION:

(a) Contractor certifies that, to the best of its knowledge, the information submitted in this PCO is accurate, complete, and current as of the date of this PCO. The price, including profit or fee, under any change order issued in response to this PCO shall be adjusted to exclude any significant cost or price information which, as of the date of this PCO, was inaccurate, incomplete, or not current.

(b) Contractor further certifies that all calculations of amounts requested under this PCO have been calculated in strict accordance with the terms and conditions of the contract (including the general Conditions) and applicable law.

Contractor's address and
telephone number:

_____
_____
_____
_____
_____

CONTRACTOR

_____
(Name)

By: _____
(Name of individual signing for Contractor)

_____
(Title/capacity of person signing)

Form date: 8/9/02

CHANGE ORDER
STATE OF MARYLAND • DEPARTMENT OF PUBLIC SAFETY & CORRECTIONAL SERVICES
DIVISION OF CAPITAL CONSTRUCTION & FACILITIES MAINTENANCE

Change Order # _____ To Contract No: _____

Change Order Issue Date: _____ Purchase Order No: _____

Contract Date: _____

Between the State of Maryland ("State") and _____

_____ ("Contractor"),

for _____

_____

1. DESCRIPTION OF WORK: Contractor is ordered under Section 3.06 of the General Conditions to furnish or delete the following work, labor, materials, equipment, services, tools, etc. ("Work") or to modify the contract terms in accordance with the terms and conditions of this order and the contract between the parties which, except as expressly modified herein, remains in full force and effect:

MODIFICATION: **(Purchase Order Numbers must be submitted on your invoice along with your FEI number).**

This order is further subject to the conditions stated in paragraphs 3A, B, and C on the reverse side of this order.

2. COMPENSATIONS, TIME EXTENSIONS, ETC. [check one]

A. ☐ **[Work/contract terms already required by the contract]**
The state considers the Work or matters which are the subject of this order be required by the contract. The State will not pay the Contractor any additional compensation and the contract time will not be extended.

B. ☐ **[Additional Work or contract terms partly or wholly outside the contract]**
The State agrees to pay the Contractor the compensation shown below (see D) for the Work or change in contract terms which are the subject of this order.
The contract time _____ Will not be extended
_____ Will be extended _____ days.
for the work or change which is the subject of this order.

C. ☐ **[Credit change order]**
For the deleted Work or change in contract terms, the contract amount will be reduced by the amount shown in D the and contract time _____ Will not be reduced
_____ Will be reduced _____ days.

D.
AMOUNT OF THIS CHANGE ORDER: $ _____
ORIGINAL CONTRACT AMOUNT: $ _____
TOTAL AMOUNT OF PREVIOUS CHANGE ORDERS: $ _____
NEW TOTAL - CONTRACT AMOUNT: $ _____

DEPARTMENT OF PUBLIC SAFETY & CORRECTIONAL SERVICES

By: _____
Procurement Officer

ACCEPTED BY CONTRACTOR ON THE TERMS AND CONDITIONS STATED _____
Contractor name

Witness/ (SEAL)
Attest: _____ By: _____
Signature

Date: _____ _____
Title

Approved: Board of Public Works _____
PSPRB Review Board _____ Date: _____ Item _____

3. TERMS AND CONDITIONS.

A. Acceptance by the Contractor of the terms and conditions of this change order constitutes a full accord and satisfaction between the State and the Contractor for all costs, compensation, and time of performance related to or arising out of the Work which is the subject of this order, including but not limited to delay and impact cost. "NTE", if used in 2D on the front of this order, means the contract amount will be increased or reduced as indicated in 2B or 2C, by a reasonable amount of compensation not to exceed the amount stated in 2D.

B. If the contractor wishes to dispute the terms of this order ("dispute" includes filing a claim based on this order), Contractor must do so in strict accordance with the requirement of the contract. If Contractor wishes to dispute this order, Contractor may file notice of its claim (subject to C Below) by signing below and returning an original of this order to DPSCS. Contractor may file notice of a claim or otherwise dispute the terms of this order by any other means meeting contract requirements. Whether this order is accepted or disputed, the Contractor must proceed diligently with the performance of the contract, including the terms of this order.

C. The State reserves all rights, defenses and counterclaims to any claim or dispute initiated by the Contractor as a result of or arising out of this order or the Work which is the subject of this order. Nothing in this order constitutes release or waiver by DPSCS of any failure of the Contractor to act prior to the date of this order, or prior to the date of actual filing by contractor of a notice of claim or dispute over the terms of this order, in strict accordance with requirements of the contract, including but not limited to requirements respecting the form and timeliness of filing (1) notice of condition or events, (2) notice of a claim and (3) the claim itself.

DISPUTED BY CONTRACTOR:

Date: _____ _____
Contractor Name

By: _____
Signature

_____
Title

SECTION 004750

STATE OF MARYLAND
DEPARTMENT OF PUBLIC SAFETY AND CORRECTIONAL SERVICES

BUSINESSES & PERSONS SUSPENDED OR DEBARRED FROM DOING BUSINESS WITH A PUBLIC BODY AND/OR THE STATE

SECTION 00 47 50 – BUSINESSES & PERSONS SUSPENDED OR DEBARRED FROM DOING BUSINESS WITH A PUBLIC BODY AND/OR THE STATE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. This section is subject to the State of Maryland Department of Public Safety and Correctional Services General Conditions of the Contact between Owner and Contractor.

B. The Contractor shall have verified through examination of the Board of Public Works most current public listing of Businesses & Persons Suspended or Debarred that No Businesses and/or Persons identified therein have been included on the Contractor's Construction Team or have provided Bid price information to the Contractor for use in Bid Submission.

C. Other Debarments:

1. A list of contractor(s) prohibited from entering into public work construction contracts due to violations of prevailing-wage requirements [Maryland Code, State Finance and Procurement Article, Section 17-226] appears periodically in the Contract Weekly and is on file with the Secretary of State. The Contractor shall follow the updates and not allow listed entities to work on this Contract.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION

3.1 **BUSINESSES AND PERSONS SUSPENDED OR DEBARRED (ATTACHED)**

END OF SECTION 004750

Contractors Barred from Doing Business with Maryland Government

Companies Engaged in Investment Activities in Iran

The following persons* are ineligible to contract with public bodies in the State of Maryland.

Bharat Petroleum Corporation Ltd.
China Communications Construction Company Ltd.
China National Petroleum Corporation
Daelim
FAL Oil Company Ltd.
Indian Oil Corporation Ltd.
India Limited
Naftiran Oil
Sasol Limited
Shanghai Zhenhua Heavy Industry Company Ltd.
Sinopec Group

* “Person” includes:

(1) a natural person, corporation, company, limited liability company, business association, partnership, society, trust, or any other nongovernmental entity, organization, or group;
(2) a governmental entity or instrumentality of a government, including a multilateral development institution, as dened by the federal International Financial Institutions Act, 22 U.S.C. 262r(c)(3); or
(3) any parent, successor, subunit, direct or indirect subsidiary of, or any entity under common ownership or control with, an entity described in item (1) or (2) above.

As determined by the Board of Public Works, Secretary’s Agenda, Item 3 (December 19, 2012).
Authority: State Finance and Procurement Article, §17-704, Annotated Code of Maryland

Debarments

The persons and companies listed below are barred from doing business with a public body in the State of Maryland.

PERSON/COMPANY	TERM
George F. Alinsod	**Indefinitely**
Joseph D. Cheek	**Indefinitely**
Polar Bear Heating and Air Conditioning Co. Inc.	**Indefinitely**

David J. Clemons	Indefinitely
Classic Construction, Inc.	Indefinitely
Michael Wilson, President, Classic Construction, Inc.	Indefinitely
Computer Health Associates, Inc.	Indefinitely
Floyd W. Dearborn	Indefinitely
John L. Dutkevich	Indefinitely
Elcontrol, Inc.	Indefinitely
ETF, Inc.	Indefinitely
Alan L. Giseman	Indefinitely
David F. Graciano	Indefinitely
J&M Construction Company	Indefinitely
James M. Myers, President & Owner, J&M Construction Co.	Indefinitely
Terry Myers, Secretary & Treasurer, J&M Construction Co.	Indefinitely
K&L Truck Equipment Company	Indefinitely
Keith E. Graham, President, K&L Truck Equipment Co.	Indefinitely
Laurel Associates, Inc.	Indefinitely
Edward Marcus	Indefinitely
Montgomery Mechanical Services and Richard Stewart	Indefinitely
Charles Morris	Indefinitely
Andrew M. Reider	Indefinitely
Allstate Boiler Service	Indefinitely
Dennis Roberts	Indefinitely
Gilbert Sapperstein	Indefinitely
Edward J. Simmons	Indefinitely
Patrick R. Sisk	Indefinitely
Richard Stewart and Montgomery Mechanical Services	Indefinitely
Dwight Walker, Jr.	Indefinitely
Scott Allan Wallick	Indefinitely

The persons and companies listed below are barred from doing business with the State.

PERSON/COMPANY	TERM
Adler Services Group, Inc.	Indefinitely
Harvey Adler	Indefinitely
Belford Associates, Inc.	Indefinitely
Mary Patricia Bromwell	Indefinitely
Thomas L. Bromwell, Sr	Indefinitely
Lawrence E. Slavin, owner/president, Belford Associates, Inc.	Indefinitely
Columbia Elevator Co., Inc.	Indefinitely
Rodney R. Ripke, President, Columbia Elevator Co., Inc.	Indefinitely
Alan B. Fabian	Indefinitely
Metal Fabricators, Inc.	Indefinitely
Geraldine E. Forti	Indefinitely
Michael C. Forti	Indefinitely
Jerry J. Hoppe, owner, Metal Fabricators, Inc.	Indefinitely
Vasilios Hatzianoglou (A.K.A. William Hatzi, A.K.A. Bill Hatzi)	Indefinitely
Registered trade names associated with Mr. Hatzianoglou: Power Dynamics [NOT Power Dynamics Corporation], Pallini Co. and Vastec. Co.	Indefinitely
Eva Hatzianoglou	Indefinitely
Ronald High	Indefinitely
Tasaduq S. Husain	Indefinitely
Gary Jefferson	Indefinitely
Larry E. Jennings, Sr.	Indefinitely
Park Technology, Inc.	Indefinitely
Andrew D. Park, President, Park Technology, Inc.	Indefinitely
W. David Stoffregen	Indefinitely
Scott Reiter	Indefinitely
Stone Cold Chemicals	Indefinitely
Lloyd Barnard (Officer SCC)	Indefinitely
Pamela McDaniel (Officer SCC)	Indefinitely

Marilyn Meek (Officer SCC)	**Indefinitely**
Thomas Stone (Officer SCC)	**Indefinitely**
Trans-Eastern Inspection Services	**Indefinitely**
Athanasios Reglas*	**Indefinitely**
Lynn Shepard, President, Trans Eastern Inspection Services	**Indefinitely**
Christopher J. Vanover	**Indefinitely**
Val Construction Co., Inc.	**Indefinitely**
Valencio J. Pires	**Indefinitely**

* The State will not seek debarment of the company, Reglas Painting, Inc. if Athanasios Reglas does not serve as officer, director, controlling shareholder, partner or employee directly involved in the process of obtaining contracts with public bodies on behalf of the company for the term of his debarment.

The person/companies listed below have agreed not to do business with the State in lieu of debarment.

PERSON/COMPANY	TERM
Michael Harper	**from 2/24/10 to 2/25/15**
William Frank Woolford	**from 2/24/10 to 2/25/15**

Other Debarments

The Commissioner of Labor and Industry files with the Secretary of State a list of contractor(s) who persistently and willfully violate the prevailing-wage statute. Any contractor appearing on that list is prohibited from entering into public work construction contacts for a period of two years from the day on which the list is filed. [Maryland Code, State Finance and Procurement Article, Section 17-226]

SECTION 005000

PROJECT DIRECTORY

SECTION 005000 - PROJECT DIRECTORY

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Directory of the Department of Public Safety and Correctional Services, Architect/Engineer Design Team, State Agencies/Authorities and Utility Companies.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions.

1.3 RELATED SECTIONS

A. Division 1 Specification Sections.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION

3.1 **PROJECT DIRECTORY:**

OWNER / USER				
Maryland Department of Public Safety and Correctional Services (DPSCS) 6776 Reisterstown Road, Suite 201 Baltimore, Maryland 21215				
Name	**Firm / Agency / Department**	**Position / Specialty / Discipline**	**email**	**Phone #**
David Bezanson	DPSCS	Assistant Secretary	dbezanson@dpscs.state.md.us	410-339-5068
Wendell France	DPSCS/DPDS	Executive Director, Central Region	wfrance@dpscs.state.md.us	410-209-4290
Carolyn Atkins	DPSCS	Director of Detention, Central Region	caatkins@dpscs.state.md.us	410-209-4299
Daniel Kelley	DPSCS	Director of Operations & Facility Maintenance, Central Region	dkelley2@dpscs.state.md.us	410-209-4109
Maria Maximo-Sabundayo	DPSCS	Director, Food Service	mmaximosabundayo@dpscs.state.md.us	410-365-4103
DPSCS / DCCFM: Division of Capital Construction and Facilities Maintenance				

Carl Lazerow	DPSCS/DCCFM	Director, DCCFM	cllazerow@dpscs.state.md.us	410-585-3027
Benedict Leibowitz	DPSCS/DCCFM	Assistant Director, DCCFM	bleibowitz@dpscs.state.md.us	410-585-3031
Bharath Kortagere	DPSCS/DCCFM	Agency Mechanical Engineer, DCCFM	bckortagere@dpscs.state.md.us	410-585-3033
Kate Dixon	DPSCS/DCCFM	Lead Agency Architect, DCCFM	kzdixon@dpscs.state.md.us	410-585-3035
Chrys Bandon-Bibum	DPSCS/DCCFM	Assistant Director, Construction Operations, DCCFM	cbandon-bibum@dpscs.state.md.us	410-585-3041 443-463-9035(c)
Andreana Aytch	DPSCS/DCCFM	Document Control – Bid Documents	aaytch@dpscs.state.md.us	410-585-3021
DPSCS / NETWORK OPERATIONS				
Arthur Ray	DPSCS	Network Operations (IT, Voice, Data)	aray3@dpscs.state.md.us	410-585-2929
Peter Kanaras	DPSCS	Network Operations (IT, Voice, Data)	pkanaras@dpscs.state.md.us	410.585.3047
BALTIMORE CITY PUBLIC SCHOOLS				
Laura D'Anna	BCPSS	Principal, Eager Street Academy	ldanna@bcps.k12.md.us	410-209-4091
DJS				
Errol Hurtt	DJS	Assistant Director of Capital Planning	errol.hurtt@maryland.gov	410-230-3162

A/E TEAM

ARCHITECTURE
PSA-Dewberry + Penza Bailey Architects, a *Joint Venture*

Name	Firm / Agency / Department	Position / Specialty / Discipline	email	Phone #
Dan Bailey	Penza Bailey Architects	Project Principal Contract Administrator	dbailey@penzabailey.com	410-435-6677
ARCHITECT **DEWBERRY ARCHITECTS** 401 SW Water Street, Ste. 701 Peoria, IL 61602-1530				
Chad DeWeese	PSA-Dewberry	Project Manager	cdeweese@dewberry.com	309-282-8100
ARCHITECT **PENZA BAILEY ARCHITECTS** 401 Woodbourne Ave Baltimore, MD 21212				
Laurie Dickeson	Penza Bailey Architects	Project Architect PBA	ldickeson@penzabailey.com	410-435-6677
SECURITY ELECTRONICS **Dewberry** 401 SW Water Street #701 Peoria, IL 61602				
Tim Smith	PSA-Dewberry	Security	tsmith@dewberry.com	309-282-8000
MECHANICAL, PLUMBING & FIRE PROTECTION ENGINEERING **ELECTRICAL ENGINEERING, TELECOMMUNICATIONS, IT, MATV/CATV** **Sidhu Associates, Inc.** 11350 McCormick Drive #1000 Hunt Valley, MD 21031				
Dexter O'Neil	Sidhu Associates	Project Manager, Mechanical	oneild@sidhuai.com	410-329-1115
K K Sidhu	Sidhu Associates	Project Manager Electrical/IT	kks@sidhuai.com	410-329-1115
Mario Bonsignore	Sidhu Associates	Project Manager, Electrical/IT	bonsignorem@sidhuai.com	410-329-1115
STRUCTURAL ENGINEERING **Hope Furrer Associates, Inc.** 501 Fairmount Ave. Suite 205 Towson, MD 21286				
Melissa Harmon	Hope Furrer Associates	Project Manager Structural	mharmon@hfurrer.com	410-583-4874

CIVIL ENGINEERING **EBA Engineering, Inc.** 4813 Seton Drive Baltimore, MD 21215				
Harish Patel	EBA Engineering	Principal Civil/Geotechnical/ Environmental	harish.patel@ebaengineering.com	410-358-7171
John Walker	EBA Engineering	Civil Engineer	john.walker@ebaengineering.com	410-358-7171
GEOTECHNICAL **EBA Engineering, Inc.** 4813 Seton Drive Baltimore, MD 21215				
Steve Diggins	EBA Engineering	Geotechnical	steve.diggins@ebaengineering.com	410-358-7171
ENVIRONMENTAL ENGINEERING **EBA Engineering, Inc.** 4813 Seton Drive Baltimore, MD 21215				
James P. Sines	EBA Engineering	Environmental	james.sines@ebaengineering.com	410-358-7171
FOOD & LAUNDRY SERVICE **R & R Designer, Inc.** 25 S. Dove Street Alexandria, VA 22314				
Vishwal Dalal	R&R designers	Food/Laundry Service	vishwal@randrdesigner.com	703-370-8613
LEED **TerraLogos: eco architecture, pc** 2901 E. Baltimore Street, Suite 300 Baltimore, MD 21224				
Kim Schaefer	TerraLogos	Sustainability Consultant-LEED Coordinator	kims@terralogos.com	410-276-8519
Peter Doo	Doo Consulting	Associate LEED Coordinator	peter@dooconsulting.net	443-463-5859
SURVEY **Dewberry & Davis, LLC** 3106 Lord Baltimore Drive Baltimore, MD 21244				
Lisa Betz	Dewberry	Survey	lbetz@dewberry.com	410-645-1402
LANDSCAPE ARCHITECT **P.E.L.A. Design, Inc.** 7400 York Road, Suite 403 Towson, MD 21204				

Liling Tien	P.E.L.A. Design	Project Manager	liling@peladesign.com	410-296-3990

REVIEW AGENCIES & UTILITIES				
Name	**Firm / Agency / Department**	**Position / Specialty / Discipline**	**email**	**Phone #**
State Fire Marshall				
Charles J. Giblin III	State Fire Marshal	Fire Protection Engineer	charles.giblin@maryland.gov	410-653-8977
Electricity & Gas				
James L McEachern	BGE	Sr Engineering Analyst	james.l.mceachern@bge.com	410-265-4033
Telephone				
Bill Blomeier	Verizon	Baltimore City Conduit	william.j.blomeier@verizon.com	410-339-6370
State of Maryland Department of the Environment				
Amanda Malcolm	Sediment and SW Plan Review Division	Acting Chief	amanda.malcolm@maryland.gov	410-537-3551
State of Maryland Department of Health and Mental Hygiene				
Carolann Liszewski	DHMH, Center for Retail Food Plan & Process Review	Regional Sanitarian	cliszewski@dhmh.state.md.us	410-767-8401
Forest Conservation				
Jahmilla Wilson	Baltimore City Forestry Division	Acting Planting Coordinator	jahmilla.wilson@baltimorecity.gov	410-396-6109
Developer's Agreement				
David Framm	Baltimore City DGS	Right-of-Way Section	david.framm@baltimorecity.gov	410-396-3667

END OF SECTION 00 50 00

SECTION 006000

LIST OF DRAWINGS

SECTION 006000 - LIST OF DRAWINGS

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EL120	SECOND LEVEL PLAN - LIGHTING
EL120A	SECOND LEVEL PLAN - LIGHTING - AREA A
EL120B	SECOND LEVEL PLAN - LIGHTING - AREA B AND C
EL121	MEZZANINE LEVEL PLAN - LIGHTING - AREA A
EL130	THIRD LEVEL PLAN - LIGHTING
EP100	BASEMENT LEVEL PLAN - POWER
EP110	MAIN LEVEL PLAN - POWER
EP110A	MAIN LEVEL PLAN - POWER - AREA A
EP110B	MAIN LEVEL PLAN - POWER - AREA B AND C
EP120	SECOND LEVEL PLAN - POWER
EP120A	SECOND LEVEL PLAN - POWER - AREA A
EP120B	SECOND LEVEL PLAN - POWER - AREA B AND C
EP121	MEZZANINE LEVEL PLAN - POWER - AREA A
EP130	THIRD LEVEL PLAN - POWER
EP140	ROOF AND CLERESTORY PLAN - POWER
ES100	SITE PLAN ELECTRICAL UTILITIES
ES110	SITE PLAN ELECTRICAL UTILITIES - DETAILS
ES111	PART PLAN SITE / DORMATORY BUILDING
ES112	EXTERIOR ELEVATION
EY100	BASEMENT LEVEL PLAN - SYSTEMS
EY110	MAIN LEVEL PLAN - SYSTEMS
EY110A	MAIN LEVEL PLAN - SYSTEMS - AREA A
EY110B	MAIN LEVEL PLAN - SYSTEMS - AREA B AND C
EY120	SECOND LEVEL PLAN - SYSTEMS
EY120A	SECOND LEVEL PLAN - SYSTEMS - AREA A
EY120B	SECOND LEVEL PLAN - SYSTEMS - AREA B AND C
EY121	MEZZANINE LEVEL PLAN - SYSTEMS - AREA A
EY130	THIRD LEVEL PLAN - SYSTEMS - AREA A
EY131	THIRD LEVEL PLAN - SYSTEMS - AREA B AND C
E400	ELECTRICAL SINGLE-LINE DIAGRAM PART 1
E401	ELECTRICAL SINGLE-LINE DIAGRAM PART 2

E402	ELECTRICAL SINGLE-LINE DIAGRAM PART 3
E403	ELECTRICAL SINGLE-LINE DIAGRAM - DEMOLITION
E404	SPECIAL SYSTEMS RISER DIAGRAMS
E405	FIRE ALARM RISER DIAGRAM
E406	F.A. GRAPHIC ANNUNCIATOR - PART 1
E407	F.A. GRAPHIC ANNUNCIATOR - PART 2
E408	ELECTRICAL DETAILS
E500	LIGHTING FIXTURE SCHEDULE
E530	PANELBOARD SCHEDULES
E531	PANELBOARD SCHEDULES
E532	PANELBOARD SCHEDULES
E533	PANELBOARD SCHEDULES
E534	PANELBOARD SCHEDULES
E535	PANELBOARD SCHEDULES
E536	PANELBOARD SCHEDULES
E537	PANELBOARD SCHEDULES
E538	PANELBOARD SCHEDULES
E539	PANELBOARD SCHEDULES
E540	PANELBOARD SCHEDULES
E541	SWITCHBOARD SCHEDULE
E542	LIGHTING RELAY PANEL SCHEDULES

TECHNOLOGY

TY-001	SECURITY SYMBOL MATRIX
TY-002	SECURITY SYMBOL NOTES
TY-100	SECURITY - SITE PLAN
TY-110A	FIRST FLOOR PLAN AREA A - SECURITY
TY-110B	FIRST FLOOR PLAN AREA B - SECURITY
TY-120A	SECOND FLOOR PLAN AREA A - SECURITY
TY-120B	SECOND FLOOR PLAN AREA B - SECURITY
TY-130A	SECOND FLOOR PLAN & MEZZ PLAN - SECURITY
TY-130B	THIRD FLOOR PLAN - SECURITY
TY-140A	ROOF PLAN AREA A - SECURITY
TY-301	ENLARGED PLANS - SECURITY
TY-302	ENLARGED PLANS - SECURITY
TY-303	ENLARGED PLANS - SECURITY
TY-304	ENLARGED PLANS - SECURITY
TY-400	CAMERA SCHEDULE
TY-501	SECURITY DETAILS
TY-502	SECURITY DETAILS
TY-503	SECURITY DETAILS
TY-601	SECURITY BLOCK DIAGRAMS

END OF SECTION 00 60 00

SECTION 00 73 19 - HEALTH AND SAFETY REQUIREMENTS

PART 1 - GENERAL

1.1 SCOPE

A. Work Includes:

1. The work covered by this Section includes the requirements for a Health & Safety Plan (HASP) that covers hazards for all work to be performed on site. The Contractor shall be responsible for ensuring compliance with the provisions of the applicable occupational safety and health statutes and regulations of the State of Maryland and the U.S. Department of Labor, Occupational Safety and Health Administration (OSHA). Further, the Contractor shall ensure that all methods of performing the work do not involve danger to the personnel employed thereon, other contractors at the site, and the general public whether or not these methods are cited in the contract documents.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, apply to this Section.

B. Limited Hazardous Materials Survey, Youth Detention Center Project, DPSCS #KT-000-110-C01, 926 Greenmount Avenue, Baltimore, Maryland 21202, dated December 24, 2014, EBA Engineering, Inc.

1.3 REFERENCES AND APPLICABLE STANDARDS AND GUIDELINES

A. The most recent edition of a relevant regulation, standard, or code shall be in effect. Where a conflict exists between the regulations, standards, codes, or these specifications, the more stringent requirements shall be utilized.

B. It shall be the duty and responsibility of the General Contractor and all of its Subcontractors to adhere to all regulations (Federal, State, and local) impacting this work including but not limited to:

1. Federal:

a. U.S. Department of Labor, Occupational Safety and Health Administration (OSHA)

1) 29 CFR 1910 – Occupational Safety and Health Standards (General Industry)

2) 29 CFR 1926 – Safety and Health Regulations for Construction

2. State:

   a. Code of Maryland Regulations (COMAR)

      1) COMAR 09.12.20 – Occupational Safety and Health

      2) COMAR 09.12.33 – Maryland Occupational Safety and Health Regulations for Access to Information About Hazardous and Toxic Substances

      3) COMAR 09.12.35 – Maryland Occupational Safety and Health Standard for Confined Spaces

1.4 SUBMITTALS

A. Prior to commencement of work, submit to the Engineer the items listed as follows for review. Work shall not start until these submittals are returned with the Engineer's written approval indicating that the submittal is returned for unrestricted use.

   1. Qualifications of the Health Safety Officer (HSO) and the Site Health and Safety Coordinator (SHSC). Upon award of contract submit a resume and applicable certifications for the HSO and the SHSC. Refer to Item 3.3 for additional information regarding personnel qualifications.

   2. Health and Safety Plan (HASP) – Submit a HASP that has been reviewed, signed, and sealed by the HSO at least 30 days before commencement of field activities, for review and comment. Comments on the Contractor's HASP and any modifications thereto will be provided, but the HASP will not be approved until the Contractor has received and addressed comments on the HASP. The Contractor shall not mobilize to the site without an approved HASP unless otherwise indicated by the Engineer.

B. During work, the Contractor shall submit the following:

   1. Site specific safety training for each worker must be provided before the first day that the worker will be on site. A copy of training documentation shall be submitted to the Engineer whenever workers are trained. Refer to Item 3.5 for additional information regarding training.

   2. A weekly safety inspection, a record of any samples collected, and any laboratory results received shall be available on-site at all times and submitted weekly to the Engineer.

   3. An incident report shall be submitted to the Owner or Owner's Representative immediately upon completion (or partial completion) but at the latest within 24 hours after the incident for each incident resulting in injury requiring medical attention to workers or the public, or property damage greater than $500.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.1 HEALTH AND SAFETY PERSONNEL RESPONSIBILITIES

A. Health and Safety Officer (HSO): The HSO has ultimate responsibility for the development of the health and safety plan and evaluation of its implementation and effectiveness. The SHSC will immediately report to the HSO any changes in site conditions or required modifications to the HASP. The HSO will provide guidance and instruction to the SHSC and must approve any modifications to the health and safety plan. The HSO shall approve submittals, and be available to assist in resolving health and safety issues, investigate incidents, and attend project management meetings.

B. Site Health and Safety Coordinator (SHSC): The Contractor shall designate a SHSC. The SHSC shall be present during all activities, make safety observations daily, and shall perform and document a weekly safety inspection. The SHSC has the primary responsibility for:

1. Supervising environmental monitoring, evaluating on-site conditions and implementing modifications to the HASP with concurrence from the Contractor's HSO.

2. Assessing compliance with the HASP.

3. Ensuring that all personnel entering the site are aware of the potential hazards and the provisions of the Contractor's HASP and are familiar with all site-specific emergency procedures.

4. Ensure that personal protective equipment (PPE) is available and properly used by all personnel.

5. Determining that all Contractor personnel entering the site have received proper health and safety training for this project and are familiar with all personal protection equipment required by this Plan.

6. Halting work, if necessary, in consultation with the Contractor's HSO.

C. Field Personnel: Field personnel including a site superintendent(s) and site workers shall know and understand the requirements of the HASP. They shall comply with all requirements of the plan.

3.2 REGULATOR SITE VISIT

A. If a regulator for health, safety, or environment requests permission to inspect the site, the inspection shall be delayed until the Engineer or consultant to the Engineer can be present.

3.3 PERSONNEL QUALIFICATIONS

A. Health and Safety Officer: The HSO will be a Certified Industrial Hygienist (CIH) with experience in construction and in good standing with the American Board of Industrial

Hygiene, or a Certified Safety Professional (CSP) with experience in construction and in good standing with the Board of Certified Safety Professionals.

B. Site Health and Safety Coordinator(s) (SHSCs): The SHSCs shall have specialized training and experience in construction safety supervision and have a thorough knowledge of OSHA regulations. The SHSCs shall have performed these duties for a minimum of 3 similar projects. Minimum training shall include:

1. Hazard Communication

2. First Aid and CPR – current certification

3. Blood Borne Pathogens

4. 30 hour OSHA Construction Safety and Health course

5. Confined Space

6. Lockout / Tagout

7. When the project involves active work associated with the following hazards, the SHSC with training in the following hazards shall be on-site.

   a. Elevated Work – Scaffolding and Fall Protection

   b. Asbestos – Asbestos Supervisor

   c. Lead – Lead Competent Person

   d. Other hazards requiring specialized training based on planned construction methods

C. Field Personnel: Field personnel who enter the work area must meet the requirements for personnel training in the Site Specific HASP.

3.4 HEALTH AND SAFETY PLAN

A. A HASP shall be prepared that covers hazards for all work to be performed on site. The plan shall be reviewed, signed, and sealed by the HSO. An example HASP Outline recommended by OSHA is included in Attachment 1.

3.5 TRAINING

A. All training required by the HASP must be completed prior to starting work on the site with documentation that all workers have received required training being available on-site for review. This training may include general construction safety, specialized training to work with a specific hazard, and site specific training.

3.6 MEDICAL SURVEILLANCE

A. Site workers who are anticipated to be exposed (without respect to the respirator assigned protection factor) to airborne concentrations of hazardous materials above the lesser of the Threshold Limit Value as published by the ACGIH or the Permissible Exposure Limit as required by OSHA regulation shall have a physical examination that includes applicable biological monitoring prior to being exposed. A physical examination is also required for workers whose skin may be exposed to hazardous materials that can be absorbed through the skin.

3.7 FIT TESTING

A. Site workers who will wear respirators shall have been fit tested for said respirators within the previous 12 months.

3.8 RISK CONTROL HIERARCHY

A. For each hazard, an explanation shall be included in the HASP why a control strategy was selected and why a higher level control strategy was not employed. The hazard controls in the hierarchy of controls are listed as follows, in order of decreasing effectiveness.

1. Eliminate Hazard
2. Substitution
3. Engineering Controls
4. Administrative Controls
5. Personal Protective Equipment

3.9 EXPOSURE MONITORING

A. The HASP shall identify a strategy to determine the exposure to anticipated hazardous materials. This shall not only include hazardous materials on-site, but also hazardous materials brought onto the site by the Contractor or Subcontractors such as spray glue and solvents.

3.10 RECORD KEEPING

A. Medical surveillance and exposure monitoring records shall be maintained in a manner compliant with 29 CFR 1910.1020.

B. Asbestos exposure monitoring records shall be maintained in a manner compliant with 29 CFR 1926.1101.

C. Lead exposure monitoring records shall be maintained in a manner compliant with 29 CFR 1926.62.

3.11 SAFETY VIOLATIONS IDENTIFIED BY OTHERS

A. If the Owner or a consultant to the Owner observes a situation that represents an immediate danger to life or health of any worker or a violation of health, safety, and environmental regulations, they shall have the authority to stop work and contact the SHSC who will be responsible for further response. Such action on their part does not constitute an acceptance of responsibility for the General Contractor's (GC's) program and is valid for that instance only.

B. If the Owner or a consultant to the Owner observes a situation that represents a dangerous situation they shall immediately contact the SHSC and report the condition for prompt action by the GC safety staff. Such action does not constitute an acceptance of responsibility for the GC's program and is valid for that instance only.

END OF SECTION 00 73 19

ATTACHMENT 1

EXAMPLE HEALTH & SAFETY PLAN OUTLINE (1 PAGE)

Example Health & Safety Plan Outline

1.0 Title Page with Signature Block

2.0 Important Contacts including employer, contact name, title, cell phone number, and e-mail addresses

3.0 Organizational Structure (Identify title and responsibilities. Describe Subcontractor requirements and how Subcontractor safety will be assured.)

4.0 Job Hazard Analysis (Include a description of engineering controls, work practice controls, and PPE designed to reduce the risk for each hazard)

a. Chemical Hazards
b. Physical Hazards
c. Biological Hazards

5.0 Training Program

6.0 Medical Surveillance Program

7.0 Exposure Monitoring

8.0 Emergency and Accident Response (Must include a minimum of all information required by 29 CFR 1926.35)

Attachments - OSHA Required Written Programs

Attach a copy of each of the following required written programs, if the hazard analysis identifies the hazard as being present on the job site.

a. Hazard Communication
b. Emergency Action Plan
c. Bloodborne Pathogens
d. Hazardous Waste Operations
e. Respiratory Protection
f. Confined Space Entry
g. Lockout/Tagout
h. Fall Protection
i. Excavations
j. Lead
k. Any other OSHA standard requiring a written plan

DIVISION 1

GENERAL REQUIREMENTS

SECTION 01 10 00 – SUMMARY OF WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

B. This section is subject to the State of Maryland Department of Public Safety and Correctional Services General Conditions of the Contract between owner and Contractor.

1.2 SUMMARY

A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Work by Owner.
4. Work under separate contracts.
5. Owner-furnished products.
6. Access to site.
7. Owner Occupancy.
8. Coordination With Occupants
9. Work restrictions.
10. Specification and drawing conventions.
11. Construction period
12. Liquidated damages
13. Work sequence
14. Permits and Fees

B. Related Requirements:

1. Section 015000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

C. Contract Precedence:

1. The following list describes the order of Contractual precedence:

   a. **First:** Executed Construction Agreement and MBE Forms;

2. The Construction Agreement between the State and the General Contractor will take precedent over all else.

   a. **Second:** Supplementary General Conditions of the Contract, if provided;
   b. **Third:** General Conditions of the Contract;
   c. **Fourth:** Contract Specifications;
   d. **Fifth:** Contract Drawings;

1.3 PROJECT INFORMATION

A. Project Identification: BCDC Youth Detention Center, DPSCS #KT-000-150-C01

1. Project Location: Project is bounded by Eager Street to North, Forrest Street to the West, Greenmount Avenue to the East, and Truxton Street to the South.

B. Owner: Maryland Department of Public Safety and Correctional Services.

1. Owner's Representative: Chrys Bandon-Bibum.

C. Architect: PSA Dewberry + Penza Bailey Architects, a Joint Venture, 401 Woodbourne Avenue, Baltimore, Maryland 21212: (410) 435-6677.

D. Architect's Consultants: The Architect has retained the following design professionals who have prepared designated portions of the Contract Documents:

1. Civil / Environmental / Geotechnical / Traffic Engineers: EBA Engineering, Inc., 4813 Seton Drive, Baltimore, Maryland 21215; 410-358-7171;
2. Structural Engineers: Hope Furrer Associates, Inc., 501 Fairmount Avenue, Towson, Maryland 21286; 410-583-4874;
3. Food Service / Laundry Consultant: R&R Designer, Inc., 5300 Holmes Run Parkway, Suite 1006, Alexandria, VA 22304; 703-548-0446;
4. Mechanical / Plumbing / Fire Protection Engineers: Sidhu Associates, 11350 McCormick Drive, #1000, Hunt Valley, Maryland 21031; 410-329-1115;
5. Electrical / IT / Telecom / MATV-CATV Engineers: Sidhu Associates, 11350 McCormick Drive, #1000, Hunt Valley, Maryland 21031; 410-329-1115;
6. Security Consultant: PSA-Dewberry, 401 SW Water Street, Suite 701, Peoria, Illinois 61602; 309-282-8000;
7. Cost Estimator: Lewicki Estimating Services, Inc, 13600 Old Chatwood Place, Chantilly, VA 20151; 703-628-2577
8. LEED Consultant: TerraLogos: eco architecture, pc, 2901 East Baltimore Street, Suite 300, Baltimore, Maryland 21224; 410-276-8519;
9. Landscape Architect: PELA Design, Inc., 7400 York Rd, Suite 403, Towson, Maryland 21204; 410-296-3990;: .

E. Other Owner Consultants: The Owner has retained the following design professionals who have prepared designated portions of the Contract Documents:

1. Commissioning Agent: MBP, 10440 Little Patuxent Parkway, Columbia, MD 21044: . has prepared the following portions of the Contract Documents:
   a. Commissioning criteria and specifications.

F. Project Web Site: A project Web site administered by Contractor will be used for purposes of managing communication and documents during the construction stage.

1. See Section 013100 "Project Management and Coordination." for requirements for establishing, administering and using the Project Web site.

1.4 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project, Contract No. DPSCS #KT-000-150-C01, is defined by the Contract Documents and consists of the following:

1. Project consists of providing all labor, materials, and equipment and performing all work for the site development and building construction for the BCDC Youth Detention Center in strict accordance with the Contract Documents subject to the terms and conditions of the contract.
2. Project Description: Department of Public Safety and Correctional Services (DPSCS), State of Maryland (herein referred to as "Owner"), is set to construct a 60-cell new Youth Detention Center (YDC) facility in Baltimore City (herein referred to as "Project") for housing juvenile detainees charged as adults.

    a. The Facility, to be used by the Division of Pre-trial Detention and Services (DPDS), will include functions of housing, administration, security, medical, mental health, education, food services, visiting, recreation, etc. for 50 male and 10 female juveniles.
    b. The 3-story building, totals approximately 61,604 gross sq. ft.: 37,929 gross sq. ft. of new construction; and 23,675 gross sq. ft. of renovation to SUI building.
    c. The scope also includes, but is not limited to, the following:

        1) The provision of construction security fencing and gates full perimeter of construction site;
        2) The demolition of the existing BPRU building in its entirety, including its additions, its below-grade deep foundation systems, and its mechanical, electrical and plumbing systems.
        3) The demolition of a portion of the SUI building, including interior wall, flooring and ceiling systems, and mechanical, electrical and plumbing systems.
        4) Upgrades to the fire alarm and detection system, and fire suppression system throughout the portion of the SUI Building currently occupied by the OSTC (roughly the south half of the SUI Building – 2 levels).
        5) Sitework:

            a) Security fencing;
            b) New perimeter security site masonry wall;
            c) New stormwater management and bio-retention facility;
            d) New parking lot;
            e) New vehicle sallyports;
            f) New truck delivery and pickup area;
            g) New site planting and hard landscaping;
            h) New site utilities;
            i) New electrical service across Forrest Street to the primary service location in the basement of "D" Block (Housing);
            j) New site lighting.
            k) Partial paving of Forrest Street to repair areas disturbed by the project work, in particular, the utility work; approximately, from Eager Street, at the north, to Truxton Street, at the south.

    d. SUI and BPRU Buildings:

        1) The SUI Building: steel structured, brick masonry bearing exterior walls; 2 story + basement; floor/roof assemblies vary (dox-plank system, metal deck/concrete system, gypsum deck system).
        2) BPRU: brick masonry bearing wall; steel floor and roof structure; 3 levels + partial basement.

3) For further understanding of both buildings, please refer to the reference documents made available through their posting on **eMarylandMarketplace (eMM)**:

   a) SUI (State Use Industries) Building: 1964 drawings (John A. Ahlers); file name 26 sheets "Central Office and Storage Building for the State Use Industries";
   b) BPRU (Baltimore Pre-Release Unit) Building: 1969 drawings (Wrenn Lewis & Jencks); 28 sheets "Dormitory Building";
   c) BPRU & SUI Renovation drawings: 1977 drawings (Lapicki-Smith); 35 sheets "Conversion of Central Office to Work-Release Housing";
   d) Construction of OSTC - Bid Documents 1991: 1991 drawings (Gaudreau); 77 sheets "Occupational Skills Training Center";

e. The Owner has registered this project with the United States Green Building Council for their LEED (Leadership in Energy and Environmental Design) certification program. The project is to be designed and constructed to achieve at a minimum, a LEED New Construction (NC) v2009 Silver rating.

f. Achieving a LEED-rated building or project requires effective communications and close coordination between the contractor, the design team, and the owner. Approximately two-thirds of the LEED credits are attributable to the design phase and the design team. The remaining one-third of the total credits become the responsibility of the General Contractor and are earned during the construction phase of the project. Refer to Section 01 35 10 Sustainable Project Requirements and the Project LEED Scorecard included in this section for additional information, specific credits, points, and tasks involved in achieving the LEED certification. All LEED pre-requisites (0 points and mandatory credit) must be met in order to submit the project for review and certification.

g. The Contractor shall demonstrate familiarity with all LEED pre-requisites, credits and innovation strategies applicable to the project prior to the start of construction. Any coordination issues, problems with meeting credit and pre-requisite criteria, coordination, material sourcing, or schedule impacts must be brought to the attention of the Architect and Owner in writing prior to the start of work.

h. The Contractor will be responsible for tracking and documenting those credits assigned to the contractor on the Project scorecard found in 013510 Sustainable Project Requirements

i. The Contractor will also be required to create, implement, and follow an Indoor Air Quality Plan during construction as noted in 015060 Indoor Air Quality Plan & Procedures During Construction and to create, implement, and follow a Construction Waste Management Plan as defined in 017419 Construction Waste Management and Disposal.

j. By submitting a bid and entering into a contract with the owner for construction, the Contractor recognizes and agrees to all special construction practices, monitoring, and other activities associated with the project having LEED requirements and certification. There shall be no additional compensation made to the Contractor, either additional time or money, for such coordination, additional work, or other activity required for LEED.

1.5 LIMITS OF WORK

A. No operations related to the construction of this project will be allowed beyond the 'Limit of Disturbance' line indicated on the Grading and Sediment Control Plans unless otherwise indicated without prior approval of the Architect / Owner. Such operations shall include, but not be limited to, parking, access, storage of materials or equipment, and locations of trailers or other temporary facilities.

B. Type of Contract:

1. Project will be constructed under a single prime contract.

1.6 WORK BY OWNER

A. General: Cooperate fully with Owner so work may be carried out smoothly, without interfering with or delaying work under this Contract or work by Owner. Coordinate the Work of this Contract with work performed by Owner.

B. Concurrent Work: Owner will perform the following additional work at site during Construction. Completion of that work will depend on successful completion of preparatory work under this Contract.

1. Owner installation of Owner-furnished furnishings, fixtures and equipment as indicated on Furniture, Fixtures, and Equipment (FF&E) Schedule and Detention (D-series) drawings, including, but not limited to: Medical and Dental furniture and equipment, other than those specified, herein; Education furniture and equipment, other than those specified, herein; General office furniture and equipment, and Detention furniture and equipment.

1.7 WORK UNDER SEPARATE CONTRACTS

A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract or other contracts. Coordinate the Work of this Contract with work performed under separate contracts.

B. Concurrent Work: Owner will award and will assign separate contract(s) for the following construction operations at Project site. Those operations will be conducted simultaneously with work under this Contract.

1. Provision of all IT and Telecommunication wiring, cabling, and equipment.

1.8 OWNER-FURNISHED PRODUCTS

A. Owner will furnish products indicated within the Contract Drawings FF&E and Detention Equipment schedules. The Contractor's Work includes receiving, unloading, handling, storing, protecting, and installing Owner-furnished/Contractor-installed products and making building services connections. The Contract Drawings indicate Owner-Furnished/Owner-installed requiring Contractor-installed utility connections.

B. Owner-Furnished Products:

1. See FF&E Schedule and Detention Equipment Schedule as part of Contract Drawings. Owner-furnished products indicated to be Owner-installed will be installed by Owner concurrent with Construction.

1.9 ACCESS TO SITE

A. General: Contractor shall have full use of Project site for construction operations during construction period. Contractor's use of Project site is limited only by Owner's right to perform work or to retain other contractors on portions of Project.

B. Work within OSTC portion of SUI building: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.

C. Access: Contractor’s access to Forrest Street is limited to the north entrance at E. Eager Street. NO CONSTRUCTION ACCESS TO FORREST ST. FROM MADISON ST. WILL BE PERMITTED.

D. Use of Site: Limit use of Project site to work in areas or areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1. Limits: Confine constructions operations to the Limits of Construction as indicated within the Contract Drawings. The indicated Limits of construction shall not be construed as preventing the Contractor from performing work outside those Limits if the work is specifically required by the Contract Documents. The Limits of Construction are only provided as general guidelines as to the extent of Work covered under this Contract. Examples of work that may extend beyond these described limits are, but not limited to: public space site and paving work or utilities.
2. Driveways, Walkways and Entrances: Keep driveways, loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.

    a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
    b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
    Before starting the work, the Contractor shall coordinate with the Owner and Baltimore City what entrances, routes or roadways shall be used for access to the work, and use only those designated for movement of personnel, materials and vehicles to and from the work. Close coordination will be required between the Contractor and the Owner, other Contractors, Baltimore City and others having an interest in the Project to assure that work on the site, access to and from the site and the general conduct of operations is maintained in a secure safe and efficient manner, and that disruption and inconvenience to existing streets and property is minimized. The Contractor shall be responsible to review the site and be familiar with all existing conditions within and around the Owner's property including local conditions and requirements.

3. Do not block or disrupt operations and deliveries to the driveways and entrances for the adjacent Correctional facilities.

a. The Contractor shall maintain free access to all buildings and areas of the site for designated vehicles, service vehicles and firefighting equipment and at no time shall block off or close roadways, alleys, sidewalks, entrance ways or fire lanes without providing auxiliary means of entrance acceptable to the Owner. Fire hydrants must remain accessible at all times. The Contractor must obtain Owner's approval and shall give the Owner and the local fire department at least forty-eight (48) hours notice of any such changes of routes.

1) This includes the south gate where Forrest Street intersects with East Madison Street. Large commercial trucks require entry and passage on Forrest Street, between East Madison Street to East Eager Street, in order to deliver goods and services to the Correctional Complex. The Contractor's operations shall not impede this function.
2) This includes the north gate where Forrest Street intersects with E. Eager Street. Visitors and personnel enter MCTC portion of the Corrections Complex at this location, and trucks and vehicles exit Forrest Street and the Corrections Complex at this location. The Contractor's operations shall not impede these functions, and the area must be kept clear and maintained.

4. Access to Site applies to, but is not limited to the primary Project Site bounded by East Eager Street, Forrest Street, and Greenmount Avenue; and to secondary sites, such as, but not limited to: "D" Block, other areas and buildings of the Baltimore Correctional Complex as required to perform the work, the Contractor's staging area, and Forrest Street.

a. Contractor may access SUI Building basement via existing exterior stair at Forrest St. Existing freight elevator may be accessed via the existing OSTC loading at Forrest St. Loading dock provides a wider path to the freight elevator. Comply with requirements for security control for access to occupied areas.

E. Condition of Existing SUI Building and associated building and site appurtenances: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.

1. Contractor shall video tape and photograph all existing on-site and off-site conditions, and interior/exterior building conditions related to work area prior to start of work in order to maintain record of those conditions.

F. Coordinate and comply with Specification Section 015000 Temporary Facilities and Controls.

G. Contractor Use of Premises:

1. Coordinate use of premises under direction of Owner.
2. Other concurrent and contiguous contracts will be ongoing during the term of this Contract.
3. Contractor shall obtain and pay for use of off-site storage or work areas.
4. Except as described in Section 015000, Temporary Facilities and Controls, for the Staging Area, there shall be no on-site parking for the General Contractor, and its Subcontractor employees. Off-site parking for construction employees shall be arranged by the Contractor. The Contractor is responsible to provide

transportation to and from the site, if required. Any additional arrangement is the responsibility of the Contractor. There are no parking areas available or supplied by Owner.

a. Contractor's and Subcontractor's personnel shall not park on public streets within 3 blocks of Corrections Complex perimeter, unless approved by Owner. The adjacent public on-street parking is used by Corrections staff and officers and shall not be burdened by Contractor's work forces.

5. **CONTRACTOR'S STAGING AREA:** Staging Area shall be the vacant site (currently used by the Owner for employee parking) located south of the Baltimore Correctional Complex and bounded by Madison Street to the north, Monument Street to the south, Graves Street to the West, and Forrest Street to the east.

   a. As described in Section 015000, Temporary Facilities and Controls, limited parking will be available to the Owner, Contractor, and the Architect within the Greenmount Avenue Staging Area site.
   b. The monitoring wells throughout the staging site shall remain and must be protected at all times. Any damage to these wells shall be repaired at the Contractor's expense.
   c. The Staging Area site shall not be used for loose material laydown (soil, gravel, sand, etc.).
   d. All temporary utility systems or connections for the staging area site shall be provided and paid for by the Contractor (power, water, IT/Telecommunications, sanitary, etc.). Contractor shall pay all necessary filing or permit fees.
   e. Contractor shall provide a temporary construction fence full perimeter of the staging area with lockable vehicular and personnel gates. Owner's representative shall receive a set of keys and have access to site at all times.
   f. Contractor shall provide temporary security lighting of the staging area.
   g. At the completion of the project, site shall be restored to its original condition.
   h. NO USE OF THE SUI BUILDING FOR CONTRACTOR STAGING OR OFFICES SHALL BE PERMITTED, UNLESS APPROVED BY THE OWNER AT SUCH TIME DURING THE PROGRESS OF THE PROJECT THAT THE OWNER DEEMS APPROPRIATE.
   i. Contractor shall obtain any MDE approvals for Staging Area and pay all fees associated with MDE filing, review and approval of the Staging Area.

6. The Contractor will not be allowed to use any Owner tools or equipment during the course of this project.
7. The Contractor shall be responsible for all damage to the project including the adjacent buildings and grounds due to their operations under this contract. Repair or replacement of damaged items shall be to the satisfaction of the Owner.
8. The Contractor shall limit his use of the premises for work and for storage, to allow for:

   a. Work by other Contractors
   b. Owner occupancy
   c. Public use and safety
   d. Provide use of corridors in all completed areas at all times

H. Related Contract Documents:

1. If related and necessary for the Work of this contract, the Contractor may contact the Owner to review and/or obtain copies of documents prepared under separate contract for the State.
2. Duplication costs of other documents are the responsibility of the Contractor

1.10 OWNER OCCUPANCY

A. Owner reserves the right to occupy completed portions of the work.

1.11 COORDINATION WITH OCCUPANTS

A. Full Owner Occupancy: Owner will occupy site and existing building(s) during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations. Maintain existing exits unless otherwise indicated.

1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and approval of authorities having jurisdiction.
2. Notify Owner not less than 72 hours in advance of activities that will affect Owner's operations.

B. When Owner has occupied a portion of the project prior to Final Completion, Contractor's employees and subcontractors shall not use facilities within the Owner occupied areas of the building(s), unless the Contractor is instructed to do so as part of construction work by the Owner.

Owner Limited Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed portions of the Work, prior to Substantial Completion of the Work, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work.

1. Architect will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied prior to Owner acceptance of the completed Work.
2. Required inspections and tests shall have been successfully completed and verified.
3. Obtain a Certificate of Occupancy from authorities having jurisdiction before limited Owner occupancy.
4. Before limited Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of Work.
5. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of Work.
6. During construction, should the Owner occupy areas of the building, all required exits and all required fire protection features are to be operable and continuously maintained for the parts occupied in accordance with NFPA 101, Article 1-3.11.1.

    a. The Contractor is wholly responsible for compliance.

1.12 WORK RESTRICTIONS

A. Work Restrictions, General: Comply with restrictions on construction operations.

1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction. Any fines levied by the City as a result of violations shall be paid in full by the Contractor.
2. The General Contractor shall be subject to such rules and regulations for the conduct of the work as the Owner and may establish. Violators shall be promptly removed from the site.

    a. All employees shall be properly and completely clothed while working. Bare torsos, legs and feet will not be allowed.
    b. Possession or consumption of alcoholic beverages or drugs, or other noxious or illegal behavior on the site is strictly prohibited. Action will be taken and the proper authorities will be notified.
    c. Inappropriate language will not be tolerated.

3. Communication in any fashion with staff or inmates within adjacent facilities is strictly prohibited and will result in immediate action.

B. Contractor shall not elect means and methods which result in an easement condition imposing costs on the Owner.

C. On-Site Work Hours: Limit work in the existing building to normal business working hours of 7 a.m. to 5 p.m., Monday through Friday, unless otherwise indicated.

1. Weekend Hours: Approval must be obtained from Baltimore City and Owner, and coordinated with Owner..
2. Early Morning Hours: Approval must be obtained from Baltimore City and Owner, and coordinated with Owner. Construction operations must comply with Baltimore City noise ordinance and Building Code of Baltimore City..
3. Hours for Utility Shutdowns: Approval must be obtained from Baltimore City and/or applicable Utility Company, and Owner, and coordinated with Owner..
4. Hours for Insert noisy activity: Must comply with Baltimore City noise ordinances and Building Code of Baltimore City.
5. Any fines levied by the City as a result of violations shall be paid in full by the Contractor.
6. **WORK WITHIN OSTC PORTION OF SUI BUILDING:** Any work within the occupied OSTC portion of the SUI Building is restricted to the hours of 4 p.m. to 6 a.m., and all workers must be accompanied by an assigned Corrections Officer at all times.

D. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:

1. Notify Architect and Owner not less than two days in advance of proposed utility interruptions.
2. Obtain Owner's written permission before proceeding with utility interruptions.

E. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.

1. Notify Architect and Owner not less than two days in advance of proposed disruptive operations.

2. Obtain Owner's written permission before proceeding with disruptive operations.
3. All Construction operations shall comply with applicable Baltimore City noise ordinances and Building Code of Baltimore City.
4. Any fines levied by the City as a result of violations shall be paid in full by the Contractor.

F. Nonsmoking Building: Smoking is not permitted anywhere with the project limits (building or site) or within 50 feet (16 m) of entrances, operable windows, or outdoor-air intakes.

G. Controlled Substances: Use of tobacco products and other controlled substances within the existing building or on Project site is not permitted.

H. Employee Identification: Contractor will provide photo identification tags for Contractor and Subcontractor personnel working on Project site. Contractor shall also provide photo identification tags for the Owner, and Architect/Engineer employees. Require personnel to use identification tags at all times.

I. Employee Screening: Comply with Owner's requirements for drug and background screening of Contractor personnel working on Project site when those workers are to interface with the adjacent secure facility.

1. Maintain list of approved screened personnel with Owner's representative.

J. Prison Rape Elimination Act (PREA): Contractor and sub-contractors, in coordination with the Owner must comply with all applicable provisions of PREA for the duration of the project while on the site, and especially while in close proximity to inmates or detainees.

K. NO VERBAL OR VISUAL COMMUNICATION, PHYSICAL CONTACT, OR DISTRIBUTION OF ANY MATERIAL OR CONTRABAND IS PERMITTED WITH INMATES OR DETAINEES.

1.13 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:

1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.

2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard and scheduled on Drawings.
3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

1.14 CONSTRUCTION PERIOD

A. The Construction time from the Notice-to-Proceed (NTP) to Substantial Completion shall not exceed that designated in the Construction Bid Form. The time from Substantial Completion to Final Completion (including Commissioning and LEED Testing Completion) shall not exceed sixty (60) calendar days from date of Substantial Completion as set forth in the Construction Bid Form, the State of Maryland General Conditions and the Construction Agreement between the State and the Contractor.

1. Contractor shall note that Occupancy cannot occur until all Commissioning and LEED Testing has successfully been completed.
2. Contractor shall note that LEED Testing cannot occur while construction operations are still in effect.
3. Contractor shall note that though Final Completion has been obtained, final payment will not occur until all LEED processes and Record Documentation has been successfully completed.

B. Within thirty (30) calendar days from the Contract Award, the NTP date will be mutually agreed upon between the Owner and the Contractor.

1. The contract shall include the Work indicated in these contract documents.
2. The Contractor shall notify the Owner in writing a minimum of seven (7) calendar days in advance of the requested date construction is planned to start within the project limits whereas the State will issue to the Contractor the “Notice-To-Proceed” and this Notice will stipulate the date on or before the Contractor is expected to begin work. From this date the construction time shall begin.
3. Work within the project limits before the requested Notice-To-Proceed date shall be at the risk of the Contractor.

C. Contractor shall prepare and submit to the Owner and Architect the cost-loaded CPM schedule in accordance with the General Conditions, Section 7.06.

D. Contractor shall prepare and submit to the Owner and Architect the Shop Drawing Submittal Schedule in accordance with the General Conditions, Section 7.06.

E. Time Extensions: Comply with Section 7.06.R of State's General Conditions for severe weather conditions.

F. SCHEDULE: In accordance with Division 00, Section “Construction Bid Form.

1.15 LIQUIDATED DAMAGES

A. Refer to Division 00, Section “Construction Bid Form”, and the State of Maryland General Conditions for stipulated Liquidated Damages that will apply to this Project and its Construction Schedule.

1.16 WORK SEQUENCE

A. Sequence of work is subject to the review and approval of the Owner and may be dependent on the status of other ongoing construction contracts on and adjacent to the Work of this contract.

B. Coordinate construction schedule and operations with the Owner.

C. The General Contractor shall be responsible for coordinating all aspects of the schedule for construction with all trades and subcontracts.

D. The General Contractor is responsible to plan, coordinate and execute his work in such a manner that there will be no disruption of the Owner's operations. If an interruption of operations is unavoidable, then this work will be scheduled with the Owner prior to beginning such work.

E. Work which interrupts the Owner's adjacent property, services, and operations will be accomplished during the time periods when it is least inconvenient to the Owner and completed in the shortest possible time frame. At no expense to the Owner, the General Contractor will anticipate and coordinate the provision of work in split shifts, weekends, or off peak periods, etc., to accommodate Owner's security, utility, delivery times, and service requirements, such as, but not limited to electrical power, IT / Telecommunications, HVAC, storm and sanitary lines. Accept as noted previously to accommodate the Owner’s adjacent property, services, and operations, all work shall be bid on a straight time basis.

F. When work affects existing adjacent Corrections facilities, the General Contractor is responsible to provide any temporary alternate supply and/or return conditions to maintain services to the facility while work is being performed. Place safety stages or markers to indicate location of disconnected services.

1. No interruptions to Owner's power, lighting, signal, or alarm circuits will be permitted without the express written permission of the Owner. Arrangements for interruptions shall be made with the Owner forty-eight (48) hours prior to the interruption and shall be made at such time and duration as authorized by them. Temporary feeders, transformer jumpers, connections, circuits, etc., shall be used as required to accomplish the above at no additional cost to the Owner.

G. Construct the work to provide for public convenience. Do not close off roadways, public ways or public facilities without City or Utility approval. Provide alternative usage or other means when closures must occur to accommodate construction.

H. These provisions shall apply to all Contractors and are applicable whether a Contractor is either directly or indirectly affected.

1.17 PERMITS AND FEES

A. Obtain all permits, licenses, approvals and pay taxes, fees and other costs in connection with the construction of this project, including the installation and operation of all equipment. Permits shall include, but limited to, operation of boilers, emergency generators, sprinkler systems, elevators, and other State of Maryland licensed and regulated systems. Contractor is responsible for the preparation of all forms, applications, plans, preparation of documents, provide proper notices and obtain

necessary approvals. Deliver inspection, permits and approval certificates to the Owner prior to Final Completion of the Work.

1. Contractor responsible to pay the State Fire Marshal all review fees for each fire suppression systems, fire alarm and detection systems:
   a. $150.00 per each system
   b. $1.20 per sprinkler head

1.18 AVAILABLE BID DOCUMENTS AND REFERENCE DOCUMENTS

A. Contract Documents will be made available to the Bidders as herein described in the Instructions to Bidders. The documents will also be posted on **eMarylandMarketplace (eMM)**: https://emaryland.buyspeed.com/bso/
   1. Bid documents are available only online from eMaryland Marketplace (eMM). Those are the only official documents to be used by Bidders for this Invitation for Bid (IFB). The Bidders shall print on their own stationery the required documents for submitting their bid (as Construction BID Form, Bid Proposal Affidavit, BID Bond, etc.) and submit to the Owner (DPSCS, Division of Capital Construction and Facilities Maintenance) in a sealed envelope which clearly indicates that it contains a sealed bid for this project with the bid due date and the name and address of the Bidder.
   2. DPSCS/DCCFM ELECTRONIC DOCUMENTS AND FORMS OF THE "INVITATION FOR BID" PACKAGE ARE THE ONLY OFFICIAL DOCUMENTS AND THEREFORE, ONLY THESE MAY BE USED FOR BIDDING PURPOSES. CONTRACT AWARD SHALL ONLY BE BASED UPON OFFICIAL DOCUMENTS ISSUED BY THE ISSUING 0FFICE.

B. The following documents form a part of the Contract Documents but are only made available for reference through their posting on **eMarylandMarketplace (eMM)**: https://emaryland.buyspeed.com/bso/

   1. **Limited Hazardous Materials Survey Report:** Dated December 24, 2014; as prepared by EBA Engineering, Inc. on behalf of PSA-Dewberry Inc. / Penza Bailey Architects, JV for the Department of Public Safety and Correctional Services, Project KT-000-150-C01.
   2. **Geotechnical Report:** Dated August 2014; as prepared by EBA Engineering, Inc. on behalf of PSA-Dewberry Inc. / Penza Bailey Architects, JV for the Department of Public Safety and Correctional Services, Project KT-000-150-C01.

C. Additional Reference Documents: The following documents **do not** form a part of the Contract Documents but are only made available for reference through their posting on **eMarylandMarketplace (eMM)**: https://emaryland.buyspeed.com/bso/

   1. **Record Drawings for the Existing Buildings:** The following record drawings are provided to the Contractor for reference only. The record drawings may not represent the actual built conditions. All information included within the record drawings must be verified by the Contractor. Neither the Department of Public Safety and Correctional Services, nor PSA-Dewberry Inc. / Penza Bailey Architects, JV and its consultants take responsibility for the accuracy of these documents. **To view these documents, the Contractor must download the files. Any printing of these documents by the Contractor or its Subcontractors, shall be at the Contractors expense:**

a. SUI (State Use Industries) Building: 1964 drawings (John A. Ahlers); file name 26 sheets “Central Office and Storage Building for the State Use Industries”;
b. BPRU (Baltimore Pre-Release Unit) Building: 1969 drawings (Wrenn Lewis & Jencks); 28 sheets “Dormitory Building”;
c. BPRU & SUI Renovation drawings: 1977 drawings (Lapicki-Smith); 35 sheets “Conversion of Central Office to Work-Release Housing”;
d. Construction of OSTC - Bid Documents 1991: 1991 drawings (Gaudreau); 77 sheets “Occupational Skills Training Center”;
e. Fire Range Renovation in Occupational Skills Training Center: 3/8/93 drawings; 4 sheets.
f. Construction of OSTC – As-Built Drawings, 12/01/1992: Johnson Controls Flow Diagrams; 8 sheets; MAU & EF Flow Diagrams, and AHU & RAF Flow Diagrams for the Occupational Skills Training Center.
g. Existing YDC Photos Full Package, 11 pages.
h. 400-Bed Dormitory 1993, 8 sheets.
i. "Contractor Staging Area Street Utility Site Plan”, (Demolition of Buildings & Clearing of Site for the Youth Detention Center), CD-103, by D.R.S. & Associates, 12-17-2008.

1.19 SPECIAL REQUIREMENTS

A. **Testing of Power Service in “D” Block:** Contractor shall test the existing power service to confirm capacity. Notify Owner immediately upon results of test.

B. **BGE Signoffs:** Contractor shall coordinate with BGE to sign off on all work related to BGE’s power equipment and service that currently serve the SUI Building, including, but not limited to, related transformers, cabling, and switches.

C. **Utility Surveys:** Contractor shall perform an underground utility survey of Forrest Street where affected by project work to confirm utility locations, types, and inverts.

D. **Maintenance of Power to The Occupational Skills Training Center (OSTC) functions in SUI Building:** The OSTC must remain occupied and in operation during the construction period. The Contractor must provide temporary power to maintain operation and function of the OSTC at all times. Comply with Section 01 50 00, Temporary Facilities and Controls.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 10 00

SECTION 01 21 00 – SPECIALTY ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 00, Division 01, and Division 02 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements governing allowances.

1. Certain items are specified in the Contract Documents by allowances. Specialty Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when direction will be provided to Contractor. If necessary, additional requirements will be issued by Change Order.

B. Types of allowances include the following:
1. Unit-cost allowances per Section 012200, Unit Price Allowances.
2. Specialty allowances.

C. Related Requirements:

1. Division 01 Section 012200 "Unit Prices" for procedures for using unit prices.
2. Division 01 Section 012600 "Contract Modification Procedures" for procedures for submitting and handling Change Orders.
3. Division 01 Section 012900 “Payment Procedures” for Application for Payment.
4. Division 01 Section 014000 "Quality Requirements" for general testing and inspecting requirements.
5. Division 01 Section 016000 “Product Requirements” for Product Options and Substitutions.
6. Division 31 Section 312500 “Erosion and Sediment Control.
7. Divisions 02 through 33 Sections for items of Work covered by allowances.

1.3 DEFINITIONS

A. Rock: Any material which cannot be removed by methods other than special rock excavation machinery, drilling, wedging and/or blasting shall be termed rock excavation. All other excavations shall be termed earth excavation. Should boulders be encountered, those in size up to 1/2 cubic yard shall be termed earth excavation.

B. Unknown, as applied to below-grade structure and infrastructure described under Schedule of Specialty Allowances: Subsurface or latent conditions not shown in either the Contract Documents, including the Limited Hazardous Materials Survey, or in the referenced existing building drawings provided by the Owner.

1.4 SELECTION AND PURCHASE

A. At the earliest practical date after award of the Contract, advise Architect of the date when final selection and purchase of each product or system described by a Specialty Allowance must be completed to avoid delaying the Work.

B. At Owner's and Architect's request, obtain proposals for each Specialty Allowance for use in making final selections. Include recommendations that are relevant to performing the Work.

1.5 ACTION SUBMITTALS

A. Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders, as specified in Section 01 26 00, Contract Modification Procedures.

1.6 INFORMATIONAL SUBMITTALS

A. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each Specialty Allowance.

B. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the Specialty Allowance.

C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.7 COORDINATION

A. Coordinate allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

1.8 SPECIALTY ALLOWANCES

A. Allowance shall include: Cost of material, product or services to General Contractor and/or Subcontractor, less applicable trade discounts; all applicable direct and indirect costs; delivery to site; applicable fees and taxes, permit costs, warranty costs, bond costs, unemployment compensation, and insurance costs; testing and cleanup; overhead and profit; labor and installation; finishing; unloading, uncrating, handling, and storage; protection from elements and damage; submittals, engineering, and shop drawing requirements; supplementary or miscellaneous items, appurtenances and devices, tools or

equipment incidental to or necessary for a sound, secure and complete installation.

B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, and similar General Condition costs shall be included as part of the Contract Sum and not part of the Specialty Allowance.

C. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.

1. If requested by Architect, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.

D. Use the Specialty Allowance only as directed by Owner and reviewed by Architect, for Owner's purposes and only by a proposal that indicate amounts to be charged to the allowance.

E. Payment shall be made in accordance with Section 012900, “Payment Procedures”, and GENERAL CONDITIONS.

F. These Specialty Allowances are included in the Contract Sum. However, Contractor must submit a proposal and obtain authorization from the Owner for the use of the funds from the Specialty Allowance.

G. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count. If the actual work requires more or fewer quantities than those quantities indicated in the proposal, provide the actual quantities to be applied against the Specialty Allowance.

H. At Project closeout, credit all unused amounts remaining in the specialty allowances back to the Owner.

I. General Contractor is advised that the proposed Specialty Allowance prices given to him shall be subject to negotiations and revisions resulting in final prices that shall be mutually agreed upon and approved by the Owner.

J. Submit substantiation of scope of work, if any, claimed in proposal related to Specialty Allowances.

K. Final payment for work governed by specialty allowance prices will be made on the basis for the actual measurements and quantities accepted by the Owner.
1. List of Specialty Allowances: A schedule of Specialty Allowances is included in Part 3.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF SPECIALTY ALLOWANCES

A. In accordance with the General Conditions and Division 1, "Specialty Allowance", or "Unit Prices", when Owner orders work to be performed beyond the work limits as set forth in the Contract Documents including materials, operations, and items of work, etc., related to the specialty allowance items listed in the following schedule, the allowance prices for these items shall prevail.

B. Accordingly, the Contractor is advised that the proposed Lump Sum Total Price given by him for the items listed below shall be subject to measurement negotiations and revisions resulting in Final prices which shall be mutually agreed upon.

C. The Owner and Architect shall determine that the work associated with the Specialty Allowance items are applicable to this allowance and beyond the limits and requirements set forth within the Contract Documents.

D. All costs associated with the Specialty Allowance prices noted in the Schedule below shall be provided within the proper Construction Bid Form as required by Section 00 12 50.

E. **Precedence of Allowances:** For all work beyond the limits and requirements as set forth within the Contract Documents, the use of the Unit Price Allowance Items shall take precedence over the use of **Specialty Allowances 1 through 7,** as described below.

F. **SA-1 Removal of Unknown Below-Grade Site Structures:** Include **$30,000** for the demolition, removal and disposal off-site of unforeseen below-grade existing infrastructure (utilities, foundation walls and footings, tanks, rubble, etc.) within the Project site, due to unknown and unforeseen conditions that require resolution to enable the proper and complete construction of the Project. Removal of unknown and unforeseen below-grade hazardous materials is included in this allowance, and shall be performed with applicable Division 02 Environmental Sections. Such work may require environmental testing and

laboratory services to determine the actual extent of contamination in accordance with Division 01 Section "Environmental Inspection, Testing and Laboratory Services." The Owner and Architect shall determine that the work is applicable to this allowance and beyond the requirements set forth within the Contract Documents.

G. **SA-2 Removal of Hazardous Roof Material:** Include **$25,000.00** for the abatement and removal of hazardous roof material within the roofing system of the SUI building to the extent of the roof replacement. The work may require environmental testing and laboratory services to determine the actual extent of contamination in accordance with Division 01 "Environmental Inspection, Testing & Laboratory Services. All Environmental work shall be performed in strict accordance with Division 02 Section "Asbestos Abatement". This unforeseen or unsatisfactory condition requires resolution to enable the proper and complete construction of the Project. The Owner and Architect shall determine that the work is applicable to this allowance and beyond the requirements set forth within the Contract Documents.

H. **SA-3 Removal of Hazardous Material from Existing Fire Suppression System and Fire Alarm/Detection System in the OSTC Portion of SUI Building:** Include **$15,000.00** for the abatement and removal of hazardous material associated with the existing fire suppression system upgrade within the OSTC portion of the SUI Building as defined in the Contract Documents. The work may require environmental testing and laboratory services to determine the actual extent of contamination in accordance with Division 01 "Environmental Inspection, Testing & Laboratory Services. All Environmental work shall be performed in strict accordance with Division 02 Section "Asbestos Abatement". This unforeseen or unsatisfactory condition requires resolution to enable the proper and complete construction of the Project. The Owner and Architect shall determine that the work is applicable to this allowance and beyond the requirements set forth within the Contract Documents.

I. **SA-4 Repair of the Existing Concrete Masonry Partition that Separates the Renovated YDC Portion of the SUI Building from the OSTC Portion of the SUI Building:** Include **$10,000.00** for the repair and infill of the existing concrete masonry wall between the new YDC portion of the SUI Building and the existing OSTC portion of the SUI Building on both the first and second existing floor levels. It is unknown whether the existing wall runs to the underside of the floor or roof deck and that all penetrations, and openings throughout the height and length of the wall are properly infilled, sealed, and made smoketight to ensure a sound smoke barrier as shown in the construction documents. Smaller opening may be firesafed or smoke sealed. Larger openings may be receive a more stable infill system. This unforeseen or unsatisfactory condition requires resolution to enable the proper and complete construction of the Project. The Owner and Architect shall determine that the work is applicable to this allowance and beyond the requirements set forth within the Contract Documents.

J. **SA-5 Upgrade to Existing Fire Suppression System in OSTC Occupied Portion of SUI Building:** Include **$45,000** for the upgrade or replacement of the existing fire suppression system in the OSTC occupied portion of the SUI Building. This may include, but not be limited to: replacement or relocation of sprinkler heads, provision of new sprinkler heads, replacement of existing piping, provision of new fire suppression piping, removal and reinstallation of existing suspended ceilings to obtain access to fire suppression systems, etc. This unforeseen or unsatisfactory condition requires resolution to enable the

proper and complete construction of the Project. The Owner and Architect shall determine that the work is applicable to this allowance and beyond the requirements set forth within the Contract Documents.

K. **SA-6 Resolution to Unknown Below Grade or Hidden Utility Conflicts:** Include **$25,000.00** for the resolution of below grade conflicts between new work and existing utilities or structures within Forrest St. This work may include, but not be limited to: relocation of new work to accommodate existing conditions to remain in place, alternate detailing to bridge over an existing utility, etc. These unknown or unforeseen conditions require resolution to enable the proper and complete construction of the Project. The Owner and Architect shall determine that the work is applicable to this allowance and beyond the requirements set forth within the Contract Documents.

L. **SA-7 Penetration Scan of First Floor "Dox Plank" Type Slab System in YDC Renovation Area of SUI Building to Locate Existing Reinforcing for New Openings:** Include **$10,000** to perform a penetration scan of the existing "Dox Plank" type slab system in the YDC renovation area of SUI Building in order to determine the configuration of the reinforcing in the existing system. This information will be used by the Architect, and its consultants, to properly locate and detail the new openings in the slab for the new work (ducts, piping, chases, conduits, etc.) relative to the reinforcing. The scan only needs to occur where penetrations occur or existing large openings are to be filled. This unforeseen or unsatisfactory condition requires resolution to enable the proper and complete construction of the Project. The Owner and Architect shall determine that the work is applicable to this allowance and beyond the requirements set forth within the Contract Documents.

M. **SA-8 Maintenance of Electrical Service to Occupied Areas of SUI Building:** Include **$30,000** for BGE costs associated with a temporary transformer and meter to main electrical service to the OSTC and other occupied areas of the SUI Building. Allowance does not apply to all other costs associated with maintaining this service, including cable, conduit, breakers and other equipment and labor, which shall be included in the bid price before the addition of the Allowance.

N. **SA-9 Repairs to Existing 15kV Switchgear in D-Block Basement:** Include **$7,500** for repairs to existing switchgear in D-Block Basement required to perform the Work of this contract. The Owner and Architect shall determine that the work is applicable to this allowance and beyond the requirements set forth within the Contract Documents.

END OF SECTION 01 21 00

SECTION 01 22 00 - UNIT PRICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for unit prices:

1. The unit prices in the UNIT PRICE SCHEDULE shall be used to increase or decrease the contract price depending upon the quantities of the items actually measured in place and authorized by the Owner. Each unit price shall include all work, materials and incidentals necessary to complete the Work required by the item.
2. The unit costs will be used to adjust the Contract Sum and shall include all direct and indirect costs, as noted below. The unit price work is above and beyond the work shown in the Contract Documents and the project work limits, however, during the course of the Work, the Owner may direct their incorporation as necessary. Payment for unit price items will be made on the basis of the quantities actually measured in place.

B. Types of allowances include the following:

1. Specialty allowances per Section 012100, Specialty Allowances
2. Unit Price Allowances:
   a. For purposes of this Information for Bid (IFB), a Unit Price Allowance has been developed which includes quantity-unit assumptions. The Contractor shall apply a unit cost to determine a total allowance for each Unit Price noted in the Unit Price Schedule. The Lump Sum total of the Unit Price Schedule is to be included in the Bid, Paragraph B, Section 00 12 50, Construction Bid Form.
   b. As noted in Paragraph 1.2, A above, the Contractor’s unit costs and actual measured quantities, will be charged to the Unit Price Allowance. Any adjustment to the Contract Sum due to a difference between the Unit Price Allowance and the actual used will be resolved as noted above, and in Section 01 29 00, Payment Procedures.

C. Related Requirements:

1. Division 01 Section 012100 "Specialty Allowance" for procedures for using the specialty allowances.
2. Division 01 Section 012600 "Contract Modification Procedures" for procedures for submitting and handling Change Orders.
3. Division 01 Section 012900 “Payment Procedures” for Application for Payment.
4. Division 01 Section 014000 "Quality Requirements" for general testing and inspecting requirements.

5. Division 01 Section 016000 “Product Requirements” for Product Options and Substitutions.
6. Division 31 Section 312500 “Erosion and Sediment Control.
7. Divisions 02 through 33 Sections for items of Work covered by allowances.

1.3 DEFINITIONS

A. Unit price is an amount proposed by the Bidders and stated on the Bid Form as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, added to or deducted from the Contract Sum by appropriate modification, if the scope of Work or estimated quantities of Work required by the Contract Documents are increased or decreased.

B. Rock: Any material which cannot be removed by methods other than special rock excavation machinery, drilling, wedging and/or blasting shall be termed rock excavation. All other excavations shall be termed earth excavation. Should boulders be encountered, those in size up to 1/2 cubic yard shall be termed earth excavation.

1.4 ACTION SUBMITTALS

A. Submit proposals for Owner’s approval for purchase of products or systems included in allowances, in the form specified for Change Orders, as specified in Section 01 26 00, Contract Modification Procedures.

1.5 INFORMATIONAL SUBMITTALS

A. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each unit price allowance.

B. Submit time sheets and other documentation to show labor time and cost for installation of unit price allowance items that include installation as part of the allowance.

C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.6 COORDINATION

1.7 Coordinate allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

1.8 PROCEDURES

A. Unit Price Costs include: Cost of material, product or services to General Contractor and/or Subcontractor, less applicable trade discounts; all applicable direct and indirect costs; delivery to site; applicable fees and taxes, permit costs, warranty costs, bond costs, unemployment compensation, and insurance costs; testing and cleanup; overhead and profit; labor and installation; finishing; unloading, uncrating, handling, and storage; protection from elements and damage; submittals, engineering, and shop drawing requirements; supplementary or miscellaneous items, appurtenances and

devices, tools or equipment incidental to or necessary for a sound, secure and complete installation.

B. Use the Unit Prices only as directed by Owner and reviewed by Architect, for Owner's purposes and only by a proposal that indicate amounts to be charged to the unit price allowance.

C. Measurement and Payment: See individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.

1. Quantities Specified:

a. Quantities indicated in the Construction Bid Form are for bidding and contract purposes only. Quantities and measurements supplied or placed in the Work and verified by the owner determine payment.
b. If the actual work requires more or fewer quantities than those quantities indicated, provide the required quantities at the unit sum/prices contracted.

2. Measurement of Quantities:

a. The calculations for determining the number of units of work, unless otherwise noted, shall be of actual units of measurement for the class of work, complete in place and accepted or omitted. No allowance for waste, loss, bulking factor, or damage will be made.
b. Measurement by devices:

1) Weigh scales: Inspected, tested and certified by the applicable State Weights and Measures department within the past year.
2) Platform scales: Of sufficient size and capacity to accommodate the conveying vehicle.
3) Metering devices: Inspected, tested and certified by the applicable State department within the past year

c. Measurement by weight: Handbook or scale weight.
d. Measurement by volume: Measured by cubic dimension using mean length, width and height or thickness.
e. Measurement by area: Measured by square dimension using mean length and width or radius.
f. Linear Measurement: Measured by linear dimension, at the item centerline or mean chord.
g. Hours
h. Numbers by individual items

3. Take all measurements and compute quantities. The Owner in coordination with the Agency Construction Manager will verify measurements and quantities.

D. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor. If found that the Contractor's measurement was unreasonably determined, the expense will revert to the Contractor.

1. If the unit prices are stated in the Contract Documents or subsequently agreed upon, and if the quantities originally contemplated increase or decrease by more

than twenty percent (20%), or if application of the agreed unit prices to the quantities of work proposed will cause substantial inequity to the Owner or the Contractor, the applicable unit prices shall be equitably adjusted.

E. List of Unit Prices: A schedule of unit prices is included in Part 3. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

F. Payment shall be made in accordance with Section 012900, “Payment Procedures”, and GENERAL CONDITIONS.

G. **AT PROJECT CLOSEOUT, CREDIT ALL UNUSED UNIT PRICE ALLOWANCES REMAINING BACK TO THE OWNER.**

H. General Contractor is advised that the proposed unit allowance prices given by him shall be subject to negotiations and revisions resulting in final prices that shall be mutually agreed upon and approved by the Owner.

I. Submit substantiation of scope of work, if any, claimed in proposal related to Unit Price Allowances.

J. Final payment for work governed by unit allowance prices will be made on the basis for the actual measurements and quantities, accepted by the Owner and Agency Construction Manager, and multiplied by the unit sum/price for work, which is incorporated in or made necessary by the work.

K. List of Unit Price Allowances: A schedule of Unit Price Allowances is included in Part 3.

L. **All unit prices shall apply equally to both additions and/or deductions.**

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF UNIT PRICES ALLOWANCES

A. In accordance with the General Conditions and Division 1, “Specialty Allowance”, or “Unit Price Allowances”, when Owner orders work to be performed beyond the work limits, as set forth in the Contract Documents, including materials, operations, and items

of work, etc., related to the unit price allowance items listed in the following schedule, the unit price allowance prices for these items shall prevail.

B. Accordingly, the Contractor is advised that the proposed Lump Sum Total Price given by him for the items listed below shall be subject to measurement negotiations and revisions resulting in Final prices which shall be mutually agreed upon.

C. The Owner and Architect shall determine that the work associated with the Unit Price Allowance items are applicable to this allowance and beyond the limits and requirements set forth within the Contract Documents.

D. All costs associated with the Unit Price Allowance items noted in the Schedule below shall be provided within the Construction Bid Form as required by Section 00 12 50, CONSTRUCTION BID FORM.

E. **Precedence of Allowances:**

1. For all work beyond the limits and requirements as set forth within the Contract Documents, the use of the Unit Price Allowance Items shall take precedence over the use of **Specialty Allowances 1 through 4,** as described in Division 01, Section "Specialty Allowance Schedule".

F. **UPA-1, Filling of Existing Openings in Gypsum Deck System in YDC Renovation Area of SUI Building, in Place:**

1. Provision, per square feet, for filling/patching of existing gypsum roof deck openings up to 6 inches deep, in accordance with structural detail shown in Structural Construction Drawings. **Quantity = 500 SF;**

G. **UPA-2, Rock Excavation and replacement with satisfactory soil material:**

1. Provision, per cubic yard, for open rock excavation, including rock excavation in trenches, caissons, and including disposal off site, and replacement with satisfactory fill material or engineered fill form off site, according to Section 312000 "Earth Moving"; **Quantity = 250 CY;**

H. **UPA-3, Removal of Unsuitable Material (backfill with structural fill material):**

1. Provision, per cubic yard, for removal of unsuitable material and replacement with structural fill for backfill adjacent to foundations, below paved areas, at utility excavations, behind walls and within 5 feet of building foundations in accordance with Section 312000, "Earth Moving"; **Quantity = 1200 CY;**

I. **UPA-4, Removal of Unsuitable Material (Backfill with Aggregate Fill Material):**

1. Provision, per cubic yard, for removal of unsuitable material within the building footprint below sub-grade elevation indicated on the drawings and replacement with aggregate fill material in accordance with the Geotechnical Report prepared by EBA Engineering, August, 2014. Allowance does not apply to backfill of voids created by the demolition work that are located below the proposed building foundations and slabs-on-grade, which shall be included in the bid price before the addition of the prices for the Specialty and Unit Price Allowances. **Quantity = 1500 CY;**

J. **UPA-5, Provision of Exit Signs, in Place:**

1. Provision of additional exit lights as specified in Section 265100, "Interior Lighting", and in accordance with Contract Documents; Need and location shall be as determined by Owner, and Architect, or State Fire Marshall, and shall include attachments, installation, and applicable required wiring. **Quantity = 10 Exit Signs and 100 LF wiring per sign;**

K. **UPA-6, Provision of Security Cameras:**

1. Provision of security camera types noted below, including installation, conduits, and wiring/cabling in accordance with Division 28, "Electronic Safety and Security". Camera types:

   a. Interior IP Fixed 0.3 Mega Pixel Camera; **Quantity = 5 Cameras and 150 LF wiring per camera**;
   b. Exterior IP Fixed 0.3 Mega Pixel Camera; **Quantity = 5 Cameras and 150 LF wiring per camera**;
   c. Exterior IP Fixed 1.3 Mega Pixel Camera; **Quantity = 1 Cameras and 150 LF wiring per camera**;
   d. Interior IP Fixed 1.3 Mega Pixel Camera; **Quantity = 2 Cameras and 150 LF wiring per camera**;
   e. Wall Mount IP, V-Cell Fixed Camera; **Quantity = 1 Cameras and 150 LF wiring per camera**;
   f. Corner Mount IP, V-Cell Fixed Camera; **Quantity = 3 Cameras and 150 LF wiring per camera**;

L. **UPA-7,** Patching of Existing Concrete Roof Slab where Roofing Material is Removed on SUI Building:

1. Provision, per square feet, of concrete leveling repair system for spalled, chipped damaged or deteriorated gypsum roof deck in accordance, including equipment, materials, placing, complete; **Quantity = 1200 SF**

M. **UPA-8, Replacement of Conduit & Wiring for Existing OSTC Fire Alarm System:**

1. Provision, per linear feet, of replacement conduit and wiring for the existing fire alarm system conduit and wiring, including equipment, materials, placing, complete; **Quantity = 5000 LF**

N. **UPA-9, Replacement of Duct Detectors for Existing OSTC Fire Alarm System:**

1. Provision, per duct detector, including new duct detector, wiring, and conduit to nearest addressable loop, programming of fire alarm panel, removal of existing control wiring for AHU shut down, reconnection to new duct detector and fire alarm panel, complete; **Quantity = 10 EA and 100 LF of wiring and conduit.**

O. **UPA-10,** Filling of Existing Small Unreinforced Openings (< .5 SF) in First Floor "Dox Plank" Type Slab System in YDC Renovation Area of SUI Building**:**

1. Provision, per square feet, of concrete fill, in accordance with structural detail shown in Structural Construction Drawings, including equipment, materials, placing, complete; **Quantity = 250 SF**

P. **UPA-11,** Filling of Existing Large Reinforced Openings (> .5 SF) in First Floor "Dox Plank" Type Slab System in YDC Renovation Area of SUI Building**:**

1. Provision, per square feet, of reinforced concrete fill, steel support framing, and metal deck, in accordance with structural detail shown in Structural Construction Drawings, including equipment, materials, placing, complete; **Quantity = 250 SF**

Q. **UPA-12,** Filling of Existing Openings in Second Floor Metal Deck and Concrete Slab System in YDC Renovation Area of SUI Building**:**

1. Provision, per square feet, of reinforced concrete fill, steel support framing, and metal deck, in accordance with structural detail shown in Structural Construction Drawings, including equipment, materials, placing, complete; **Quantity = 250 SF**

END OF SECTION 01 22 00

SECTION 01 25 00 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:

1. Administrative and procedural requirements for substitutions.
2. Contractor's options in selection of products

B. Related Requirements:

1. Section 016000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.
2. Divisions 02 through 33 Sections for specific requirements and limitations for substitutions.

1.3 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

1.4 ACTION SUBMITTALS

A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Substitution Request Form: Use CSI Form 13.1A.
2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
b. Coordination information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and

separate contractors, that will be necessary to accommodate proposed substitution.

c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
e. LEED Material Submittal Processing Sheet, if required.
f. Samples, where applicable or requested.
g. Certificates and qualification data, where applicable or requested.
h. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
i. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
j. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
k. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
l. Cost information, including a proposal of change, if any, in the Contract Sum.
m. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
n. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.5 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

B. Verify the substitution does not impact LEED Credit criteria. If any material, process or other qualification of the substitution will impact the LEED credit or pre-requisite criteria,

then the "**LEED Material Submittal Processing Sheet"** as found in Section 01 35 00 shall be submitted.

1.6 PROCEDURES

A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
b. Requested substitution provides sustainable design characteristics that specified product provided for compliance with LEED requirements.
c. Substitution request is fully documented and properly submitted.
d. Requested substitution will not adversely affect Contractor's construction schedule.
e. Requested substitution has received necessary approvals of authorities having jurisdiction.
f. Requested substitution is compatible with other portions of the Work.
g. Requested substitution has been coordinated with other portions of the Work.
h. Requested substitution provides specified warranty.
i. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Architect will consider requests for substitution if received within 30 days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Architect.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation

services, increased cost of other construction by Owner, and similar considerations.

b. Requested substitution does not require extensive revisions to the Contract Documents.
c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
d. Requested substitution provides sustainable design characteristics that specified product provided for compliance with LEED requirements.
e. Substitution request is fully documented and properly submitted.
f. Requested substitution will not adversely affect Contractor's construction schedule.
g. Requested substitution has received necessary approvals of authorities having jurisdiction.
h. Requested substitution is compatible with other portions of the Work.
i. Requested substitution has been coordinated with other portions of the Work.
j. Requested substitution provides specified warranty.
k. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 25 00

SECTION 01 26 00 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

B. Related Requirements:

1. Section 012500 "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the Contract award.

1.3 MINOR CHANGES IN THE WORK

A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710, "Architect's Supplemental Instructions."

1.4 SUBMITTALS

A. Submit name and address of Contractor’s representative authorized to receive and accept changes and responsible for informing others in Contractor's employ of changes to the Work at contract signing.

B. Change Order Request form will be provided by the Department of Public Safety and Correctional Services.

C. Procedure for submitting Change Order Request (COR) shall comply with requirements of this Section and Owner’s written instructions.

1.5 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Owner or Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time as a Request for Proposal (RFP). If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Requests for Proposal are not instructions either to stop work in progress or to execute the proposed change.
2. Within time specified in Request for Proposal but not greater than 15 days after receipt of Request for Proposal, submit a quotation in the form of a Change

Order Request estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.

a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
c. Include costs of labor and supervision directly attributable to the change.
d. Include an updated Contractor's construction schedule that indicates the effect of the change and Time Impact Analysis, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
e. Quotation Form: Use forms acceptable to the Owner and Architect.

B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor shall issue a Notification of Change / Reservation of Right within 10 calendar days of the first instance of the discovery of condition or circumstance that necessitates the change, Failure to promptly reserve the right and/or propose may be cause for denial of request. Within 10 calendar days of the Notification of Change / Reservation of Right, Contractor shall submit a Change Order Request to Architect and Owner.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Section 012500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
7. Proposal Request Form: Use CSI Form 13.6A, "Change Order Request (Proposal)," with attachments CSI Form 13.6D, "Proposal Worksheet Summary," and Form 13.6C, "Proposal Worksheet Detail."
8. Indicate if the change does or does not impact the LEED rating, selected credits or any pre-requisite credit. If yes, then include a statement as to the issues, costs, and full impact of the change for the LEED rating.

1.6 ADMINISTRATIVE CHANGE ORDERS

A. Allowance Adjustment: See Section 012100 "Allowances" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect actual costs of allowances.

B. Unit-Price Adjustment: See Section 012200 "Unit Prices" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect measured scope of unit-price work.

1.7 CHANGE ORDER PROCEDURES

A. On Owner's approval of Contactor's Change Order Request, Architect will issue a Proposed Change Order for signature by the Contractor, and the Architect. The Proposed Change Order will then be forwarded to the Owner for conversion individually or incorporation as a group into a Change Order for modification of the contract. The Owner and Contractor will sign the Change Order.

B. Documentation of Change in Contract Sum/Price and Contract Time:

1. Maintain detailed records of work done. Provide full information required for evaluation of proposed changes, and to substantiate costs of changes in the Work.
2. Document each quotation for a change in cost or time with sufficient data to allow evaluation of the quotation.
3. Provide additional data to support computations:

    a. Quantities of products, labor, and equipment.
    b. Taxes, insurance and bonds.
    c. Overhead and profit
    d. Justification for any change in Contract Time.
    e. Credit for deletions from Contract, similarly documented.

4. Support each claim for additional costs, and for work done with additional information:

    a. Origin and date of claim.
    b. Dates and times work was performed, and by whom.
    c. Time records and wage rate paid
    d. Invoices and receipts for products, equipment, and subcontracts, similarly documented.

1.8 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: Owner through the Architect may issue a Construction Change Directive on AIA Document G714 or a similar form. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order. A Construction Change Directive may be used when it is in the best interest of the Owner to have the Contractor proceed with the work before a formal proposal can be negotiated.

1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.

1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 26 00

SECTION 01 29 00 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. References: State of Maryland Department of Public Safety and Correctional Services Standard Owner-Contractor Agreement:

1. Contract Sum, amounts of Progress Payments, Retainages and time for Submittals.

C. Format: State of Maryland, Department of Public Safety and Correctional Services Application and Certification for Payment.

D. Related Requirements:

1. Section 012100 "Allowances" for procedural requirements governing the handling and processing of allowances.
2. Section 012200 "Unit Prices" for administrative requirements governing the use of unit prices.
3. Section 012600 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
4. Section 013200 "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.
5. Section 013510 "Sustainable Project Requirements, Paragraph 1.9 for Contractor’s material tracking responsibilities.
6. Section 015000 “Temporary Facilities And Controls” for Contractor service payments.

1.3 DEFINITIONS

A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.

1. Coordinate line items in the schedule of values with other required administrative forms and schedules, including the following:

    a. Application for Payment forms with continuation sheets.
    b. Submittal schedule.
    c. Items required to be indicated as separate activities in Contractor's construction schedule.

2. Submit the schedule of values to Architect at earliest possible date, but no later than 15 days before Notice-to-Proceed..

B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.

1. Identification: Include the following Project identification on the schedule of values:

    a. Project name and location.
    b. Name of Architect.
    c. Architect's project number.
    d. Contractor's name and address.
    e. Date of submittal.

2. Arrange schedule of values consistent with format of Department of Public Safety and Correctional Services form for Application and Certificate for Payment.
3. Arrange the schedule of values in tabular form with separate columns to indicate the following for each item listed:

    a. Related Specification Section or Division.
    b. Description of the Work.
    c. Name of subcontractor.
    d. Name of manufacturer or fabricator.
    e. Name of supplier.
    f. Change Orders (numbers) that affect value.
    g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.

        1) Labor.
        2) Materials.
        3) Equipment.

4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with Project Manual table of contents. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.

    a. Bond costs, if applicable
    b. General conditions line item(s)
    c. Division 1 cost breakdown as required
    d. Major portions of the work shall be broken down into labor and material line items for specific areas of the facility
    e. Stored material projections
    f. Warranties and manuals

g. A listing of approved and executed change orders to the contract, if any, in sequential order
h. Include separate line items under Contractor and principal subcontracts for LEED documentation and other Project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.

5. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
6. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.

   a. Differentiate between items stored on-site and items stored off-site. If required, include evidence of insurance.
   b. List taxes for stored items separately.

7. Provide separate line items in the schedule of values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
8. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
9. Purchase Contracts: Provide a separate line item in the schedule of values for each purchase contract. Show line-item value of purchase contract. Indicate owner payments or deposits, if any, and balance to be paid by Contractor.
10. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.

    a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.

11. Correlate line items in the Schedule of Values with other required administrative schedules and forms, including:

    a. Construction Managers construction schedule
    b. Application for payment form
    c. List of subcontractors with special designation and totals for MBE firms
    d. List of MBE sub-contractors and their percentage of subcontract
    e. Alternates
    f. Allowances
    g. List of products
    h. List of principal suppliers and fabricators
    i. Submittal

12. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.
13. Schedule of value items shall have a direct and understandable relation to the project master construction CPM schedule, so as to allow the Contractor and Owner, in collaboration with the ACM, to produce a cost loaded CPM schedule for cash flow projects. The Schedule of Values shall be the basis for the Contractor’s application for payments.

14. The Owner shall have the right to require the Contractor to alter the value or add / delete categories listed on the schedule of values at any time for the following reasons:

    a. The schedule of values appears to be incorrect or unbalanced;
    b. A revision of the segregation of values is required due to the Contractor's revising the sequence of construction or assembly of building components which in turn invalidates the schedule of values;

15. The Contractor is required to correlate the documentation for payment of stored materials requested in the application for payment against the agreed upon breakdown of the schedule of values. The Owner reserves the right to not process the application for payment if this correlation has not been submitted in conjunction with the application.

1.5 APPLICATIONS FOR PAYMENT

A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Owner and Architect. Application for Payment will be paid for by Owner.

1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

2. If the required LEED documentation during that payment period is not completed, the application for payment, at the discretion of the Owner, may not be processed until such LEED documentation or processes is properly completed and submitted.

B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.

1. Submit draft copy of Application for Payment seven days prior to due date for review by Owner, and Architect.

C. Application for Payment Forms: Use "State of Maryland Department of Public Safety and Correctional Services Application and Certification for Payment" or other form that is acceptable by the Department of Public Safety and Correctional Services as form for Applications for Payment.

D. Application Preparation: Complete every entry on form. Type required information on form using format required by DPSCS. Do not prepare by hand printing. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Owner, or Architect will return incomplete applications without action.

1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.

4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.

E. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.

1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment, for stored materials.
2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
3. Provide summary documentation for stored materials indicating the following:

    a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
    b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
    c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.

4. Off-site storage for materials must be in a licensed and bonded warehouse, stored in segregated and secure facilities and accessible by Owner for inspection and measurement of quantity or counting of units.
5. Should materials be stored off-site, Contractor shall provide for transportation or reimbursement of travel costs by Owner for inspection and measurement of quantity or counting of units.

F. Transmittal: Submit 4 signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

G. Substantiating Data

1. When Architect, and/or Owner requires substantiating information, submit data to Architect and/or Owner justifying line item amounts in question.
2. Provide one copy of data with cover letter for each copy of submittal.
3. Show application number and date, and line item number and description.
4. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
5. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
6. When an application shows completion of an item, submit conditional final or full waivers.
7. Owner reserves the right to designate which entities involved in the Work must submit waivers.
8. Waiver Forms: Submit executed waivers of lien on forms acceptable to Owner.
9. Waiver Forms: Submit executed waivers of lien on forms, acceptable to Owner.

H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.
2. Schedule of values.
3. Sustainable design submittal for project materials cost data.
4. Contractor's construction schedule (preliminary if not final).
5. Products list (preliminary if not final).
6. Sustainable design action plans.
7. Schedule of unit prices.
8. Submittal schedule (preliminary if not final).
9. List of Contractor's principal consultants.
10. Copies of building permits.
11. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
12. Initial progress report.
13. Report of preconstruction conference.
14. Certificates of insurance and insurance policies.
15. Performance and payment bonds.
16. Current Certificates of Insurance.

I. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

J. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:

1. Evidence of completion of Project closeout requirements.
2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
3. Updated final statement, accounting for final changes to the Contract Sum.
4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
6. AIA Document G707, "Consent of Surety to Final Payment."
7. Evidence that claims have been settled.
8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
9. Final liquidated damages settlement statement.
10. AN AMOUNT, AS DESIGNATED IN SECTION 01 77 00, WILL BE RETAINED UNTIL SUCH TIME AS THE CONTRACTOR’S LEED DOCUMENTATION AND PROCESSES ARE SUCCESSFULLY COMPLETED.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 29 00

SECTION 01 31 00 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. Informational submittals
2. General coordination procedures.
3. Coordination drawings.
4. Requests for Information (RFIs).
5. Project Web site.
6. Project meetings.

B. Related Requirements:
1. Section 013200 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
2. Section 017300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
3. Section 017700 "Closeout Procedures" for coordinating closeout of the Contract.
4. Division 36 Sections for coordinating the Work with Owner's Commissioning Authority.
5. Section 013510 "Sustainable Project Requirements" for coordinating LEED submittals and credit verification information

1.3 DEFINITIONS

A. RFI: Request from Owner, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

1.4 INFORMATIONAL SUBMITTALS

A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

1. Name, address, and telephone number of entity performing subcontract or supplying products.
2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.

B. Key Personnel Names: Within 15 days of NTP and prior to commencement of construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.

1. Post copies of list in project meeting room, in temporary field office, on Project Web site, and by each temporary telephone. Keep list current at all times.

1.5 GENERAL COORDINATION PROCEDURES

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, which depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required obtaining the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's construction schedule.
2. Preparation of the schedule of values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.

D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

1.6 COORDINATION DRAWINGS

A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.

1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:

a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
b. Coordinate the addition of trade-specific information to the coordination drawings by multiple contractors in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
f. Indicate required installation sequences.
g. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

B. Coordination Drawing Organization: Prepare and organize coordination drawings as digital data files according to the following requirements::

1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
2. Space between ceiling systems and floor or roof deck above: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within ceiling space to accommodate layout of mechanical (HVAC and ductwork distribution), plumbing, fire-protection, fire alarm and detection, fire suppression, electrical, data, security electronics equipment, cable trays or conduits, and light fixtures indicated on Drawings. Indicate areas of conflict between all systems and components.
3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire-protection, fire alarm, and electrical equipment.
4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.

6. Mechanical and Plumbing Work: Show the following:

    a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
    b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
    c. Fire-rated enclosures around ductwork.

7. Electrical Work: Show the following:

    a. Runs of vertical and horizontal conduit 1-1/4 inches (32 mm) in diameter and larger.
    b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.
    c. Panel board, switch board, switchgear, transformer, busway, generator, and motor control center locations.
    d. Location of pull boxes and junction boxes, dimensioned from column center lines.

8. Fire-Protection System: Show the following:

    a. Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.

    b. Location of zone control assemblies and identification of zones.

    c. Drawings shall be signed and sealed by a licensed fire protection or licensed fire protection contractor.

9. Review: Architect will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make changes as directed and resubmit.
10. Coordination Drawing Prints: Prepare coordination drawing prints according to requirements in Section 013300 "Submittal Procedures."

11. Architect will furnish Contractor one set of digital data files of Drawings for use in preparing coordination digital data files.

    a. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Drawings.
    b. Digital Data Software Program: Drawings are available in AutoCAD, DWG files.
    c. Contractor shall execute a data licensing agreement in the form of Agreement included in this Project Manual .
    d. See Section 013300 “Submittal Procedures” for requirements and costs for sharing of the drawing files with the Contractor.

1.7 REQUESTS FOR INFORMATION (RFIs)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in

the form specified, and enter it into the electronic record using the Project Document Control Software provided by the Contractor and approved by the Owner.

1. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

1. Project name.
2. Project number.
3. Date.
4. Name of Contractor.
5. Name of Architect.
6. RFI number, numbered sequentially.
7. RFI subject.
8. Specification Section number and title and related paragraphs, as appropriate.
9. Drawing number and detail references, as appropriate.
10. Field dimensions and conditions, as appropriate.
11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
12. Contractor's signature.
13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

    a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Forms: Software-generated form with substantially the same content as indicated above, acceptable to Architect.

1. Attachments shall be electronic files in Adobe Acrobat PDF format.

D. PROPER RFI and Contractor Responsibility:

1. An RFI is PROPER when prepared by the Contractor in accordance with the requirements of this Section.
2. An RFI is a properly prepared written request by the Contractor’s Project Manager to the Architect for interpretation of the Contract Documents when the intent of the Contract Documents is not reasonably inferable and an interpretation of the Contract Documents is required from the Architect in advance of performing Work.
3. It is the responsibility of the Contractor to make a reasonable and detailed review of the Contract Documents prior to the issuance of an RFI to the Architect to determine that the requested interpretation is not readily inferable from the Contract Documents.
4. When Contractor believes an RFI may result in a change in the Contract Sum, Contract Time, or both, do not submit an RFI.

    a. The Contractor shall submit a Notification of Change or Change Order Request in accordance with Section 012600 Contract Modification Procedures.

E. IMPROPER RFI and Contractor Responsibility:

1. RFI not prepared in accordance with requirements of this Section.
2. RFI that requests an interpretation of the Contract Documents that could have been reasonably inferred from the Contract Documents.
3. An IMPROPER RFI may be is subject to reimbursable costs.
4. An IMPROPER RFI will be returned to the Contractor unanswered.

    a. Architect shall notify Owner and Contractor that RFI is Improper within five (5) calendar days following receipt.
    b. The Architect may request from the Owner fair and reasonable costs for the time and materials expended by the Architect for the time expended in processing and responding to an IMPROPER RFI.
    c. Owner may deduct fair and reasonable costs for the time and materials expended by the Architect in processing and responding to an IMPROPER RFI from the Contractor on a monthly basis at the time of the Contractor's Payment Application Request.

5. The reimbursable cost is not a penalty, but a fair reimbursement of the costs the Contractor should have otherwise expended in researching the Contract Documents for the requested interpretation.

    a. The decision of the Architect in the determination of an IMPROPER RFI is final and binding.

6. An RFI submitted for any of the following reasons is, but not limited to, an IMPROPER RFI and may be subject to reimbursable costs:

    a. When the Architect's response will result in the issuance of a Request For Proposal by the Architect.
    b. The Contractor must submit a Notification of Change or Change Order Request, not an RFI when:

        1) Request when response may result in adjustment of the Contract Sum.
        2) Request when response may result in adjustment of the Contract Duration.

    c. Request for substitution of product, performance or standard of quality.
    d. Request for a change to the Contract Documents to respond to job site conditions or activities.
    e. Request for a clarification of a required Submittal or Shop Drawing either before or after such Submittal review by the A/E.
    f. Handwritten RFI.
    g. Request approval of submittals.
    h. Request approval of substitutions.
    i. Request for approval of Contractor's means and methods.
    j. Request coordination of various materials and systems indicated on Contract Documents with field conditions and with each other.
    k. RFI prepared by a subcontractor or material supplier.
    l. RFI submitted directly to the Architect by a subcontractor or material supplier.

F. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow a minimum of seven 7 working days for Architect's response for each

RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.

1. Improper RFIs will be returned without action:
   a.

2. Architect response period will be extended beyond 7 calendar days by the Architect for the following:
   a. Where Architect's action includes a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
   b. Where required by complicated RFI.
   c. When more than one design and/or engineering discipline is required to provide a response.
   d. Concurrent review of multiple RFI's.
   e. Receipt of Improper RFI.
3. Architect will advise Contractor in writing within five calendar days following receipt of original RFI if RFI response period will exceed 7 calendar days.
4. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Modification Procedures."

   a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.

G. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log biweekly . Software log with not less than the following:

1. Project name.
2. Name and address of Contractor.
3. Name and address of Architect.
4. RFI number including RFIs that were returned without action or withdrawn.
5. RFI description.
6. Date the RFI was submitted.
7. Date Architect's response was received.

H. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.

1. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
2. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

1.8 PROJECT WEB SITE

A. Provide, administer, and use Project Web site for purposes of hosting and managing project communication and documentation until Final Completion. Project Web site shall include the following functions:

1. Project directory.
2. Project correspondence.

3. Meeting minutes.
4. Contract modifications forms and logs.
5. RFI forms and logs.
6. Task and issue management.
7. Photo documentation.
8. Schedule and calendar management.
9. Submittals forms and logs.
10. Payment application forms.
11. Drawing and specification document hosting, viewing, and updating.
12. Online document collaboration.
13. Reminder and tracking functions.
14. Archiving functions.

B. Contractor, subcontractors, and other parties granted access by Contractor to Project Web site shall execute a data licensing agreement in the form of Agreement acceptable to Owner and Architect.

1.9 PROJECT MEETINGS

A. General: Architect will schedule and conduct meetings and conferences at Project site unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting at least one week in advance of the meeting date. Notify Owner and Architect of scheduled meeting dates and times.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees at least three business days prior to the scheduled meeting date.
3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.

B. Preconstruction Conference: Architect will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.

1. Conduct the conference to review responsibilities and personnel assignments.
2. Attendees: State’s Project Manager, Owner's Commissioning Authority,State’s Construction Inspection and Testing Firm (SCITF); Architect, and their consultants; Contractor and its superintendent; Contractor’s Construction Inspection and Testing Firm (CCITF); Contractor’s Quality Control Manager and the Contractor’s Specialty Subcontractors; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

    a. Contractor’s Specialty Subcontractors include:

        1) Electronic Security Contractor (ESC)
        2) Mechanical Contractor
        3) Fire Protection Contractor
        4) Plumbing Contractor
        5) Electrical Contractor

3. Agenda: Discuss items of significance that could affect progress, including the following:

    a. Contractor Action Items

        1) Submittal of executed bonds and insurance certificates.
        2) Execution of Owner-Contractor Agreement.
        3) Submittals:

            a) List of subcontractors
            b) List of major products
            c) Schedule of values
            d) Preliminary Construction Progress Schedule
            e) Preliminary shop drawing submittal schedule.

        4) Designation of responsible Contractor personnel with emergency contact telephone numbers (three persons minimum).
        5) Equipment and material lists as specified.
        6) Temporary utilities.
        7) Testing services and procedures for testing.
        8) Requirements for startup of equipment (Commissioning).

    b. Owner / Agency Construction Manager Action Items

        1) Procedures and processing of RFIs, field decisions, submittals, substitutions, Applications for Payment, proposal requests, change orders, and Contract closeout procedures.
        2) Computer software programs to be utilized and distribution of computer generated sample reports to be utilized during construction.
        3) Scheduling and Schedules.
        4) Documentation in support of payment.
        5) Distribution of Contract Documents.
        6) Use of premises by Owner and Contractor, including work restrictions and working hours.
        7) Construction facilities and controls provided by Owner.
        8) Site Security.
        9) Responsibility for temporary facilities and controls.
        10) Procedures for maintaining record documents.
        11) Requisitions for Payment.
        12) Submittal Procedures..
        13) Security.
        14) Safety and housekeeping procedures.
        15) Survey and building layout.
        16) Progress photos
        17) Inspection and acceptance of utility systems and equipment placed into service during construction period.
        18) Critical work sequencing and long-lead items.
        19) Designation of key personnel and their duties.
        20) Lines of communications.
        21) Procedures for testing and inspecting.

    c. Distribution of the Contract Documents.
        1) Procedures for moisture and mold control.
        2) Procedures for disruptions and shutdowns.
        3) Construction waste management and recycling.

4) Parking availability.
5) Office, work, and storage areas.
6) Equipment deliveries and priorities.
7) First aid.

4. Minutes: Within seven calendar days, Architect will record and distribute meeting minutes and issue to the Contractor for subsequent distribution to all attendees.

   a. At the Owner's discretion, the Owner may record the proceedings of the Preconstruction Conference in audio and/or video.
   b. If recorded, the recording is made part of the Owner's official documents of Construction Administration Phase of the project

C. Commissioning Meetings: See Division 01 Section "General Commissioning Requirements for procedures for Commissioning Scoping Meeting.

D. LEED Coordination Conferences: LEED Consultant will schedule and conduct a sustainable design coordination conference at a time convenient to Owner Architect, and Contractor.

1. Conferences: Attend three (3) Construction LEED Coordination Meetings sponsored by the architect and led by the LEED Consultant. To be scheduled within 30 days of the NTP by the architect and conducted during a regular construction progress meeting.
2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent and sustainable design coordinator; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect meeting sustainable design requirements, including the following:

   a. Sustainable design LEED Scorecard.
   b. General requirements for sustainable design-related procurement and documentation.
   c. Project closeout requirements and sustainable design certification procedures.
   d. Role of sustainable design coordinator.
   e. Construction waste management.
   f. Construction operations and sustainable design requirements and restrictions.
   g. Construction Indoor Air Quality Plan.
   h. Contractors LEED Materials Tracking Logs or Spreadsheets.

4. Minutes: LEED Consultant will record and distribute meeting minutes.

E. Preinstallation Conferences: When requested by the Owner or Architect, or required in individual Specification Sections, the Contractor shall advise the Owner's Project Manager and Architect in writing of a Preinstallation Conference a minimum of fourteen (14) days prior to the scheduled commencement date of the Work.

1. The Preinstallation Conference shall be conducted seven (7) calendar days prior to the scheduled commencement date of the Work.
2. Preinstallation Conferences shall be held at the Contractor's on-site conference room.

3. Contractor shall prepare agenda, conduct conference, record minutes, and distribute meeting minutes within five (5) calendar days following the conference but not latter than three (3) calendar days prior to Work commencement.
4. Attendees:

    a. Owner's Project Manager.
    b. Contractor's Project Manager.
    c. Contractor's Quality Control Manager.
    d. Contractor's Field Engineer.
    e. Architect and/or A/E Project Manager.
    f. Entities directly affecting, or affected by, work of the Section, including but not limited to:
    g. Subcontractor Superintendent.
    h. Material vendors.
    i. Trade installers.
    j. Contractor's Construction and Inspection Testing Firm (CCITF) Project Manager.
    k. State's Construction and Inspection Testing Firm (SCITF) Project Manager.

5.
6. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

    a. Contract Documents.
    b. Options.
    c. Related RFIs.
    d. Related Change Orders.
    e. Purchases.
    f. Deliveries.
    g. Submittals.
    h. LEED requirements.
    i. Review of mockups.
    j. Possible conflicts.
    k. Compatibility requirements.
    l. Time schedules.
    m. Weather limitations.
    n. Manufacturer's written instructions.
    o. Warranty requirements.
    p. Compatibility of materials.
    q. Acceptability of substrates.
    r. Temporary facilities and controls.
    s. Space and access limitations.
    t. Regulations of authorities having jurisdiction.
    u. Testing and inspecting requirements.
    v. Installation procedures.
    w. Coordination with other work.
    x. Required performance results.
    y. Protection of adjacent work.
    z. Protection of construction and personnel.

7. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
8. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.

9. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

F. Project Closeout Conference: Owner's Project Manager will schedule a project closeout conference, at a time convenient to Owner and Architect, but no later than 90 days prior to the scheduled date of Substantial Completion.

1. Conduct the conference to review requirements and responsibilities related to Project closeout.
2. Attendees: Authorized representatives of Owner, Owner's Commissioning Authority, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:

    a. Preparation of record documents.
    b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
    c. Submittal of written warranties.
    d. Requirements for completing LEED documentation.
    e. Requirements for preparing operations and maintenance data.
    f. Requirements for delivery of material samples, attic stock, and spare parts.
    g. Requirements for demonstration and training.
    h. Preparation of Contractor's punch list.
    i. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
    j. Submittal procedures.
    k. Coordination of separate contracts.
    l. Owner's partial occupancy requirements.
    m. Installation of Owner's furniture, fixtures, and equipment.
    n. Responsibility for removing temporary facilities and controls.

4. Minutes: Entity conducting meeting will record and distribute meeting minutes.

G. Owner's Progress Meetings (OPM): Architect will conduct progress meetings at biweekly intervals.
1. Attendees: In addition to attendees listed below, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.

    a. The Owner and the State's Project Manager.
    b. The Using Agency Representative for Maintenance.
    c. The Using Agency Representative for Operations and Security.
    d. The Project Architect and/or the A/E Project Manager.
    e. State's Construction and Inspection Testing Firm (SCITF) Project Manager.
    f. The Contractor's Project Manager.
    g. The Contractor's Quality Control Manager (QCM).
    h. The Contractor's Field Engineer.

i. The Contractor's Construction and Inspection Testing Firm (CCITF) Project Manager.
j. The Contractor's Specialty Contractor(s) Project Manager.
k. The Contractor's Mechanical, Plumbing, Electrical Project Managers, as required by the Construction Progress Schedule.
l. The Contractor's other Subcontractor Project Managers as required by the Owner or the Architect.

2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
    1) Contractor's Construction Schedule: Review of progress since the last meeting, including determination of whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Review schedule for next period.
    2) Review of minutes of previous meeting.
    3) Review of Work progress and on-site security.
    4) Review of Contractor's Request for Interpretations.
    5) Review of Architect's Request for Interpretation Log.
    6) Field observations, problems, and decisions.
    7) Review of submittals schedule and status of submittals.
    8) Review of off-site fabrication and delivery schedules.
    9) Maintenance of progress schedule.
    10) Corrective measures to regain projected schedules.
    11) Executed and planned progress during succeeding work periods.
    12) Coordination of projected progress.
    13) Maintenance of quality and work standards.
    14) Effect of proposed changes on progress schedule and coordination.

    b. Review of present and future needs of each entity present, including the following:

        1) Interface requirements.
        2) Sequence of operations.
        3) Status of submittals.
        4) Status of LEED documentation.
        5) Deliveries.
        6) Off-site fabrication.
        7) Access.
        8) Site utilization.
        9) Temporary facilities and controls.
        10) Progress cleaning.
        11) Quality and work standards.
        12) Status of correction of deficient items.
        13) Field observations.
        14) Status of RFIs.
        15) Status of proposal requests.
        16) Pending changes.
        17) Status of Change Orders.
        18) Pending claims and disputes.
        19) Documentation of information for payment requests.

3. Contractor Prepared Documents for the Owner's Progress Meeting

a. The Contractor's Project Manager shall provide documents containing representative information that the Contractor shall prepare and distribute to the Procurement Officer and each attendee at the start of each Owner's Progress Meeting, they include:

1) Prior Owner's Progress Meeting Minutes prepared by the Architect.
2) Schedule Narrative

a) "Look-Ahead Narrative": Describe by week each trade contractor's past two-week effort and the scheduled next four-week effort.
b) Indicate in the Narrative where the past two or more week scheduled tasks were not accomplished and describe the means and methods the Contractor will utilize to recover schedule slippage.
c) The two-week back and four-week Look-Ahead Narrative shall be based on the CPM Construction Schedule.

3) Request for Interpretation (RFI) Log.
4) Approved Change Order (CO) Log.
5) Shop Drawing and Product Submittal Log.

a) Shop Drawing and Product Submittal Log shall be a status report generated by the specified construction scheduling software, no exception.
b) The Submittal Log shall identify each Submittal item by specification Section sequential number.
c) The Submittal Log shall include and identify the early start, late start, early finish and late finish for each Submittal item.

6) New Business

a) Contractor produced itemized list of issues to be discussed.
b) Number each item starting with the current OPM number followed by a period and the sequential item number. Example: 7.01, 7.02, etc.

4. Minutes: Within seven calendar days, Architect will record meeting minutes and issue to the Owner and Contractor for subsequent distribution to their personnel, subcontractors, or other attendees that are associated with the Owner or Contractor. The Architect will distribute to its consultants.

a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

H. Contractor's Coordination Meetings (CCM): Contractor will conduct coordination meetings at biweekly (every 2 weeks) intervals, off-cycle from the OPM.

1. Attendees: In addition to the attendees listed below, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.

a. The Owner and the State's Project Manager.
b. The Using Agency Representative for Maintenance.
c. The Using Agency Representative for Operations and Security.
d. State's Construction and Inspection Testing Firm (SCITF) Project Manager.
e. The Contractor's Project Manager.
f. The Contractor's Quality Control Manager (QCM).
g. The Contractor's Field Engineer.
h. The Contractor's Construction and Inspection Testing Firm (CCITF) Project Manager.
i. The Contractor's Specialty Contractor(s) Project Manager.
j. The Contractor's Mechanical, Plumbing, Electrical Project Managers, as required by the Construction Progress Schedule.
k. The Contractor's other Subcontractor Project Managers as required by the Owner or the Architect.

2. Agenda: Review and correct or approve minutes of previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

a. Contractor's Construction Schedule: Review of progress since the last meeting. Including determine of whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule.

1) Review schedule for next period.
2) Review of Work progress and on-site security.
3) Review of Contractor's Request for Interpretations
4) Review of Contractor's Request for Interpretation Log.
5) Field observations, problems, and decisions.
6) Identification of problems that impede planned progress.
7) Review of submittals schedule and status of submittals.
8) Review of off-site fabrication and delivery schedules.
9) Maintenance of progress schedule.
10) Corrective measures to regain projected schedules.
11) Planned progress during succeeding work period.
12) Coordination of projected progress.
13) Maintenance of quality and work standards.
14) Effect of proposed changes on progress schedule and coordination.
15) Other business relating to Work.

b. Review of present and future needs of each entity present, including the following:

1) Interface requirements.
2) Sequence of operations.
3) Status of submittals.
4) Status of LEED documentation.
5) Deliveries.
6) Off-site fabrication.
7) Access.
8) Site utilization.
9) Temporary facilities and controls.
10) Progress cleaning.
11) Quality and work standards.
12) Status of correction of deficient items.

13) Field observations.
14) Status of RFIs.
15) Status of proposal requests.
16) Pending changes.
17) Status of Change Orders.
18) Pending claims and disputes.
19) Documentation of information for payment requests.

3. Contractor Prepared Documents for Contractor's Progress Meeting:

a. The Contractor's Project Manager shall provide documents containing representative information that the General Contractor shall prepare for distribution at each CCM, they include:

1) Schedule Narrative:

a) A description of the work by trade or system.
b) Describe the past two-week's effort and the next four weeks effort.
c) Indicate where the four-week scheduled tasks were not accomplished and report on the methods to be employed by the Contractor to recover schedule slippage.

2) Look-ahead Schedule:

a) Two-week back and four-week Look-ahead Bar Chart schedule developed from the CPM Construction Schedule.

3) Request for Interpretation Log (RFI).
4) Approved Change Order Log (ACO).
5) Shop Drawing and Products Submittal Log.
6) New Business:

a) General Contractor produced itemized list of issues to be discussed.
b) Number each item starting with the current meeting number, followed by a period and the sequential item number.
c) Example: 7.01, 7.02, etc.

4. Minutes: Within seven calendar days, Contractor will record meeting minutes and issue to the Owner and Contractor for subsequent distribution to their personnel, subcontractors, or other attendees that are associated with the Owner or Contractor. One copy shall be distributed to the Architect.

5. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

I. Site Coordination Meetings: In addition to the Owner's Progress Meetings and the Contractor Coordination Meetings, the Contractor may be required to attend the Owner's Site Coordination Meeting.

1. The Site Coordination Meeting will be held in the State's on-site conference room.

2. The Site Coordination Meeting will be held in the State's on-site conference room.
3. The Contractor will receive a minimum notification of twenty-four (24) hours in advance of an Owner's Site Coordination Meeting by the Owner.
4. The Owner will prepare the agenda, conduct and issue meeting minutes to the Contractor and Architect and all attendees within five (5) calendar days.
5. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
    a. Review present and future needs of the Owner's reresentatives present, including the following:

        1) Owner interface requirements or issues – operational, security.
        2) Sequence of operations.
        3) Utility interruptions
        4) Owner provided scope coordination (FFE, IT, Telecom, Security, etc.), including scheduling, deliveries, integration with Contractor work;
        5) Access.
        6) Site utilization.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 31 00

SECTION 01 32 00 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Startup construction schedule.
2. Contractor's construction schedule.
3. Construction schedule updating reports.
4. Daily construction reports.
5. Material location reports.
6. Site condition reports.
7. Special reports.

B. Related Requirements:
1. Section 01 33 00 "Submittal Procedures" for submitting schedules and reports.
2. Section 01 35 10 "Sustainable Project Requirements" for LEED coordination and activities.
3. Section 01 40 00 "Quality Requirements" for submitting a schedule of tests and inspections.
4. Section 01 50 60 "Indoor Air Quality during Construction" for the plan and scheduling activities.
5. Section 01 91 13 "General Commissioning Requirements" to establish schedule and coordination with project commissioning activities.

1.3 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.

1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
2. Predecessor Activity: An activity that precedes another activity in the network.
3. Successor Activity: An activity that follows another activity in the network.

B. Cost Loading: The allocation of the schedule of values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum unless otherwise approved by Architect.

C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships.

Network calculations determine when activities can be performed and the critical path of Project.

D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

E. Event: The starting or ending point of an activity.

F. Float: The measure of leeway in starting and completing an activity.

1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

G. Fragnet: A partial or fragmentary network that breaks down activities into smaller activities for greater detail.

H. Major Area: A story of construction, a separate building, or a similar significant construction element.

I. Milestone: A key or critical point in time for reference or measurement.

J. Network Diagram: A graphic diagram of a network schedule, showing activities and activity relationships.

K. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For firms and persons specified in "Quality Assurance" Article and in-house scheduling personnel to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

B. Submittals Schedule: Submit five (5) copies of schedule. Arrange the following information in a tabular format:

1. Scheduled date for first submittal.
2. Specification Section number and title.
3. Submittal category (action or informational).
4. Name of subcontractor.
5. Description of the Work covered.

C. Scheduled date for Architect's final release or approval.

D. Format for Submittals: Submit required submittals in the following format:

1. Working electronic copy of schedule file, where indicated.

2. PDF electronic file.

E. Startup construction schedule.

1. Approval of cost-loaded, startup construction schedule will not constitute approval of schedule of values for cost-loaded activities.

F. Startup Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.

G. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.

1. Submit a working electronic copy of schedule, using software indicated, and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.

H. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.

1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.
2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
3. Total Float Report: List of all activities sorted in ascending order of total float.
4. Earnings Report: Compilation of Contractor's total earnings from the Notice to Proceed until most recent Application for Payment.

I. Construction Schedule Updating Reports: Submit with Applications for Payment.

J. Daily Construction Reports: Submit two copies at daily intervals. One copy to the Owner and one to the Owner. In the event that the General Contractor’s daily report is not received by 10:00 am to the Owner, it will be understood that no daily report was filled out properly and legally.

K. Material Location Reports: Submit at weekly intervals.

L. Site Condition Reports: Submit at time of discovery of differing conditions.

M. Special Reports: Submit at time of unusual event.

1.5 QUALITY ASSURANCE

A. Scheduling Consultant Qualifications: An experienced specialist in CPM scheduling and reporting, with capability of producing CPM reports and diagrams within 24 hours of Architect's request.

B. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to the preliminary construction schedule and Contractor's construction schedule, including, but not limited to, the following:

1. Review software limitations and content and format for reports.
2. Verify availability of qualified personnel needed to develop and update schedule.
3. Discuss constraints, including work stages, area separations, interim milestones, and partial Owner occupancy.
4. Review delivery dates for Owner-furnished products.
5. Review schedule for work of Owner's separate contracts.
6. Review submittal requirements and procedures.
7. Review time required for review of submittals and resubmittals.
8. Review requirements for tests and inspections by independent testing and inspecting agencies.
9. Review time required for Project closeout and Owner startup procedures, including commissioning activities.
10. Review and finalize list of construction activities to be included in schedule.
11. Review procedures for updating schedule.

1.6 COORDINATION

A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.

B. Coordinate Contractor's construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from entities involved.
2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

C. Auxiliary Services: Cooperate with photographer and provide auxiliary services requested, including access to Project site and use of temporary facilities including temporary lighting.

PART 2 - PRODUCTS

2.1 SUBMITTALS SCHEDULE AND REGISTER

A. General: Compile a complete and comprehensive schedule and register of all submittals required by the Contract Documents and organized by specification section number anticipated to be made during progress of the work. Submit three (3) copies of submittal schedule and register to Owner, and Architect for review and comment within 15 days after Notice to Proceed and before any items are submitted. Upon review and comment by the Owner, and Architect, this schedule will become part of the Contract and the Contractor will be required to adhere to the schedule except when specifically otherwise permitted.

1. Revisions: Revise and update the schedule on a monthly basis as necessary to reflect conditions and sequences. Promptly submit revised schedules to the Owner, and Architect for review and comment.
2. Post copies appropriately in the Project and Field offices.

B. The submittal register shall be submitted in a format as prescribed by and to the level of detail required by the Owner and Architect. Submittal Register shall include such items as:

1. List of each type of required submittal item such as but not limited to shop drawings, product data, certificates of compliance, samples, guarantees and warranties, test reports, operation and maintenance manuals.
2. Listing of subcontractors.
3. Insurance certificate.
4. Performance and payment bonds.
5. Permits.
6. Payment applications.
7. Schedule of Values.
8. List of products.
9. Project closeout submittals.
10. Submittal dates.
11. Related section number.
12. Name of contractor, trade or manufacturer

C. Prepare and submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Indicate items requiring submission for each section number as listed in the Specification Table of Contents, as applicable.

D. The Owner shall have the right to require the Contractor to add and/or delete items on the submittal register at any time.

E. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.

1. Initial Submittal: Submit concurrently with preliminary network diagram. Include submittals required during the first 60 days of construction. List those required to maintain orderly progress of the Work and those required early because of long lead-time for manufacture or fabrication.

a. At Contractor's option, show submittals on the Preliminary Construction Schedule, instead of tabulating them separately.

2.2 Final Submittal: Submit concurrently with the first complete submittal of Contractor's Construction Schedule.

2.3 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Time Frame: Extend schedule from date established for the Notice to Proceed to date of final completion.

1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

B. The Work shall be prosecuted at such rate as will ensure meeting the milestones, Pre-Commissioning Construction Completion, Substantial Completion and Final Completion dates specified in the Contract. By execution of the Contract, the Contractor represents that he has analyzed the Work required by the Contract Documents, the methods of construction involved, the availability of qualified labor, constraints on access and use

of the site, the work of other contractors, and his own capacity to perform the work and agrees that the specified times are reasonable and that they include a reasonable allowance for bad weather based on Section 7.06 of the GENERAL CONDITIONS.

C. The Owner shall initiate required meetings to coordinate and review the Schedule in accordance with Division 013100, Project Management and Coordination.

D. Following these meetings and within fourteen (14) days of award of contract, the Contractor shall prepare and submit the following information for the Owner's, and Architect's review and comment.

1. A time scaled and crew loaded construction schedule in tabular form covering all activities required to complete the work. Included in this tabular form will be quantities of work (i.e. CY, etc.) for a particular activity and the estimated manhours for each work activity. Activities shall be in a format and at a level of detail approved by the Owner. Durations for all activities shall be shown in working days (as opposed to calendar days). Activities shall include, at a minimum, preparation and approval of shop drawings, fabrication, delivery, installation, start-up, punch-out through to substantial completion. Show relationships between the Contractor's own work activities and those of other contractors, subcontractors and suppliers based on a thorough review of the Contract Documents.
2. Graphic diagrams indicating major work areas and the proposed direction or sequence of work within each work area and across the overall project.
3. Assumed crew sizes, equipment production rates and similar data used to arrive at durations and sequence.
4. The General Contractor will utilize the Master Schedule to plan, coordinate and manage the work of all contractors, subcontractors and suppliers. The Contractor is to complete all work in accordance with the Project Construction Plan.
5. The Contractor agrees that it shall have no claim against the Owner, and/or Architect for an increase in the contract price, nor for a payment or allowance of any kind for damage, loss or expense resulting from delays regardless of whether the delay is the basis for an extension of time. The General Contractor shall have no claim for damage, loss or expense resulting from reasonable interruptions to, or necessary suspension of work to enable other contractors to perform their work.

E. Updates and Modifications to the Construction Schedule:

1. If, during the progress of the work, the Contractor determines he will not be able to complete his work in the time allotted within the Project Master Schedule for Construction, he must notify the Owner within five (5) days. The Owner may, at its reasonable discretion, make adjustments in the Project Master Schedule for Construction to accommodate the General Contractor if timely written notification is given to the Owner, the adjustment is within the statement milestone dates, and the change will not adversely impact other contractors.
2. In advance of progress meetings as specified in Section 013100, “Project Management and Coordination”, Contractor shall prepare a short interval schedule covering a minimum 2-week period coordinating the detailed activities of his own forces and his subcontractors and suppliers. The short interval schedules shall be prepared in bar chart form and submitted 24 hours prior to the progress meetings.
3. On a weekly basis, and in accordance with the GENERAL CONDITIONS, the Contractor shall provide detailed information on progress to date, planned work,

and quantities and types of labor, materials, and equipment required to complete the work in accordance with contractual requirements.

F. Adjustment of Contractor's Effort:

1. Whenever it becomes apparent that an activity completion date may not be met (after adjustments are made as specified herein), the Contractor shall take the following actions at no additional cost to the Owner to place the work back on schedule. For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using fragnets to demonstrate the effect of the proposed change on the overall project schedule.

    a. Increase manpower or add equipment.
    b. Increase number of working hours per shift, shifts per working day, working days per week, or any combination thereof.
    c. Reschedule activities to achieve maximum practical concurrence.
    d. If the General Contractor fails to take the above actions, the Owner may take such actions as he may deem necessary to place the work back on schedule and shall deduct the cost of such actions from monies due or to become due to the Contractor.

G. Performance Periods, and Liquidation Damages:

1. Performance Period: The Contractor shall commence the Work upon receipt of a Notice(s)-To-Proceed, and shall achieve Milestone, Pre-Commissioning Construction Completion, Substantial Completion, and Final Completion dates in accordance with the Project Construction schedule.
2. Liquidated Damages: Liquidated Damages shall be in compliance with the GENERAL CONDITIONS and REQUEST FOR PROPOSAL, as well as, Section 011000, “Summary”.

H. Submit revised schedules with each Application for Payment, identifying changes since previous version. Indicate estimated percentage of completion for each item of Work at each submission.

I. Activities: Treat each story or separate area as a separate numbered activity for each main element of the Work. Comply with the following:

1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
3. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
4. Startup and Testing Time: Include days for commissioning, startup and testing as approved by Owner.
5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Owner’s, Architect's administrative procedures necessary for certification of Substantial Completion.
6. LEED Testing: Schedule indoor air quality testing when no other construction activities are occurring. Perform testing in accordance with Section 01 50 60 Indoor Air Quality plan during Construction" and provide LEED related testing for

credit IEQc3.2. Schedule indoor air quality flushout in compliance with LEED credit IEQc3.2, OPTION 1, two week flush out prior to occupancy.

7. Punch List and Final Completion: Include not more than 45 days for completion of punch list items for Construction Completion, and not more than 30 days for completion of punch list items for Final Completion.

J. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
   1. Work under More Than One Contract: Include a separate activity for each contract.
   2. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
   3. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Section 011000 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
   4. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Section 011000 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
   5. Work Restrictions: Show the effect of the following items on the schedule:
      a. Uninterruptible services.
      b. Partial occupancy before Substantial Completion.
      c. Use of premises restrictions.
      d. Provisions for future construction.
      e. Seasonal variations.
      f. Environmental control.

   6. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:

      a. Subcontract awards.
      b. Submittals.
      c. Purchases.
      d. Mockups.
      e. Fabrication.
      f. Sample testing.
      g. Deliveries.
      h. Installation.
      i. Tests and inspections.
      j. Adjusting.
      k. Curing.
      l. Building flush-out.
      m. Startup and placement into final use and operation.
      n. Commissioning.
      o. LEED testing.
      p. Placement into final use and operation.

   7. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:

      a. Structural completion.
      b. Temporary enclosure and space conditioning.
      c. Permanent space enclosure.
      d. Completion of mechanical installation.

e. Completion of electrical installation.
f. Substantial Completion.

1. Other Constraints: . Show the effects of the following items on the schedule.

a. Interface with Security requirements of existing Corrections facilities where work is required.
b. Interruptions of existing Secure Corrections facilities as a result of work within the SUI Building.
c. Interruptions of existing Secure Corrections facilities as a result of work within the “D” Block.
d. Interruptions of existing Secure Corrections facilities as a result of work with Forrest Street.

2. Coordination with Baltimore City Department of Public Works, Baltimore City Department of Transportation, BGE, Verizon and other utility entities or agencies as required to perform work.

K. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion

L. Cost Correlation: Superimpose a cost correlation timeline, indicating planned and actual costs. On the line, show planned and actual dollar volume of the Work performed as of planned and actual dates used for preparation of payment requests.

1. See Division 01, Section "Payment Procedures" for cost reporting and payment procedures.

M. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:

1. Unresolved issues.
2. Unanswered Requests for Information.
3. Rejected or unreturned submittals.
4. Notations on returned submittals.
5. Pending modifications affecting the Work and Contract Time.

N. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, equipment required to achieve compliance, and date by which recovery will be accomplished.

O. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.

1. Use latest version of Primavera Professional Project Management, or its complement in Prolog, or other Scheduling/Project Management program that is as capable and robust and approved by Owner . Purchase and provide the Owner one unopened copy of the Project Management Software system. The software program shall become the property of the Owner.

2.4 STARTUP CONSTRUCTION SCHEDULE

A. Bar-Chart Schedule: Submit startup, horizontal, bar-chart-type construction schedule within 14 days of date established for Execution of Contract.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

2.5 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

A. General: Prepare network diagrams using AON (activity-on-node) format.

B. Startup Network Diagram: Submit diagram within 30 days of date established for the Notice to Proceed . Outline significant construction activities for the first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

C. CPM Schedule: Prepare Contractor's construction schedule using a cost- and resource-loaded, time-scaled CPM network analysis diagram for the Work.

1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 30 days after date established for the Notice to Proceed .

    a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Architect's approval of the schedule.

2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
4. Use "one workday" as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule in order to coordinate with the Contract Time.

D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the startup network diagram, prepare a skeleton network to identify probable critical paths.

1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:

    a. Preparation and processing of submittals.
    b. Mobilization and demobilization.
    c. Purchase of materials.
    d. Delivery.
    e. Fabrication.
    f. Utility interruptions.

g. Installation.
h. Work by Owner that may affect or be affected by Contractor's activities.
i. Testing and commissioning.
j. Punch list and final completion.
k. Activities occurring following final completion.

2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.

    a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.

5. Cost- and Resource-Loading of CPM Schedule: Assign cost to construction activities on the CPM schedule. Do not assign costs to submittal activities. Obtain Architect's approval prior to assigning costs to fabrication and delivery activities. Assign costs under main subcontracts for testing and commissioning activities, operation and maintenance manuals, punch list activities, Project record documents, LEED documentation, and demonstration and training (if applicable), in the percent amount of of the Contract Sum as determined in collaboration with the Owner and Architect .

    a. Each activity cost shall reflect an appropriate value subject to approval by Architect.
    b. Total cost assigned to activities shall equal the total Contract Sum.

E. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall project schedule.

F. Initial Issue of Schedule: Prepare initial network diagram from a sorted activity list indicating straight "early start-total float." Identify critical activities. Prepare tabulated reports showing the following:

1. Contractor or subcontractor and the Work or activity.
2. Description of activity.
3. Main events of activity.
4. Immediate preceding and succeeding activities.
5. Early and late start dates.
6. Early and late finish dates.
7. Activity duration in workdays.
8. Total float or slack time.
9. Average size of workforce.
10. Dollar value of activity (coordinated with the schedule of values).

G. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:

1. Identification of activities that have changed.

2. Changes in early and late start dates.
3. Changes in early and late finish dates.
4. Changes in activity durations in workdays.
5. Changes in the critical path.
6. Changes in total float or slack time.
7. Changes in the Contract Time.

H. Value Summaries: Prepare two cumulative value lists, sorted by finish dates.

1. In first list, tabulate activity number, early finish date, dollar value, and cumulative dollar value.
2. In second list, tabulate activity number, late finish date, dollar value, and cumulative dollar value.
3. In subsequent issues of both lists, substitute actual finish dates for activities completed as of list date.
4. Prepare list for ease of comparison with payment requests; coordinate timing with progress meetings.

    a. In both value summary lists, tabulate "actual percent complete" and "cumulative value completed" with total at bottom.
    b. Submit value summary printouts one week before each regularly scheduled progress meeting.

2.6 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:

1. Project Title.
2. Contract Number.
3. Date Report Represents.
4. Date Report was prepared.
5. Field Engineer’s Name.
6. Work start time and work stop time.
7. Contractor’s project administration manpower by description and total.
8. List of subcontractors at Project site.
9. List of separate contractors at Project site.
10. Manpower distribution and totals by category of trade and trade skill level.
11. Summary of manpower tasks scheduled and accomplished during the reporting period.
12. Equipment at Project site.
13. Material deliveries.
14. Official Weather Report from the nearest Federal Weather Reporting Station or as approved by the Architect. High and low temperatures and general weather conditions, including presence of rain or snow.
15. Accidents.
16. Meetings and significant decisions.
17. Unusual events (see special reports).
18. Stoppages, delays, shortages, and losses.
19. Meter readings and similar recordings.
20. Emergency procedures.
21. Orders and requests of authorities having jurisdiction.
22. Change Orders received and implemented.
23. Construction Change Directives received and implemented.
24. Services connected and disconnected.

25. Equipment or system tests and startups.
26. Partial completions and occupancies.
27. Substantial Completions authorized.

B. Material Location Reports: At weekly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site. Indicate the following categories for stored materials:

1. Material stored prior to previous report and remaining in storage.
2. Material stored prior to previous report and since removed from storage and installed.
3. Material stored following previous report and remaining in storage.

C. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.7 SPECIAL REPORTS

A. General: Submit special reports directly to Owner within one day of an occurrence. Distribute copies of report to parties affected by the occurrence.

B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Scheduling Consultant: Engage a consultant to provide planning, evaluation, and reporting using CPM scheduling.

1. In-House Option: Owner may waive the requirement to retain a consultant if Contractor employs skilled personnel with experience in CPM scheduling and reporting techniques. Submit qualifications.
2. Meetings: Scheduling consultant shall attend all meetings related to Project progress, alleged delays, and time impact.

B. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.

2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate final completion percentage for each activity.

C. Distribution: Distribute copies of approved schedule to Architect Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

1. Post copies in Project meeting rooms and temporary field offices.
2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 01 32 00

SECTION 01 32 33 - PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for the following:

1. Preconstruction photographs.
2. Periodic construction photographs.
3. Final completion construction photographs.

B. Related Requirements:
1. Section 013300 "Submittal Procedures" for submitting photographic documentation.
2. Section 017700 "Closeout Procedures" for submitting photographic documentation as project record documents at Project closeout.
3. Section 017900 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

1.3 INFORMATIONAL SUBMITTALS

A. Monthly submissions: Photographs must be submitted with application payment
1. Submission shall include photographs taken at ground level, around the perimeter of the building and general interior construction images.

B. Final submission: Contractor shall submit 1 flash drive containing all construction photographs for both the Owner and the Architect.

1.4 INFORMATIONAL SUBMITTALS

A. Digital Photographs: Submit image files within three days of taking photographs.

1. Digital Camera: Minimum sensor resolution of 8 megapixels.
2. Format: Minimum 3200 by 2400 pixels, in unaltered original files, with same aspect ratio as the sensor, uncropped, date and time stamped, in folder named by date of photograph, accompanied by key plan file.
3. Identification: Provide the following information with each image description in file metadata tag:

a. Name of Project.
b. Name of Architect.
c. Name of Contractor.
d. Date photograph was taken.

e. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.

B. Construction Photographs: Submit 2 sets of prints of each photographic view within seven days of taking photographs.

1. Format: 4 x 5 inch prints on single-weight, white paper; enclosed back to back in clear plastic sleeves that are punched for standard three-ring binder.
   a. Photographs printed on injet printers will be accepted
   b. Photographs shall be submitted in color

2. Identification: On back of each print, provide an applied label or rubber-stamped impression with the following information:

   a. Name of Project.
   b. Name of Owner and Architect.
   c. Name of Contractor.
   d. Date photograph was taken if not date stamped by camera.
   e. Description of vantage point, indicating location, direction and elevation or story of construction.
   f. Unique sequential identifier keyed to accompanying key plan.

1.5 QUALITY ASSURANCE

A. Web-Based Photographic Documentation Service Provider: A firm specializing in providing photographic equipment, Web-based software, and related services for construction projects, with record of providing satisfactory services similar to those required for Project.

1.6 USAGE RIGHTS

A. Obtain and transfer copyright usage rights from photographer to Owner for unlimited reproduction of photographic documentation.

B. Photographs shall be taken in such a way as to show progress of work but camera location, shall not view any existing corrections and security sensitive areas of adjacent DPSCS sites as determined by Owner.

PART 2 - PRODUCTS

2.1 PHOTOGRAPHIC MEDIA

A. Digital Images: Provide images in JPG format, produced by a digital camera with minimum sensor size of 8 megapixels, and at an image resolution of not less than 3200 by 2400 pixels.

PART 3 - EXECUTION

3.1 CONSTRUCTION PHOTOGRAPHS

A. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.

1. Maintain key plan with each set of construction photographs that identifies each photographic location.

B. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.

1. Date and Time: Include date and time in file name for each image.
2. Field Office Images: Maintain one set of images accessible in the field office at Project site, available at all times for reference. Identify images in the same manner as those submitted to Architect.

C. Preconstruction Photographs: Before commencement of demolition, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Architect.

1. Flag construction limits before taking construction photographs.
2. Take 30 photographs to show existing conditions adjacent to property before starting the Work.
3. Take 30 photographs of existing buildings either on or adjoining property to accurately record physical conditions at start of construction.
4. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.

D. Periodic Construction Photographs: Take 30 photographs weekly, with timing each month adjusted to coincide with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.

E. Architect or Owner-Directed Construction Photographs: From time to time, Architect or Owner will instruct photographer about number and frequency of photographs and general directions on vantage points. Select actual vantage points and take photographs to show the status of construction and progress since last photographs were taken.

F. Time-Lapse Sequence Construction Photographs: Take 20 photographs as indicated, to show status of construction and progress since last photographs were taken.

1. Frequency: Take photographs weekly, with timing each month adjusted to coincide with the cutoff date associated with each Application for Payment.
2. Vantage Points: Following suggestions by Architect or Owner and Contractor, photographer to select vantage points. During each of the following construction phases, take not less than two of the required shots from same vantage point each time to create a time-lapse sequence as follows:

a. Commencement of the Work, through completion of subgrade construction.
b. Above-grade structural framing.
c. Exterior building enclosure.
d. Interior Work, through date of Substantial Completion.

G. Final Completion Construction Photographs: Take 30 color photographs after date of Substantial Completion for submission as project record documents. Architect or Owner will inform photographer of desired vantage points.

1. Do not include date stamp.

END OF SECTION 01 32 33

SECTION 01 33 00 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

B. Related Requirements:

1. Section 012900 "Payment Procedures" for submitting Applications for Payment and the schedule of values.
2. Section 013200 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
3. Section 017823 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
4. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
5. Section 017900 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.
6. Section 103510 Sustainable Project Requirements

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."

B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

C. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.

D. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

E. SharePoint Site: A website for the use of the project where files, calendars and discussion can be shared.

1.4 ACTION SUBMITTALS

A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.

1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
2. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.

    a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.

4. Format: Arrange the following information in a tabular format:

    a. Scheduled date for first submittal.
    b. Specification Section number and title.
    c. Submittal category: Action; informational.
    d. Name of subcontractor.
    e. Description of the Work covered.
    f. Scheduled date for Architect's final release or approval.
    g. Scheduled date of fabrication.
    h. Scheduled dates for purchasing.
    i. Scheduled dates for installation.
    j. Activity or event number.
    k. For LEED related submittals, complete the LEED Material Submittal Sheet attached to this section.

1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Digital Data Files: Electronic digital data files of the Contract Drawings will be provided by Design Team for Contractor's use in preparing submittals.

1. The Design Team will furnish Contractor digital data drawing files of the Contract Drawings for use in preparing Shop Drawings and Project record drawings.

    a. The Design Team makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
    b. Digital Drawing Software Program: The Contract Drawings are available in <**Insert name and version of digital drawing software program and operating system**>.

c. Contractor shall execute a data licensing agreement with each individual Design Team members.

2. Individual Drawings Costs: Contractor to coordinate the cost of each electronic drawing file, paid in advance by certified check or money order payable to the associated Design Team member. Costs are for clearing specific proprietary information from drawing file.
   a. Architectural cost: **$300** per electronic drawing file.
   b. The following digital data drawing files will be furnished for each appropriate discipline:

      1) Floor plans.
      2) Reflected ceiling plans.

3. BIM model will not be provided by the A/E.

4. Contractor is responsible for coordinated directly with each Team Member to determine drawing costs and obtaining associated waiver form(s). DO NOT contact the Architect for requests not related to the Architect's documents.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

   a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow 15 days for review of each resubmittal.
4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.
5. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow 15 days for review of each submittal. Submittal will be returned to before being returned to Contractor.

D. Paper Submittals: Place a permanent label or title block on each submittal item for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a space approximately 6 by 8 inches (150 by 200 mm) on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
3. Include the following information for processing and recording action taken:

    a. Project name.
    b. Date.
    c. Name of Architect.
    d. Name of Contractor.
    e. Name of subcontractor.
    f. Name of supplier.
    g. Name of manufacturer.
    h. Submittal number or other unique identifier, including revision identifier.

        1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).

    i. Number and title of appropriate Specification Section.
    j. Drawing number and detail references, as appropriate.
    k. Location(s) where product is to be installed, as appropriate.
    l. Other necessary identification.

4. Additional Paper Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.

    a. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect.

5. Transmittal for Paper Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return without review submittals received from sources other than Contractor.

    a. Transmittal Form for Paper Submittals: Provide locations on form for the following information:

        1) Project name.
        2) Date.
        3) Destination (To:).
        4) Source (From:).
        5) Name and address of Architect.
        6) Name of Contractor.
        7) Name of firm or entity that prepared submittal.
        8) Names of subcontractor, manufacturer, and supplier.
        9) Category and type of submittal.
        10) Submittal purpose and description.
        11) Specification Section number and title.

12) Specification paragraph number or drawing designation and generic name for each of multiple items.
13) Drawing number and detail references, as appropriate.
14) Indication of full or partial submittal.
15) Transmittal number, numbered consecutively.
16) Submittal and transmittal distribution record.
17) Remarks.
18) Signature of transmitter.

E. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:

1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.

a. File name shall use project identifier, Specification Section number and name, followed by a decimal point and then a sequential number (e.g., **YDC_04 20 00.01 – Unit Masonry**). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., YDC_04 20 00.01.**A** – Unit Masonry).

1) Submitted files not following this format will not be reviewed.

3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.
4. Transmittal Form for Electronic Submittals: Use electronic PDFs containing the following information:

a. Project name.
b. Date.
c. Name and address of Architect.
d. Name of Contractor.
e. Name of firm or entity that prepared submittal.
f. Names of subcontractor, manufacturer, and supplier.
g. Category and type of submittal.
h. Submittal purpose and description.
i. Specification Section number and title.
j. Specification paragraph number or drawing designation and generic name for each of multiple items.
k. Drawing number and detail references, as appropriate.
l. Location(s) where product is to be installed, as appropriate.
m. Related physical samples submitted directly.
n. Indication of full or partial submittal.
o. Transmittal number, numbered consecutively.
p. Submittal and transmittal distribution record.
q. Other necessary identification.
r. Remarks.

F. Options: Identify options requiring selection by Architect.

G. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from

requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.

H. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.

I. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

J. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1. Post electronic submittals as PDF electronic files directly to [**Project Web site**] [**Architect's FTP site**] specifically established for Project.

    a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.

2. Submit electronic submittals via email as PDF electronic files.

    a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.

3. Submit electronic submittals as **ONE** PDF file for each specification section. Submittals submitted as individual files for each submission element will be rejected.
4. Action Submittals: Submit electronic copies of each submittal unless otherwise indicated.
5. Informational Submittals: Submit electronic copies of each submittal unless otherwise indicated. Architect will not return copies.
6. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.

    a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.

b. Provide a notarized statement on original paper copy certificates and certifications where indicated.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:

a. Manufacturer's catalog cuts.
b. Manufacturer's product specifications.
c. Standard color charts.
d. Statement of compliance with specified referenced standards.
e. Testing by recognized testing agency.
f. Application of testing agency labels and seals.
g. Notation of coordination requirements.
h. Availability and delivery time information.

4. For equipment, include the following in addition to the above, as applicable:

a. Wiring diagrams showing factory-installed wiring.
b. Printed performance curves.
c. Operational range diagrams.
d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

5. Submit Product Data before or concurrent with Samples.
6. Submit Product Data in the following format:

a. PDF electronic file.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

a. Identification of products.
b. Schedules.
c. Compliance with specified standards.
d. Notation of coordination requirements.
e. Notation of dimensions established by field measurement.
f. Relationship and attachment to adjoining construction clearly indicated.
g. Seal and signature of professional engineer if specified.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 11 by 17 inches, but no larger than 30 by 42 inches.
3. Submit Shop Drawings in the following format:
a. PDF electronic file.

b. If requested by the Architect, The Contractor to provide Five opaque (bond) copies of each submittal. Architect will return 3 copies.

c. Prepare Shop Drawings in the following format: Same digital data software program, version, and operating system as the original Drawings.
d. Refer to Section 013100 "Project Management and Coordination" for requirements for coordination drawings.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:

a. Generic description of Sample.
b. Product name and name of manufacturer.
c. Sample source.
d. Number and title of applicable Specification Section.
e. Specification paragraph number and generic name of each item.

3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

4. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

a. Number of Samples: Submit Four sets of Samples. Architect will retain two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record sample.

1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.

5. Electronic submittals of manufacturer’s color samples and color charts will not be reviewed. Only physical samples and manufacture’s original color charts will be reviewed. Delays of submitting hard copies will result in addition review time.

E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
2. Manufacturer and product name, and model number if applicable.
3. Number and name of room or space.
4. Location within room or space.
5. Submit product schedule in the following format:

    a. PDF electronic file.

F. Coordination Drawing Submittals: Comply with requirements specified in Section 013100 "Project Management and Coordination."

G. Contractor's Construction Schedule: Comply with requirements specified in Section 013200 "Construction Progress Documentation."

H. Application for Payment and Schedule of Values: Comply with requirements specified in Section 012900 "Payment Procedures."

I. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 014000 "Quality Requirements."

J. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 017700 "Closeout Procedures."

K. Maintenance Data: Comply with requirements specified in Section 017823 "Operation and Maintenance Data."

L. Sustainable Design Submittals: Comply with requirements specified in Section 013510 Sustainable Project Requirements - LEED v2009 for New Construction and Major Renovations."

M. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

N. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.

O. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

P. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

Q. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

R. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

S. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

T. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

U. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:

1. Name of evaluation organization.
2. Date of evaluation.
3. Time period when report is in effect.
4. Product and manufacturers' names.
5. Description of product.
6. Test procedures and results.
7. Limitations of use.

V. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

W. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

X. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

Y. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2.2 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic files copies of certificate, signed and sealed by the responsible design professional licensed in the State Of Maryland, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

B. Project Closeout and Maintenance Material Submittals: See requirements in Section 017700 "Closeout Procedures."

C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

A. Action Submittals: Architect will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.

B. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.

D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

E. Submittals not required by the Contract Documents may be returned by the Architect without action.

END OF SECTION 01 33 00

SECTION 01 35 10 - SUSTAINABLE PROJECT REQUIREMENTS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:

1. US Green Building Council
2. References
3. Sustainability Consultant
4. Sustainable Project Requirements
5. Overall Environmental Requirements
6. Environmental requirements implementation
7. Submittals
8. Quality Assurance
9. Qualifications
10. Pre-Construction meeting
11. Construction worker training program
12. Prohibited materials.

B. Related Sections:

1. Section 01 3300 – Submittal procedures
2. Section 01 5060 – Indoor air quality during construction
3. Section 01 7419 – construction waste management and disposal
4. Section 01 9113 – General Commissioning nRequirements
5. Individual specification sections for additional product requirements.

C. Inclusion of information or requirements for any activity, material, component, or assembly in this Section does not supersede or invalidate information or requirements for the same found in any other Section. In case of any conflicts or omissions, the Architect will resolve the issue.

D. Related documents

1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Divisions 01 Specification Sections, apply to this Section.

E. Summary

1. Section includes general requirements and procedures for compliance with certain USGBC LEED prerequisites and credits needed for Project to obtain a minimum LEED Silver certification based on USGBC's "LEED 2009 for New Construction & Major Renovations."

2. Other LEED prerequisites and credits needed to obtain LEED certification depend on product selections and may not be specifically identified as LEED requirements. Compliance with requirements needed to obtain LEED prerequisites and credits may be used as one criterion to evaluate substitution requests and comparable product requests.

3. Additional LEED prerequisites and credits needed to obtain the indicated LEED certification depend on Architect's design and other aspects of Project that are not part of the Work of the Contract.

4. A copy of the LEED Project checklist is attached at the end of this Section for information only.

5. Specific requirements for LEED are included in greater detail in other Sections.

1.2 US GREEN BUILDING COUNCIL

A. LEED® – an acronym for the phrase 'Leadership in Energy and Environmental Design' – is a registered trademark of the U.S. Green Building Council (USGBC), and is used here by permission. The LEED green building certification program is the nationally accepted benchmark for the design, construction and operation of high performance green buildings.

B. The USGBC is a 501(c)(3) non-profit that developed the LEED Green Building Rating System.

1.3 DEFINITIONS & REFERENCES

A. Chain-of-Custody Certificates: Certificates signed by manufacturers certifying that wood used to make products was obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship." Certificates shall include evidence that manufacturer is certified for chain of custody by an FSC-accredited certification body.

B. Regional Materials: Materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site. If only a fraction of a product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value.

C. Recycled Content: The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.

1. "Post-consumer" material is defined as waste material generated by households or by commercial, industrial, and institutional facilities in their role as end users of the product, which can no longer be used for its intended purpose.

2. "Pre-consumer" material is defined as material diverted from the waste stream during the manufacturing process. Excluded is reutilization of materials such as rework, regrind, or scrap generated in a process and capable of being reclaimed within the same process that generated it.

D. US Green Building Council:

1. LEED Reference Guide for Green Building Design and Construction, Version 3.0 (2009), along with all errata and addenda released by the US Green Building Council on their website, www.usgbc.org,on or before 12 November 2014.

E. Other:

1. All publications included by reference in the SUMMARY OF REFERENCED STANDARDS sections and RESOURCES sections of all Credit Sections applicable to this Project, found in the LEED Reference Guide for Green Building Design and Construction, 2009 Edition, along with all errata and addenda released by the US Green Building Council on their website, www.usgbc.org ,on or before 12 NOVEMBER 2014.

1.4 SUSTAINABILITY CONSULTANT

A. The Sustainability Consultant for the Project is:

Kim Schaefer, AIA, LEED AP
TerraLogos: eco architecture, p.c.
2901 East Baltimore Street, Suite 300
Baltimore, MD 21224
www.terralogos.com
Kims@terralogos.com
410.276.8519

In association with:
Peter Doo, FAIA, LEED Fellow
Doo Consulting, Inc
531 Piccadilly Rd
Baltimore, MD 21204
www.dooconsulting.net
Peter@dooconsulting.net
443-463-5859

B. See References for additional information.

1.5 SUSTAINABLE PROJECT REQUIREMENTS

A. LEED CERTIFICATION

1. The Owner has registered the Project with the U.S. Green Building Council (USGBC) in the LEED program. This Project is required to achieve a LEED Silver Rating under the LEED New Construction v2009 program, which requires that a minimum of 50 points shall be earned by the Project.
2. 59 (fifty-nine) LEED credit points are currently selected by the project team to earn a Silver LEED rating. Contractor is directly responsible for achieving 20 to 22 of these credit points. Contractor is directly responsible for achieving two pre-requisite credits. (SSp1 & EAp1)
3. Contractor is directly responsible for providing and/or updating LEED project information monthly throughout the course of the project as part of the regular on-site progress meetings. The following information shall be reported in the designated field progress meetings
4. LEED Updates – discuss any issues that may impact the LEED credits, as you go through each of the items listed below. For this project I recommend reviewing this material at each Construction Progress meeting and sending TL an update of the forms once a month.
5. Material Tracking Logs updated for credit MRc4, 5, & 7; IEQc4
6. Review of Construction Waste Demolition Tracking Log and progress
7. Update on IAQ Plan and measures, report any infractions, include photograph
8. Update on Commissioning Activities and schedule, training activities
9. Schedule or construction activities that may impact LEED credits

10. Attach copy of updated LEED Tracking Logs.
11. Portions of the LEED Scorecard and Design Credit submittals are not complete. The Contractor is to comply with all LEED credits marked “Yes” AND “Maybe”, with final and the most current credit selections and responsibilities being recorded in the project’s SmartSheet LEED Scorecard. Per item no.B.3, the contractor shall be granted access to the Smartsheet online scorecard and task list.

B. LEED SCORECARD

1. Refer to the Project LEED Scorecard included in this section for specific credits to be achieved, design intention, and construction practices to be followed throughout the course of the project.
2. The Contractor shall comply with all requirements for each LEED Credit listed in the Project LEED Scorecard in accordance with USGBC guiding documents. See paragraph 1.3 REFERENCES, above.
3. Contractor shall be granted access to the Sustainability Consultant’s Smartsheet online scorecard and task list. Contractor shall notify the Sustainability Consultant within 10 days of the Notice to Proceed date that they have access to the Smartsheet project LEED Scorecard
4. The Contractor shall have primary responsibility for LEED compliance and documentation for all credit line items marked with a ’GC’ (which stands for General Contractor) in the column labeled ‘BIC’ in the project’s Smartsheet LEED Scorecard.

C. CONTRACTOR LEED DOCUMENTATION RESPONSIBILITIES

1. The Sustainability Consultant shall make available to the Contractor, access to the following:

   a. SMART SHEET ACCESS, Contractor Guidelines for meeting credit requirements, and the LEED Online account. The Name and contact information for the Contractor’s LEED coordinator shall be provided, to the Architect and Sustainability Consultant within 30 days of the notice to proceed.

2. The Contractor shall maintain on site, the LEED credit records, tracking logs, submittals, LEED related progress notes and any other documentation required to successfully complete the LEED application throughout the project in a 3-ring binder with electronic file backup.
3. Payment Retainage: In accordance with Section 01 78 39, retainage shall be imposed until Contractor has submitted all required LEED documentation.
4. The Contractor shall fully complete and sign-off on the LEED-Online Credit Template, form or other required documentation for each credit Contractor is directly responsible for.
5. All such requisite documentation and back-up for each credit Contractor is directly responsible for is subject to review and approval by the Sustainability Consultant. Upon any such direction by the Sustainability Consultant, Contractor shall revise and resubmit documentation until found acceptable by the Sustainability Consultant.
6. See References for more information.
7. See Section 01 74 19 – CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL and Section 01 50 60 – CONSTRUCTION INDOOR AIR QUALITY.

D. LEED®

1. The intention of the LEED Rating system is to design, build and operate energy efficient, water-conserving, healthy buildings that minimize their impact on the natural resource base and limit disruption to their physical site.
2. The ultimate certification of the building is solely at the discretion of the U.S. Green Building Council (USGBC). While every effort will be made to satisfy the requirements and provide the necessary documentation for a LEED Rating, the work executed or the LEED documentation provided is not a guarantee of certification. Certification is strictly based upon review by the USGBC via the LEED ONLINE (LOV3) system available at https://www.leedonline.com.

1.6 OVERALL ENVIRONMENTAL REQUIREMENTS

A. Notify the Owner and Architect if conflicts arise between performance of the work and environmental goals before ordering material or executing the work.

B. This specification is not intended to limit alternative means of achieving these requirements. Suggestions and input from the Contractor for implementing these requirements are encouraged. A team approach is encouraged.

1.7 ENVIRONMENTAL REQUIREMENTS PARAGRAPHS

A. Many Specifications Sections include an Environmental Requirements paragraph, which does include specific LEED credit references. These specific LEED credit references identify LEED requirements and Contractor responsibilities related to the particular Specification Section.

B. These specific LEED credit references constitute neither a comprehensive nor exclusive list of all possible LEED requirements and Contractor responsibilities for that Specifications section, and shall not be so construed.

C. The Contractor is responsible for fulfilling all general project environmental requirements as well as all LEED construction-related requirements.

D. Contractor shall not be absolved of any such general project environmental requirement or LEED construction-related requirement due to any omission thereof in any specific section or sections of these Specifications.

1.8 ADMINISTRATIVE REQUIREMENTS

A. Respond to questions and requests from Architect and the USGBC regarding LEED credits that are the responsibility of the Contractor, that depend on product selection or product qualities, or that depend on Contractor's procedures until the USGBC has made its determination on the project's LEED certification application. Document responses as informational submittals.

1.9 ACTION SUBMITTALS

A. General: Submit additional LEED submittals required by other Specification Sections.

1. LEED submittals are in addition to other submittals. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance with indicated LEED requirements.
2. LEED Documentation Submittals:

    a. Credit EAc 5: Product data and wiring diagrams for sensors and data collection system used to provide continuous metering of building energy-

consumption performance over a period of time of not less than one year of postconstruction occupancy.

b. Credit MR 2: Comply with Section 017419 "Construction Waste Management and Disposal."

c. Credit MR 4: Product data and certification letter from product manufacturers indicating percentages by weight of post-consumer and pre-consumer recycled content for products having recycled content. Include statement indicating material cost for each product having recycled content.

d. Credit MR 5: Product data for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

e. Credit MR 7: Product data and chain-of-custody certificates for products containing certified wood. Include statement indicating cost for each certified wood product.

f. Credit IEQ 3.1:
   i) Construction indoor-air-quality management plan.
   ii) Product data for temporary filtration media.
   iii) Product data for filtration media used during occupancy.
   iv) Construction Documentation: Six photographs at three different times during the construction period, along with a brief description of the SMACNA approach employed, documenting implementation of the indoor-air-quality management measures, such as protection of ducts and on-site stored or installed absorptive materials.

g. Credit IEQc3.2:
   v.) Signed statement describing the building air flush-out procedures including the dates when flush-out was begun and completed and statement that filtration media was replaced after flush-out.

   vi.) Product data for filtration media used during flush-out and during occupancy.

   vii.) Report from testing and inspecting agency indicating results of indoor-air-quality testing and documentation showing compliance with indoor-air-quality testing procedures and requirements.

h. Credit IEQ 4.1: Product data for adhesives and sealants used inside the weatherproofing system indicating VOC content of each product used.

i.) Credit IEQ 4.2: Product data for paints and coatings used inside the weatherproofing system indicating VOC content of each product used.

ii.) Credit IEQ 4.4: Product data for products containing composite wood or agrifiber products or wood glues indicating that they do not contain urea-formaldehyde resin.

3. INFORMATIONAL SUBMITTALS
   1. Qualification Data: For LEED coordinator.
   2. Project Materials Cost Data: Provide statement indicating total cost for materials used for Project. Costs exclude labor, overhead, and profit. Include breakout of costs for the following categories of items:
      a. Furniture.
      b. Plumbing.
      c. Mechanical.
      d. Electrical.
      e. Specialty items such as elevators and equipment.
      f. Wood-based construction materials.

3. LEED Action Plans: Provide preliminary submittals within [30] thirty days of date established for the Notice to Proceed indicating how the following requirements will be met:
   a. Credit MR 2: Waste management plan complying with Section 017419 "Construction Waste Management and Disposal."
   b. Credit MR 4: List of proposed materials with recycled content. Indicate cost, post-consumer recycled content, and pre-consumer recycled content for each product having recycled content.
   c. Credit MR 5: List of proposed regional materials. Identify each regional material, including its source, cost, and the fraction by weight that is considered regional.
   d. Credit MR 7: List of proposed certified wood products. Indicate each product containing certified wood, including its source and cost of certified wood products.
   e. Credit IEQ 3.1: Construction indoor-air-quality management plan.
4. LEED Progress Reports: Concurrent with each Application for Payment, submit reports comparing actual construction and purchasing activities with LEED action plans for the following:
   a. Credit MR 2: Waste reduction progress reports complying with Section 017419 "Construction Waste Management and Disposal."
   b. Credit MR 4: Recycled content.
   c. Credit MR 5: Regional materials.
   d. Credit MR 7: Certified wood products.

5. QUALITY ASSURANCE
   a. LEED Coordinator: Engage an experienced LEED-Accredited Professional to coordinate LEED requirements. LEED coordinator may also serve as waste management coordinator.

1.10 ENVIRONMENTAL REQUIREMENTS IMPLEMENTATION

A. Contractor shall designate an on-site party (or parties) responsible for instructing workers and overseeing the environmental requirements for the project and compiling applicable LEED credit documentation.

B. DISTRIBUTION:

The Contractor shall distribute copies of the environmental requirements to the Job-Site Superintendent, each Subcontractor and Supplier, and shall distribute LEED tracking updates to the GC or Construction Manager at regular progress meetings. The GC or Construction Manager shall maintain and make available a reference copy of the LEED construction back-up documentation, Scorecard and LEED-related logs and submittals on the construction site.

C. MEETINGS:

Environmental Requirements and LEED Coordination items shall be discussed at the following meetings. See Section 01 300 ADMINISTRATIVE REQUIREMENTS.
   a. Pre-construction meeting
   b. Construction LEED progress review meetings – as determined by the project team
   c. Attend (3) designated Construction LEED Coordination meetings held by the Architect and Sustainability Consultant

1.11 SUBMITTALS

A. Section 013300 - SUBMITTAL PROCEDURES: Requirements for submittals.

B. Construction Plans:
1. Construction Waste Management Plan:
1. Comply with all LEED requirements.
2. Subject to review and approval by the Sustainability Consultant. Revise and resubmit, if so directed by Sustainability Consultant, until approved.
3. Indicate analysis of estimated job site waste to be generated, including types and quantities; and proposed alternatives to use of landfill.
4. Submit monthly reports of actual recycling rates, salvage rates, and landfill rates.
2. Construction Indoor Air Quality (IAQ) Plan:
1. Comply with all LEED requirements.
2. Subject to review and approval by the Sustainability Consultant. Revise and resubmit, if so directed by Sustainability Consultant, until approved.
3. Indicate absorptive material and HVAC system protection; source control; pathway interruption; housekeeping and construction sequencing.
3. Materials Tracking Logs
1. Contractor shall maintain material cost tracking for all selected and applicable credits. The cost of the material only is to be tracked throughout the construction phase of the project.
2. Subject to review and approval by the Sustainability Consultant. Revise and resubmit, if so directed by Sustainability Consultant, until approved.

1.12 QUALITY ASSURANCE

A. Perform Work in accordance with LEED Reference Guide to achieve certification at Silver Rating, at a minimum, under LEED NC v2009 Rating System.
1. Owner and Architect/Engineer identified Project sustainable Project requirements.
2. Furnish products with materials and properties for entire Project to meet or exceed specified sustainable Project requirements.
3. Perform Work using means and methods for entire Project to meet or exceed specified sustainable Project requirements.

1.13 LEED DOCUMENTATION RESPONSIBILITIES

A. The following Construction Credits will be the Contractor’s responsibility for final sign-off, confirmation and/or coordination with additional responsible parties as noted on the project LEED Scorecard.

1. SSp1
2. EAp1
3. EAc3
4. EAc5
5. EAc6
6. MRc2
7. MRc4
8. MRc5

9. MRc7
10. IEQc3.1/3.2
11. IEQc4

B. Contractor shall submit all LEED documentation to the Sustainability Consultant for review and approval. Contractor shall revise and resubmit, as required by Sustainability Consultant.

C. See Paragraph 1.12 Resolution of LEED Issues.

1.14 RESOLUTION OF LEED ISSUES

A. All questions regarding the either the scope of, quality of, and/or level of detail required for LEED documentation will be decided by the Sustainability Consultant. The Sustainability Consultant shall be the ultimate arbiter of all such issues.

B. LEED Requests for Clarification – Contractor shall respond to any Request for Clarification from the LEED review team.
1. Contractor shall be responsible for revising any documentation and / or supplying any additional documentation identified by the Sustainability Consultant as being required in the response to any such LEED Request for Clarification.
2. Contractor shall submit all LEED documentation and documentation revisions to the Sustainability Consultant for review and approval. Contractor shall revise and resubmit, as required by Sustainability Consultant.
3. All such revisions of LEED documentation, production of additional documentation, and any and all other activities required for responding to such LEED Requests for Clarification shall be at no increase to Contract Sum.

C. LEED Appeals – Owner retains the right to appeal any LEED review decisions.
1. Contractor shall be responsible for revising any documentation and / or supplying any additional documentation identified by the Sustainability Consultant as being required to support any such appeal.
2. Contractor shall submit all LEED documentation and documentation revisions to the Sustainability Consultant for review and approval. Contractor shall revise and resubmit, as required by Sustainability Consultant.
3. All such revisions of LEED documentation, production of additional documentation, and any and all other activities required for such LEED appeals shall be at no increase to Contract Sum.

1.15 QUALIFICATIONS

A. Monitor and manage compliance with this section under direct supervision of LEED Accredited Professional.

B. Contractor shall engage a LEED Construction Coordinator to manage the contractor's LEED certification requirements and LEED Construction process on behalf of the Construction team. This individual must be LEED AP, but preferably LEED AP BD+C. The LEED Construction Coordinator must have a minimum of 7 years of LEED project experience, including LEED Silver or greater certified completed projects of similar size and complexity to this Project.

1.16 PRE-INSTALLATION MEETINGS

A. Section 013000 - Administrative Requirements: Pre-installation meeting.

1.17 CONSTRUCTION WORKER TRAINING PROGRAM

A. Contractor shall prepare and implement a construction worker training plan and associated implementation and sustainability policies.

B. This training plan shall be subject to review and approval by the Sustainability Consultant. Revise and resubmit, if so directed by Sustainability Consultant, until approved.

C. This training plan shall be designed to fully train all Contractor and Sub-Contractor employees working on site of the sustainability requirements for the Project and appropriate sustainability requirements implementation measures.

D. No workers will work on site before successfully completing the requirements of this training plan.

E. LANGUAGE REQUIREMENTS
1. All training sessions shall be offered in both English and Spanish.
2. All information materials for use in implementing this plan shall be written in both English and Spanish.
3. All informational signage for use in implementing this plan shall be written in both English and Spanish.

F. Construction worker training plan shall incorporate, at a minimum, the following elements:

1. Identification of all workers, by job position classification, covered by the plan.
2. Identification of all trainers, by job position classification, covered by the plan.
3. Identification of all training topics, as applicable, correlated with employees requiring each type of training. These topics shall include, at a minimum:
   a. General sustainability principles for the project
   b. Specific sustainability project requirements as they apply to each worker's activities on site.
   c. Specific procedures to implement the general sustainability principles
   d. Consequences for the Contractor for failing to achieve any one of the sustainability requirements for the project.
   e. Consequences for workers for failing to conform to the requirements of the training plan, sustainability policies, and implementation policies.
4. Regular refresher training, to be scheduled no less than bi-weekly.
   a. Time schedule for implementing the plan.
   b. Supervisory structure for implementing the plan
   c. Plan for identifying and implementing ongoing corrective training needs.
   d. List of all written materials required.
   e. List of all signage required.
   f. Schedule of training facilities.

PART 2 PRODUCTS

2.1 MATERIALS, GENERAL

A. Provide products and procedures necessary to obtain LEED credits required in this Section. Although other Sections may specify some requirements that contribute to LEED credits, the Contractor shall determine additional materials and procedures necessary to obtain LEED credits indicated.

B. RECYCLED CONTENT OF MATERIALS
1. Credit MR 4: Building materials shall have recycled content such that post-consumer recycled content plus one-half of pre-consumer recycled content for Project constitutes a minimum of [20] percent of cost of materials used for Project.
   a. Cost of post-consumer recycled content plus one-half of pre-consumer recycled content of an item shall be determined by dividing weight of post-consumer recycled content plus one-half of pre-consumer recycled content in the item by total weight of the item and multiplying by cost of the item.
   b. Do not include furniture, plumbing, mechanical and electrical components, and specialty items such as elevators and equipment in the calculation.

C. REGIONAL MATERIALS
1. Credit MR 5: Not less than [20] percent of building materials (by cost) shall be regional materials.

D. CERTIFIED WOOD
1. Credit MR 7: Not less than 100 percent (by cost) of wood-based materials shall be produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."
   a. Wood-based materials include, but are not limited to, the following materials when made from wood, engineered wood products, or wood-based panel products:
      i) Rough carpentry.
      ii) Miscellaneous carpentry.
      iii) Heavy timber construction.
      iv) Wood decking.
      v) Metal-plate-connected wood trusses.
      vi) Structural glued-laminated timber.
      vii) Finish carpentry.
      viii) Architectural woodwork.
      ix) Wood paneling.
      x) Wood veneer wall covering.
      xi) Wood flooring.
      xii) Wood lockers.
      xiii) Wood cabinets.

E. LOW-EMITTING MATERIALS
1. Credit IEQ 4.1: For field applications that are inside the weatherproofing system, adhesives and sealants shall comply with the following VOC content limits when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

b. Wood Glues: 30 g/L.
c. Metal-to-Metal Adhesives: 30 g/L.
d. Adhesives for Porous Materials (Except Wood): 50 g/L.
e. Subfloor Adhesives: 50 g/L.
f. Plastic Foam Adhesives: 50 g/L.
g. Carpet Adhesives: 50 g/L.
h. Carpet Pad Adhesives: 50 g/L.
i. VCT and Asphalt Tile Adhesives: 50 g/L.
j. Cove Base Adhesives: 50 g/L.
k. Gypsum Board and Panel Adhesives: 50 g/L.
l. Rubber Floor Adhesives: 60 g/L.
m. Ceramic Tile Adhesives: 65 g/L.
n. Multipurpose Construction Adhesives: 70 g/L.
o. Fiberglass Adhesives: 80 g/L.
p. Contact Adhesive: 80 g/L.
q. Structural Glazing Adhesives: 100 g/L.
r. Wood Flooring Adhesive: 100 g/L.
s. Structural Wood Member Adhesive: 140 g/L.
t. Single-Ply Roof Membrane Adhesive: 250 g/L.
u. Special-Purpose Contact Adhesive (contact adhesive that is used to bond melamine-covered board, metal, unsupported vinyl, rubber, or wood veneer 1/16 inch or less in thickness to any surface): 250 g/L.
v. Top and Trim Adhesive: 250 g/L.
w. Plastic Cement Welding Compounds: 250 g/L.
x. ABS Welding Compounds: 325 g/L.
y. CPVC Welding Compounds: 490 g/L.
z. PVC Welding Compounds: 510 g/L.
aa. Adhesive Primer for Plastic: 550 g/L.
bb. Sheet-Applied Rubber Lining Adhesive: 850 g/L.
cc. Aerosol Adhesive, General-Purpose Mist Spray: 65 percent by weight.
dd. Aerosol Adhesive, General-Purpose Web Spray: 55 percent by weight.
ee. Special-Purpose Aerosol Adhesive (All Types): 70 percent by weight.
ff. Other Adhesives: 250 g/L.
gg. Architectural Sealants: 250 g/L.
hh. Nonmembrane Roof Sealants: 300 g/L.
ii. Single-Ply Roof Membrane Sealants: 450 g/L.
jj. Other Sealants: 420 g/L.
kk. Sealant Primers for Nonporous Substrates: 250 g/L.
ll. Sealant Primers for Porous Substrates: 775 g/L.
mm. Modified Bituminous Sealant Primers: 500 g/L.
nn. Other Sealant Primers: 750 g/L.

2. Credit IEQ 4.2: For field applications that are inside the weatherproofing system, paints and coatings shall comply with the following VOC content limits when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
a. Flat Paints and Coatings: VOC not more than 50 g/L.
b. Nonflat Paints and Coatings: VOC not more than 150 g/L.
c. Dry-Fog Coatings: VOC not more than 400 g/L.
d. Primers, Sealers, and Undercoaters: VOC not more than 200 g/L.
e. Anticorrosive and Antirust Paints Applied to Ferrous Metals: VOC not more than 250 g/L.

f. Zinc-Rich Industrial Maintenance Primers: VOC not more than 340 g/L.
g. Pretreatment Wash Primers: VOC not more than 420 g/L.
h. Clear Wood Finishes, Varnishes: VOC not more than 350 g/L.
i. Clear Wood Finishes, Lacquers: VOC not more than 550 g/L.
j. Floor Coatings: VOC not more than 100 g/L.
k. Shellacs, Clear: VOC not more than 730 g/L.
l. Shellacs, Pigmented: VOC not more than 550 g/L.
m. Stains: VOC not more than 250 g/L.

3. Credit IEQ 4.4: Composite wood, agrifiber products, and adhesives shall not contain urea-formaldehyde resin.
4. Prerequisite EA 3: Remove CFC-based refrigerants from existing HVAC&R equipment indicated to remain and replace with refrigerants that are not CFC based. Replace or adjust existing equipment to accommodate new refrigerant as described in HVAC Sections.
5. Credit EAc4: Remove clean-agent fire-extinguishing agents that contain HCFCs or halons and replace with agent that does not contain HCFCs or halons. See Section 212200 "Clean-Agent Fire-Extinguishing Systems" for additional requirements.
6. MEASUREMENT AND VERIFICATION
Credit EA 5: Implement measurement and verification plan in accordance with the EVO's "International Performance Measurement and Verification Protocol (IPMVP), Volume III: Concepts and Options for Determining Energy Savings in New Construction," and as further defined by the following:
   a. Insert measurement and verification plan design team submitted for credit.
   b. If not already in place, install metering equipment to measure energy usage. Monitor, record, and trend log measurements.
   c. Evaluate energy performance and efficiency by comparing actual to predicted performance.
   d. Measurement and verification period shall cover at least one year of postconstruction occupancy.

7. CONSTRUCTION WASTE MANAGEMENT
   a. Credit MR 2: Comply with Section 017419 "Construction Waste Management and Disposal."
8. CONSTRUCTION INDOOR-AIR-QUALITY MANAGEMENT
   a. Credit IEQ 3.1: Comply with SMACNA's "SMACNA IAQ Guideline for Occupied Buildings under Construction."
   b. If Owner authorizes use of permanent heating, cooling, and ventilating systems during construction period as specified in Section 015000 "Temporary Facilities and Controls," install filter media having a MERV 8 according to ASHRAE 52.2 at each return-air inlet for the air-handling system used during construction.
   c. Replace all air filters immediately prior to occupancy.
9. Credit IEQ 3.2:
   a. After construction ends, prior to occupancy and with all interior finishes installed, perform a building flush-out by supplying a total volume of 14000 cu. ft. (4 300 000 L) of outdoor air per sq. ft. (sq. m) of floor area while maintaining an internal temperature of at least 60 deg F (16 deg C) and a relative humidity no higher than 60 percent.
   b. Air-Quality Testing:

i) Conduct baseline indoor-air-quality testing, after construction ends and prior to occupancy, using testing protocols consistent with the EPA's "Compendium of Methods for the Determination of Air Pollutants in Indoor Air," and as additionally detailed in the USGBC's "Green Building Design and Construction Reference Guide."

ii) Demonstrate that the contaminant maximum concentrations listed below are not exceeded:

(1) Formaldehyde: 27 ppb.
(2) Particulates (PM10): 50 micrograms/cu. m.
(3) Total Volatile Organic Compounds (TVOC): 500 micrograms/cu. m.
(4) 4-Phenylcyclohexene (4-PH): 6.5 micrograms/cu. m.
(5) Carbon Monoxide: 9 ppm and no greater than 2 ppm above outdoor levels.

iii) For each sampling point where the maximum concentration limits are exceeded, conduct additional flush-out with outside air and retest the specific parameter(s) exceeded to indicate the requirements are achieved. Repeat procedure until all requirements have been met. When retesting noncomplying building areas, take samples from same locations as in the first test.

iv) Air-sample testing shall be conducted as follows:

(1) All measurements shall be conducted prior to occupancy but during normal occupied hours, and with building ventilation system starting at the normal daily start time and operated at the minimum outside air flow rate for the occupied mode throughout the duration of the air testing.

(2) Building shall have all interior finishes installed including, but not limited to, millwork, doors, paint, carpet, and acoustic tiles. Nonfixed furnishings such as workstations and partitions are encouraged, but not required, to be in place for the testing.

(3) Number of sampling locations varies depending on the size of building and number of ventilation systems. For each portion of building served by a separate ventilation system, the number of sampling points shall not be less than one per 25,000 sq. ft. (2300 sq. m) or for each contiguous floor area, whichever is larger, and shall include areas with the least ventilation and greatest presumed source strength.

(4) Air samples shall be collected between 3 and 6 feet (0.9 and 1.8 m) from the floor to represent the breathing zone of occupants, and over a minimum four-hour period.

2.2 PROHIBITED MATERIALS

A. Contractor shall not use any materials, components, or assemblies on this Project not included in submittals approved by Architect/Engineers.

PART 3 EXECUTION - Not Used

END OF SECTION

LEED 2009 for New Construction and Major Renovation
Project Scorecard

Project Name: Youth Detention Center 3.3.2015
Project Address:

Yes	?	No			
20	1	5	SUSTAINABLE SITES		26 Points
Y			Prereq 1	Construction Activity Pollution Prevention	Required
1			Credit 1	Site Selection	1
5			Credit 2	Development Density and Community Connectivity	5
1			Credit 3	Brownfield Redevelopment	1
6			Credit 4.1	Alternative Transportation - Public Transportation Access	6
1			Credit 4.2	Alternative Transportation - Bicycle Storage and Changing Rooms	1
3			Credit 4.3	Alternative Transportation - Low-Emitting and Fuel-Efficient Vehicles	3
2			Credit 4.4	Alternative Transportation - Parking Capacity	2
		1	Credit 5.1	Site Development - Protect or Restore Habitat	1
		1	Credit 5.2	Site Development - Maximize Open Space	1
	1		Credit 6.1	Stormwater Design - Quantity Control	1
		1	Credit 6.2	Stormwater Design - Quality Control	1
		1	Credit 7.1	Heat Island Effect - Nonroof	1
1			Credit 7.2	Heat Island Effect - Roof	1
		1	Credit 8	Light Pollution Reduction	1

Yes	?	No			
4		6	WATER EFFICIENCY		10 Points
					4
Y			Prereq 1	Water Use Reduction	Required
4			Credit 1	Water Efficient Landscaping	2 to 4
			2	Reduce by 50%	2
			4	No Potable Water Use or Irrigation	4
		2	Credit 2	Innovative Wastewater Technologies	2
		4	Credit 3	Water Use Reduction	2 to 4
			2	Reduce by 30%	2
			3	Reduce by 35%	3
			4	Reduce by 40%	4

6	9	20	ENERGY & ATMOSPHERE		35 Points
Y			Prereq 1	Fundamental Commissioning of Building Energy Systems	Required
Y			Prereq 2	Minimum Energy Performance	Required
Y			Prereq 3	Fundamental Refrigerant Management	Required
2	4	13	Credit 1	Optimize Energy Performance	1 to 19
			1	Improve by 12% for New Buildings or 8% for Existing Building Renovations	1
			2	Improve by 14% for New Buildings or 10% for Existing Building Renovations	2
			3	Improve by 16% for New Buildings or 12% for Existing Building Renovations	3
			4	Improve by 18% for New Buildings or 14% for Existing Building Renovations	4
			5	Improve by 20% for New Buildings or 16% for Existing Building Renovations	5
			6	Improve by 22% for New Buildings or 18% for Existing Building Renovations	6
				Improve by 24% for New Buildings or 20% for Existing Building Renovations	7
				Improve by 26% for New Buildings or 22% for Existing Building Renovations	8
				Improve by 28% for New Buildings or 24% for Existing Building Renovations	9
				Improve by 30% for New Buildings or 26% for Existing Building Renovations	10
				Improve by 32% for New Buildings or 28% for Existing Building Renovations	11
				Improve by 34% for New Buildings or 30% for Existing Building Renovations	12
				Improve by 36% for New Buildings or 32% for Existing Building Renovations	13
				Improve by 38% for New Buildings or 34% for Existing Building Renovations	14
				Improve by 40% for New Buildings or 36% for Existing Building Renovations	15
				Improve by 42% for New Buildings or 38% for Existing Building Renovations	16
				Improve by 44% for New Buildings or 40% for Existing Building Renovations	17
				Improve by 46% for New Buildings or 42% for Existing Building Renovations	18
				Improve by 48%+ for New Buildings or 44%+ for Existing Building Renovations	19
		7	Credit 2	On-Site Renewable Energy	1 to 7
				1% Renewable Energy	1
				3% Renewable Energy	2
				5% Renewable Energy	3
				7% Renewable Energy	4
				9% Renewable Energy	5
				11% Renewable Energy	6
				13% Renewable Energy	7
2			Credit 3	Enhanced Commissioning	2
	2		Credit 4	Enhanced Refrigerant Management	2
	3		Credit 5	Measurement and Verification	3
2			Credit 6	Green Power	2

LEED 2009 for New Construction and Major Renovation
Project Scorecard

Project Name: Youth Detention Center 3.3.2015
Project Address:

Yes	?	No			
7		7	**MATERIALS & RESOURCES**		14 Points
Y			Prereq 1	Storage and Collection of Recyclables	Required
		3	Credit 1.1	Building Reuse - Maintain Existing Walls, Floors and Roof	1 to 3
				Reuse 55%	1
				Reuse 75%	2
				Reuse 95%	3
		1	Credit 1.2	Building Reuse - Maintain Interior Nonstructural Elements	1
2			Credit 2	Construction Waste Management	1 to 2
				50% Recycled or Salvaged	1
				75% Recycled or Salvaged	2
		2	Credit 3	Materials Reuse	1 to 2
				Reuse 5%	1
				Reuse 10%	2
2			Credit 4	Recycled Content	1 to 2
				10% of Content	1
				20% of Content	2
2			Credit 5	Regional Materials	1 to 2
				10% of Materials	1
				20% of Materials	2
		1	Credit 6	Rapidly Renewable Materials	1
1			Credit 7	Certified Wood	1
Yes	?	No			
10	2	3	**INDOOR ENVIRONMENTAL QUALITY**		15 Points
Y			Prereq 1	Minimum Indoor Air Quality Performance	Required
Y			Prereq 2	Environmental Tobacco Smoke (ETS) Control	Required
1			Credit 1	Outdoor Air Delivery Monitoring	1
	1		Credit 2	Increased Ventilation	1
1			Credit 3.1	Construction Indoor Air Quality Management Plan - During Construction	1
1			Credit 3.2	Construction Indoor Air Quality Management Plan - Before Occupancy	1
1			Credit 4.1	Low-Emitting Materials - Adhesives and Sealants	1
1			Credit 4.2	Low-Emitting Materials - Paints and Coatings	1
1			Credit 4.3	Low-Emitting Materials - Flooring Systems	1
1			Credit 4.4	Low-Emitting Materials - Composite Wood and Agrifiber Products	1
	1		Credit 5	Indoor Chemical and Pollutant Source Control	1
1			Credit 6.1	Controllability of Systems - Lighting	1
		1	Credit 6.2	Controllability of Systems - Thermal Comfort	1
1			Credit 7.1	Thermal Comfort - Design	1
1			Credit 7.2	Thermal Comfort - Verification	1
		1	Credit 8.1	Daylight and Views - Daylight	1
		1	Credit 8.2	Daylight and Views - Views	1
Yes	?	No			
6			**INNOVATION IN DESIGN**		6 Points
5			Credit 1	Innovation in Design	1 to 5
			1	IDc1.1: Innovation in Design - SSc4.1 Public Transportation Access, Option 1 - Exemplary Performance	1
			1	IDc1.2: Innovation in Design - MRc7 Certified Wood - Exemplary Performance	1
			1	IDc1.3: Innovation in Design - EAc6 Green Power - Exemplary Performance	1
			1	IDc1.4: Innovation in Design - Integrated Pest Management	1
			1	IDc1.5: Innovation in Design - Green Cleaning	1
1			Credit 2	LEED® Accredited Professional	1
Yes	?	No			
1			**REGIONAL PRIORITY**		4 Points
1			Credit 1	Regional Priority	1 to 4
			1	RPc1.1 Regional Priority - SSc4.1 Public Transportation Access	1
				Regionally Defined Credit Achieved	1
				Regionally Defined Credit Achieved	1
				Regionally Defined Credit Achieved	1
Yes	?	No			
54	12	41	**PROJECT TOTALS (Certification Estimates)**		110 Points

Certified: 40-49 points Silver: 50-59 points Gold: 60-79 points Platinum: 80+ points

SECTION 01 35 23 – ENVIRONMENTAL INSPECTION, TESTING, AND LABORATORY SERVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

B. This section is subject to the State of Maryland Department of Public Safety and Correctional Services General Conditions of the Contract between owner and Contractor.

1.2 SUMMARY

A. Section Includes:

1. Selection of payment.
2. Environmental Inspection and Testing Agency (EITA) responsibilities
3. Environmental inspection and testing reports.
4. Limits on EITA authority
5. Contractor responsibilities.

B. Related Requirements:

1. Division 1 Specification Sections.
2. Division 2 Specification Sections.

C. References:

1. Field Sampling and Analysis Technologies Matrix and Reference Guide (Document # EPA/542B-98/002; March 1998 or latest edition)

1.3 SELECTION AND PAYMENT:

A. General:

1. Contractor will employ and pay for the services of an independent EITA to perform environmental inspection and laboratory testing.
2. EITA must possess at least 3 years of experience in identifying and testing contaminated medium and materials.
3. EITA shall employ qualified environmental professions as defined in ASTM Standard E 1903. The environmental professional shall be required to have specific certifications as necessary.
4. EITA shall perform environmental inspection, field-testing, laboratory testing, and laboratory analysis in support of the Contractor's Work.
5. Employment of EITA shall not relieve Contractor of obligation to perform Work with requirements of Contractor Documents.

1.4 ENVIRONMENTAL INSPECTION AND TESTING AGENCY (EITA) RESPONSIBILITIES

A. Inspect, collect, and test samples of suspect contaminated mediums/material encountered during the Project not previously identified in Specification Sections

B. Provide qualified environmental professional at site to observe and visually monitor mediums/materials during project

C. Environmental testing laboratory shall have American Association for Laboratory Accreditation (A2LA) or equivalent; Army Corps of Engineers validation or equivalent; and participate in the National Voluntary Laboratory Accreditation Program (NVLAP)

D. Cooperate with Owner, Architect, and Engineers, and Contractor in performance of services.

E. Inspect and maintain all records of environmental compliance including disposal of contaminated medium/materials and the perspective impact on the Project.

F. Perform inspection, sampling, and testing of suspect contaminated mediums in compliance with specified standards.

G. Promptly notify Owner, Architect Engineer, and Contractor in writing of suspect contaminated mediums/materials and the perspective impact on the Project.

H. Perform additional inspections and tests required by the Owner, Architect/Engineer, and/or Contractor as directed by the Owner.

I. Contractor shall require EITA to attend Preconstruction Conference, Owner's Progress Meetings and Contractor's Coordination Meetings

J. EITA shall certify at completion of removal of any contaminated medium/material that 'The contaminated medium/material has been removed/remediated in compliance with all applicable local, state, and federal regulation.'

PART 2 - PRODUCTS

2.1 ENVIRONMENTAL INSPECTION AND INSPECTION REPORTS

A. After each inspection and test, promptly distribute four (4) copies of the reports to Owner, Architect/Engineer, and Contractor through the Contractor.

B. Reports shall include:

1. Date issued
2. Project title, number and location
3. Location of testing
4. Name of environmental professional and testing laboratory.
5. Date and time of sampling and testing
6. Reasons for sampling
7. Type of inspection or test
8. Sampling and test methods used
9. Date of laboratory test

10. Results of tests and interpretation
11. Conclusion and recommendations
12. Conformance with Contract Documents

PART 3 - EXECUTION

3.1 LIMITS ON ENVIRONMENTAL INSPECTION AND TESTING AGENCY (EITA) AUTHORITY:

A. EITA may not release, revoke, alter, or enlarge on requirements of Contract Documents.

B. EITA may not approve or accept any portion of the Work.

C. EITA may not assume any duties of Contractor.

D. EITA has no authority to stop the Work unless adverse health or safety conditions to human and/or the environment exist.

3.2 CONTRACTOR RESPONSIBILITIES:

A. Cooperate with (EITA) and provide access to the Work.

B. Provide incidental (non-environmental) labor and facilities, and provide access to obtain and handle samples.

C. Contractor shall provide corrective action when notified of defects.

D. In the event that the Contractor takes exception to the inspection and test report, the Contractor shall schedule a meeting, if necessary, with the Owner and EITA in an effort to resolve any conflict.

END OF SECTION 01 35 23

SECTION 01 40 00 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, Commissioning Authority, or authorities having jurisdiction are not limited by provisions of this Section.
4. Specific test and inspection requirements are not specified in this Section.

C. Related Requirements:

1. Section 014001 “Quality Control Program” for Contractor’s Quality Control Plan, and for qualifications of Contractor’s Construction Inspection and Testing Firm (CCITF).

2. Section 014002 “Inspection, Testing and Laboratory Services” for responsibilities of Contractor’s Construction, Inspection and Testing firm (CCITF).

3. Divisions 02 through 33 Sections for specific test and inspection requirements.

4. Section 013510 "Sustainable Project Requirements" for LEED related testing.

1.3 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the

Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.

C. Mockups: Full-size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to review constructability, to show interface between assemblies and dissimilar materials; to ensure there are no thermal and moisture problems, and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

1. Laboratory Mockups: Full-size physical assemblies constructed at testing facility to verify performance characteristics.
2. Integrated Exterior Mockups: Mockups of the exterior envelope erected separately from the building but on Project site, consisting of multiple products, assemblies, and subassemblies.
3. Room Mockups: Mockups of typical interior spaces complete with wall, floor, and ceiling finishes, doors, windows, millwork, casework, specialties, furnishings and equipment, and lighting.

D. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.

E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

F. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.

G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).

J. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.4 CONFLICTING REQUIREMENTS

A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.5 INFORMATIONAL SUBMITTALS

A. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

1.6 CONTRACTOR'S QUALITY-CONTROL PLAN

1.7 Quality-Control Plan, General: See Division 01, Section “Quality Control Program”.

1.7 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: See Section 014002, “Inspection, Testing and Laboratory Services”.

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of technical representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of factory-authorized service representative making report.
2. Statement that equipment complies with requirements.
3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
4. Statement whether conditions, products, and installation will affect warranty.
5. Other required items indicated in individual Specification Sections.

D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.8 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.

F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.

G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329 ; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.

1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.

2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:

1. Contractor responsibilities include the following:

a. Provide test specimens representative of proposed products and construction.
b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
f. When testing is complete, remove test specimens, assemblies, and mockups; do not reuse products on Project unless approved by Owner and Architect.

2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect and Commissioning Authority, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

K. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
2. Notify Owner and Architect seven days in advance of dates and times when mockups will be constructed.
3. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at Project.
4. Demonstrate the proposed range of aesthetic effects and workmanship.
5. With input from Owner, obtain Architect's approval of mockups before starting work, fabrication, or construction.

a. Allow seven days for initial review and each re-review of each mockup.

6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
7. Demolish and remove mockups when directed unless otherwise indicated.

L. Integrated Exterior Mockups: Construct integrated exterior mockup according to approved Shop Drawings . Coordinate installation of exterior envelope materials and products for which mockups are required in individual Specification Sections, along with supporting materials.

1. The following Sections include requirements for Integrated Exterior Mockups:

a. Division 04 Section “Unit Masonry.”
b. Division 04 Section “Cast Stone Masonry.”
c. Division 07 Section “Formed Metal Wall Panels.”
d. Division 07 Section “Fluid-Applied Membrane Air Barriers.”
e. Division 07 Section “Formed Metal Wall Panels.”
f. Division 07 Section “Intumescent Fireproofing.”
g. Division 09 Section “Resinous Flooring and Wall Coatings.”
h. Division 09 Section “Fluid Applied Athletic Flooring.”

M. Room Mockups: Construct room mockups incorporating required materials and assemblies, finished according to requirements. Provide required lighting and additional lighting where required to enable Architect to evaluate quality of the Work. Provide room mockups of the following rooms:

1. Typical housing unit cell and typical cell mechanical chase, including all MEP and security equipment.

N. Laboratory Mockups: Comply with requirements of preconstruction testing and those specified in individual Specification Sections in Divisions 02 through 33.

1.9 QUALITY CONTROL

A. Contractor Responsibilities:

1. See Section 014001, “Quality Control Program”.
2. When the words Quality Control are used within the Contract Documents, the work of providing qualitative control, monitoring and documenting the quality of the contract is the responsibility of the Contractor.

B. Manufacturer's Field Services: See Section 014001, Quality Control Program”

C. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 40 00

SECTION 01 40 01 - QUALITY CONTROL PROGRAM

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Contractor's Quality Control Firm and Quality Control Program.

B. Quality Control of products and workmanship.

C. Manufacturer's instructions.

D. Manufacturer's certificates and field services.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions.

1.3 RELATED SECTIONS

A. Division 01 Section 014000 "Quality Requirements" for administrative and procedural requirements for quality assurance and quality control.

B. Division 01 Section 014002 "Inspection, Testing and Laboratory Services" for requirements for Contractor's Construction, Inspection and Testing Firm (CCITF).

1.4 DESCRIPTION: PROJECT QUALITY CONTROL

A. Coordinate with requirements of Division 1 Specification Sections.

B. The Contractor shall take note of the following:

1. When the words Quality Control are used within the Contract Documents the work of providing qualitative control, monitoring and documenting the quality of the contract is the responsibility of the Contractor.

C. The Contractor shall employ a full time, on-site Quality Control Manager (QCM) for the duration of the contract to provide and implement Quality Control measures and services identified in the Contract Documents and in accordance with the Contractor's written Quality Control Program as reviewed and approved by the State.

D. Apparent Awardee shall engage a full time Security Detention Construction Coordinator (SDCC) to manage, coordinate, and ensure compliance with all Security related construction work and requirements, including integration with other new construction. The SDCC shall manage all Security Detention Equipment (doors, windows, hardware, enclosures, furnishings, materials, etc.), and all Electronic Safety and Security systems, This individual must have a minimum of 10 years of Security detention equipment and systems project experience within correctional facilities, including one (1) completed

correctional project of $20 million or more and two (2) completed correctional projects of $15 million or more.

E. The Contractor's full time independent Construction and Testing Firm shall be a separate company with no affiliation to the Contractor. The Contractor's independent Quality Control Construction and Testing Firm shall be known as the Contractor's Construction Inspection and Testing Firm (CCITF). Contractor's CCITF shall provide Quality Control testing and inspection of the Project for the duration of the Project. The primary function of the CCITF will be to ensure adherence to applicable codes and regulations. The CCIT Team shall include, but not be limited to, the following disciplines. The final configuration of the CCIT team shall be determined by the individual project manual sections. In certain circumstances, the same person may perform separate inspection functions providing they hold the requisite certifications and meet all experience and education requirements as set forth in the applicable code or regulation.

1. **CCITF Manager (CCITFM)**: This position requires a minimum of ten (10) years of actual field experience in managing quality control in the construction of buildings, including mechanical, electrical, site/civil work, architectural, structural, and other engineering work OR a graduate degree in architecture, civil engineering, construction management, and building construction with a minimum of five (5) years on-site construction inspection and quality control experience; AND a least two (2) years of the experience shall be in corrections and or similar facilities projects. The CCITFM shall have a strong background quality control and inspection of building construction, including mechanical, electrical, and plumbing systems. With the ultimate approval of Contractor's Project and Quality Control Manager, this person shall be responsible for the coordination of all of the required construction inspection and testing (on call) services as well as the activities of all CCITF personnel. The CCITFM shall have in-depth knowledge of the Project construction contract documents and current Maryland State Building Codes including the International Building Code (IBC) 2006, NFPA, ASTM, etc. The CCITFM shall report to the Contractor's Project Manager. The CCITFM shall be employed on a full-time basis at the jobsite during construction and site preparation of the facilities; responsible for ensuring and verifying that the construction work is performed in complete conformance with the construction contract documents and any approved modifications thereto; and shall issue to the Owner and Agency Construction Manager, through the contractor, written certification of such conformity.

2. **General Construction Inspector (GCI)**: This position requires a minimum of eight (8) years of field experience in the construction of buildings, including mechanical, electrical, site work, architectural, structural, and other construction related engineering work or a graduate architect or civil engineer with a minimum of five (5) years on-site experience in construction inspection. The GCI shall be employed on a full-time basis at the jobsite during the facility construction and shall ensure that all work is performed in complete conformity with the Contract documents and approved modifications thereto. The GCI shall report, and issue written inspection daily reports to the CCITFM. In the absence of the CCITFM or when working multiple shifts, the GCI shall perform similar duties.

3. **Architectural Inspector (AI) – Part-Time**: A graduate architect with a minimum of five (5) years experience in the architectural aspects of construction for correctional or similar facilities including, but not limited to, paint application; gypsum wallboard installation; partition wall framing; and wall, ceiling, floor, roof, concrete, and masonry finishes.

4. **Structural Inspector (SI) – Part-Time**: A registered engineer with a minimum of eight (8) years field experience in inspection of structural work, including, precast, pre-stressed, and cast-in-place concrete; structural and reinforcing steel; and reinforced masonry during major building construction projects similar to this Project. The SI shall inspect and assure the integrity of the Contract structural work.

5. **Steel/Welding Inspector (WI) – Part-Time**: A certified welding inspector with a minimum of five (5) years experience inspecting welds for conformity with the applicable standards and specifications of the American Welding Society, American Society of Mechanical Engineers (ASME), and American Institute of Steel Construction (AISC). Experience shall include low and high pressure steel piping, steel erection inspection, shop fabrication, steel joists and metal work installation, and proven ability to read and interpret shop drawings and specifications.

6. **Non-Destructive Evaluation (NDE) Test Inspector– Part-Time**: The NDE test inspector shall be certified by the American Society for Non-Destructive Testing criteria level II radiography, ultrasonic, liquid penetrant and magnetic particle tests. This position requires a minimum of five (5) years experience inspecting piping and structural steel welds for conformity with applicable standards and specifications of the American Welding Society and ASME Boiler Construction Code.

7. **Electrical Inspector (EI) – Part-Time**: A licensed master electrician with a minimum of ten (10) years of field experience inspecting the installation and construction progress of electrical systems, including telecommunication/security systems, fire alarm and annunciation systems for conformity with applicable State and local codes and construction documents. Must be familiar with International Electrical Testing association, acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

8. **Plumbing Inspector (PI) – Part-Time**: A licensed master plumber with a minimum of ten (10) years field experience inspecting the installation of plumbing systems in accordance with State Plumbing Code and the Contract documents. The PI shall inspect and assure the integrity of plumbing systems and meet education and experience requirements in accordance with the latest State plumbing code and any applicable local code for the Project.

9. **Mechanical Inspector (MI) – Part-Time**: This position requires a minimum of ten (10) years field experience as an inspector or installer of complex mechanical systems. The MI shall inspect the installation of systems for conformity with applicable State codes and the construction contract documents. Experience shall include a working knowledge of heating and air conditioning systems, preferably in correctional or institutional type installations. The MI shall be thoroughly conversant with the high pressure boiler rules of the State Department of labor and licensing regulations and shall assist DPSCS in obtaining an Emission Certification from the Maryland Department of the Environment (MDE) before any boiler will be fired for its intended use.

10. **Geotechnical/Materials Inspector (GMI) – Part-Time**: This position requires a minimum of five (5) years experience in the inspection of foundation installations, footings, underpinning and construction materials. The acceptable experience shall be from regions with geotechnical/material conditions similar to this Project or those existing throughout the State.

11. **Roofing Inspector (RI) – Part-Time**: This position requires a minimum of eight (8) years experience inspecting the application EPDM membranes, slate, built-up-roofing, metal roofing, roof drains, scuppers, metal sheet flashing, roof ladders, roof walks, ballast, etc.

12. **Civil Inspector (CI) – Part-Time**: A certified inspector with a minimum of five (5) years experience inspecting civil works such as paving, utilities, and site work. NICET certification is required.

13. **Electronic Security Inspector (ESI) – Part-Time**: A certified technician with a minimum of ten (10) years of field experience or a registered electrical engineer with a minimum of 5 years experience inspecting the installation and construction progress of security electronics and communications systems including CCTV/MATV telecommunications/security systems, fire alarm, fence detection and annunciation systems for conformity with contract documents, applicable State and local codes and the construction documents or be an active registered communication designer (RCPD) with a minimum of 3 years experience.

14. **Soils & Materials Technician (SMT) – Part-Time**: A qualified and certified person with minimum 5 years field experience to perform tests on soils, concrete, masonry and other materials as applicable for the project. The technician will perform his work under the direction and guidance of the CCITFM.

F. The CCITF shall be under the direct control and management of the Contractor's Quality Control Manager (QCM) for the duration of the project.

G. The CCITF Manager and QCM are fully responsible and accountable to the Contractor's Project Manager for the Quality Control of the Project for the duration of the Project.

H. Provide an independent Environmental Inspection & Testing Firm to perform environmental inspection & laboratory testing. The Contractor's independent Environmental Inspection & Testing Firm shall be known as Environmental Inspection & Testing Agency (EITA).

I. Through the Agency Construction Manager, the Owner will employ a full time independent Construction Inspection and Testing Firm for the benefit of the Owner to ensure that the contractor has complied with Quality Control requirements. The Owner's independent testing/inspection firm shall be known as the State's Construction Inspection and Testing Firm (SCITF).

1.5 CCITF AND EITA SERVICES

A. Provide for specified Quality Control services and environmental inspection and testing services through independent inspection & testing agencies (CCITF and EITA) employed by the Contractor.

1. In Project Manual Sections, services may be identified to be provided by the Contractor's Construction Inspection and Testing Firm (CCITF) or may refer only to field and/or laboratory testing and inspection requirements. These services and requirements are the sole responsibility of Contractor. In all cases and circumstances the Contractor shall provide and pay for these services.
2. In Sections, environmental services may be identified to be provided by the Environmental Inspection & Testing Agency (EITA) or may refer to environmental

inspection, laboratory testing and analysis requirements. These services and requirements are the sole responsibility of contractor. In all cases and circumstances the Contractor shall provide and pay for these services.

1.6 SCITF SERVICES

A. The Owner reserves the right to ensure that the contractor has complied with Quality Control testing, inspection, environmental inspection, and laboratory testing and analysis requirements.

B. The Owner will employ services of independent agencies under separate contracts, to periodically test, inspect, review fabrications, construction activities, work in place, or other testing by the Contractor.

C. The Owner will employ services of independent environmental professionals to inspect and review the environmental sampling, testing and analysis data performed by EITA.

D. These activities by the Owner do not relieve the Contractor of his responsibility for providing Quality Control activities in compliance with the Contract Documents.

1.7 QCM AND CCITF REQUIREMENTS

A. Contractor's QCM and CCITF shall have a minimum of ten (10) years of construction related experience where the technical and costs requirements are similar to the technical and cost requirements of this project.

1. Identify and submit qualifications of the Contractor's candidate CCITF at the Preconstruction Conference for State's review and approval.

a. The State reserves the right to reject or accept the candidate QCM at their sole discretion.

2. Identify and submit qualifications of the Contractor's candidate CCITF Manager at the Preconstruction Conference for State's review and approval.

a. Candidate CCITF shall meet requirements for Testing Agency Qualifications defined under Section 014000 QUALITY REQUIREMENTS, Paragraph 1.8 G.

b. The State reserves the right to reject or accept the candidate CCITF Manager at their sole discretion.

1.8 CONTRACTOR'S QUALITY CONTROL PROGRAM

A. Quality Control (QC) is defined to involve and require related testing and inspection procedures, and refers to collective actions required to ensure that fabricated and installed materials, equipment, systems comply with Contract Documents and regulations by governing agencies and authorities.

B. Perform required actions and include specified surveillance, inspection, testing, measuring, reporting, and correction-of-defects.

C. Completion of required Quality Control actions on a unit of work does not relieve Contractor of responsibility for compliance with other requirements of the Contract Documents.

D. Tests and Inspections that may or may not be performed by the State's Construction Inspection and Testing Firm (SCITF) is not to be construed as replacement for the Contractor's Quality Control Tests and Inspections.

E. Specified and identified Quality Control requirements are not intended to limit Contractor's and Contractor's Fabricator's procedures that achieve compliance with the requirements of the Contract Documents; nor are these intended to limit related requirements which may be imposed by other provisions hereof, or by governing agencies and authorities.

1.9 QUALITY CONTROL ORGANIZATION AND SUBMITTALS

A. Quality Control Plan: Submit the Contractor's Quality Control Plan (QCP) at the Preconstruction Conference.

1. Plan shall indicate the required staff qualifications, personnel assignments, procedures, instructions, record keeping, and forms to be used for implementing and reporting QC requirements.
2. Upon receipt of the State's review and acceptance of the Contractor's Quality Control Plan, coordinate and integrate the principal actions and work into the Contractor's Construction Progress Schedule.
3. Include in the QC Plan a complete listing by specification Section of inspections and tests to be performed; and chart how the results will be reported to the Owner, Architect and SCITF.

    a. Submit in QC Plan copy of Contractor's letter of authorization appointing qualifications of the QCM for overall management of the QCP and his authority to act for the Contractor in QC matters. Acceptance of the candidate QCM qualifications is subject to the State's review and approval.
    b. When acceptable to the State, schedule and maintain QC staff on Project Site and elsewhere, whenever work is scheduled and performed such that qualified QC staff perform and document the QC work.
    c. Include in the QC Plan and maintain a current listing of QC staff assignments, indicating names, qualifications, duties, authorizations, and responsibilities.

4. Indicate and include in the QC Plan specifically how the related Sections under Divisions 0 and 1, inclusive of the State's General Requirements, are to be implemented.
5. Prior to the start of work, meet with the Agency Construction Manager and his staff and review the QC Plan and how the Contractor will implement and integrate the QC Plan with the Construction Progress Schedule.
6. Develop a mutual understanding of the QC Plan details and time frames, acceptable to the State for both onsite and offsite activities; including interrelationships between QC actions and SCITF related actions.
7. Prepare and distribute detailed minutes of meeting, and subsequent meetings; signed by both the Contractor's PM, QCM and Agency Construction Manager.

    a. Do not proceed with work subject to QC requirements until acceptance of QC Plan has been granted by QCM and Agency Construction Manager.

b. Continued acceptance is subject to satisfactory performance of work, including satisfactory execution of QC Plan provisions.
c. Do not change accepted QC Plan, except with prior written approval of Agency Construction Manager and QCM on proposed change.
d. State reserves the right to require changes in the QC Plan, where required by the Agency Construction Manager as necessary to assure required qualities and Contract compliance.

1.10 QUALITY CONTROL SERVICES

A. General: Include sample taking, testing, analysis, reporting, and similar activities as part of this contract.

B. QC Pre-Analysis and Preparation: Prior to start of each unit of work subject to QC inspection and testing, review related Contract Document requirements; and ensure that preliminary actions have been completed, including submittal/approval procedures, procurement of materials/equipment/services required for the work, installation personnel and equipment available at the site, and inspection and test equipment and agencies are present. Notify Agency Construction Manager a minimum of 48 hours in advance of each QC preanalysis inspection procedure, and provide written record of such procedure to the QCM and Agency Construction Manager.

C. Where indicated, scheduled and/or identified, engage the QC service to perform inspections associated with or required in connection with QC activities, including written confirmation that materials being used in the work comply with the requirements of the Contract Documents.

D. For QC services on work to be provided over prepared substrates; engage the related QC service to inspect and test prepared substrates for suitability to receive the superimposed work; and include the results of substrate inspections and testing in related QC reporting.

E. Proceed with initial QC service related to each element of work as soon as possible after installation of a suitable increment of work has been accomplished. QCM shall notify Agency Construction Manager at least 48 hours in advance of each anticipated QC service, and include anticipated schedule for follow-up services, through installation of remaining increments. Conclude each QC sequence of service for a unit-of-work with a completion set of services, and a summary report for entire QC services on the unit of work.

F. Provide testing as scheduled, specified, indicated or as otherwise required to ensure accurate determination of quality compliances with requirements of the Contract Documents. Comply with recognized standards of testing for each industry and trade. Use recognized independent testing laboratory services acceptable to the State. Provide written report of each QC inspection and test performed, including the following information:

1. Contract Title and Contract Number.
2. Test title, source, and sequence number.
3. Date(s) and location(s) of samples, and dates of tests; related Contract Document Specification Section and Article.
4. Identify the recognized industry/trade test method and specification.
5. Name of testing laboratory, and individual conducting inspection/test procedure.

6. Ambient conditions at time of sample taking, and at time of inspection/test procedure.
7. Inspection/test data, results, interpretations, and analysis of information developed.
8. Test agency's/individual's comments and professional opinions concerning; whether test has "passed", whether work-in-place complies with contract requirements, and whether retesting or other testing is recommended; complete with responsible individual's signature and date.
9. Other data as required/implied, by nature of particular inspection/test procedure being completed, or by provisions in related technical section of these Contract Specifications.
10. Include statement of person or agency conducting the inspection/test procedure; to the effect of "certification" that materials/equipment/services incorporated into the work comply with requirements of the Contract Documents; or "expressing" reservations thereto, as observed or determined.

G. Maintain complete record and log of entire QC actions, ready for Agency Construction Manager examination at any time. Highlight defects, deficiencies, and noncompliance's found; along with corrective actions/reconstructions completed, to be completed, or recommended for acceptance of Agency Construction Manager.

H. Completion Inspection: At the time each unit of work or separate increment thereof is substantially complete, and regardless of whether subjected to specific QC inspection and testing, conduct a completion inspection and develop a "punch list" of deficiencies to be corrected on non-complying elements, and include in QC documentation. Include in report the dates established or estimated for completion of corrections, as required to comply with Construction Progress Schedule and Close-Out Procedures identified elsewhere.

1.11 COINCIDENTAL SERVICES

A. Provide incidental services needed by engaged QC agency/services, including services performed by SCITF and by its engaged services. Incidental services include, but are not limited to the following:

1. Use of Contractor's QC testing laboratory.
2. Assistance in gaining access to work, and taking of test samples, and subsequent repair of work and substrates.
3. Temporary facilities, as reasonably utilized by quality control/testing services.
4. The handling, curing, storage, and protection of test samples at the Project Site.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 WORKMANSHIP

A. Comply with industry-referenced standards except where more restrictive tolerances or specified requirements indicate more rigid standards; the more restrictive requirement shall apply.

B. Provide sufficient quantity of qualified personnel to comply with requirements of specifications for this project.

C. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, and racking.

D. Provide finishes to match approved samples and mockups.

3.2 MANUFACTURER'S INSTRUCTIONS

A. Require compliance with instructions in full detail, including each step in construction sequence.

B. Should instruction conflict with Contract Documents, request clarification from Architect before proceeding.

3.3 MANUFACTURER'S CERTIFICATES

A. When required by Specification Sections, submit manufacturer's certificate in original duplicate, certifying that products meet or exceed specified requirements, executed by responsible officer of the manufacturer.

3.4 MANUFACTURER'S FIELD SERVICES

A. Provide qualified manufacturer representative when required by Specification Section or as a result of review and evaluation of Contractor's sub-contractor's named list.

B. Provide qualified manufacturer representative, at no additional cost to Owner, to perform the following:

1. Observe field conditions.
2. Conditions of surfaces and installation.
3. Quality of workmanship.
4. Start-up of equipment.
5. Test, adjust, and balance equipment.
6. Provide written report of observations and recommendations to Contractor within two days of each site visit.

C. Submit report to architect in accordance with Section 013300.

3.5 CORRECTION OF WORK

A. Defects in Work: Where QC procedures disclose defects in the work, and where similar procedures by SCITF disclose defects; provide remedial actions, as agreed upon with Agency Construction Manager, to upgrade, repair, restore, reconstruct, replace, or otherwise correct defects in the work, so as to provide compliance with requirements of the Contract Documents. Refer to State's General Conditions which establish the State's recourses where Contractor has failed or refused to comply with Agency Construction Manager's notification(s) of noncompliance(s) resulting from the QC and/or QA procedures, including the recourse of possibly suspending work in

accordance with related sections in the General Conditions of the Construction Contract.

1. Provide reinspection/retesting of corrected work, comparable with that required for initial work, and as directed by the Agency Construction Manager; repeat until compliances are achieved.

    a. Where SCITF inspection/testing service has disclosed defects, followed by Contractor's correction of work; State will perform the reinspection/retesting of corrected work, but at Contractor's expense.

2. Neither the required QC procedure, nor detection of defects, nor correction of defects, nor the reinspection/retesting of corrected work, provides a basis for Contractor's claim for Contract Modification, Additional Compensation, or request for extension of Contract Time.

3.6 RESTORATION AND PROTECTION

A. General, Final Restoration: Upon completion of inspection, sample taking, testing, and correction-of-defects for the work in place; repair damaged work and substrates, and restore finishes to eliminate deficiencies in visual and performance qualities; comply with Agency Construction Manager's requests. Restore protection as specified. Comply with provisions of Division 01 Section "Execution."

B. Continued Protection: As an integral action of the QC Plan, provide continued protection of completed work through remainder of Construction Time, and monitor protective measures in relation to construction activities.

END OF SECTION 014001

SECTION 01 40 02 - INSPECTION, TESTING AND LABORATORY SERVICES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Selection and payment.

B. Laboratory responsibilities.

C. Laboratory reports.

D. Limits on testing laboratory authority.

E. Contractor responsibilities.

F. Schedule of inspections and tests.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions.

1.3 RELATED SECTIONS

A. Division 01 Section 014000 “Quality Requirements” for administrative and procedural requirements for quality assurance and quality control.

B. Division 01 Section 014001 “Quality Control Program ” for requirements for Contractor’s Quality Control firm and Quality Control Program.

1.4 REFERENCES

A. ANSI/ASTM D 3740:

1. Practice for Evaluation of Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.

B. ANSI/ASTM E 329:

1. Recommended Practice for Inspection and Testing Agencies for Concrete, Steel, and Bituminous Materials as Used in Construction.

1.5 SELECTION AND PAYMENT

A. General:

1. Comply with requirements of Section 011000, “Summary” as applicable.

2. Contractor will employ and pay for services of a Maryland licensed independent construction inspection and testing laboratory firm.
3. Contractor's Construction, Inspection and Testing Firm (CCITF) shall perform construction inspection, field testing, laboratory testing and laboratory analysis in support of the Contractor's Work.
4. Employment of CCITF shall not relieve Contractor of obligation to perform Work in compliance with requirements of Contract Documents.

1.6 LABORATORY RESPONSIBILITIES

A. Test samples of concrete and mortar mixes utilized in the Project from on-site and off-site construction and fabrication Work.

B. Provide qualified personnel at site to observe and test soil placement for compaction requirements.

C. Perform destructive and non-destructive testing of welds, bolts, fasteners and other component assembly methods.

D. Cooperate with Owner, Architect and Engineers, and Contractor in performance of services.

E. Perform inspection, sampling, and testing of products in compliance with specified standards.

F. Ascertain compliance of materials, methods and mixes with requirements of Contract Documents.

G. Promptly notify Owner, Architect, Engineer and Contractor in writing of observed irregularities or non-conformance or non-compliance with Contract Document requirements of the Work or products.

H. Perform additional inspections and tests required by Owner, Architect/Engineer and/or Contractor as directed by the Owner at no additional cost to the Owner.

I. Contractor shall require CCITF to attend Preconstruction Conference, Owner's Progress Meetings and Contractor's Coordination Meetings.

PART 2 - PRODUCTS

2.1 LABORATORY REPORTS

A. After each inspection and test, promptly distribute four (4) copies of laboratory reports to Owner, Architect/Engineer and Contractor through the Contractor.

B. Reports shall include the following:

1. Data issued.
2. Project title and number.
3. Name of inspector.
4. Date and time of sampling or inspection.
5. Identification of product and Specification Section.

6. Location in the Project.
7. Type of inspection or test.
8. Date of observation and/or test.
9. Date of laboratory test and/or analysis.
10. Results of tests.
11. Conformance with Contract Documents.

C. When requested by Owner and/or Architect/Engineer, provide interpretation of test results.

PART 3 - EXECUTION

3.1 LIMITS ON CCITF AUTHORITY

A. CCITF may not release, revoke, alter, or enlarge on requirements of Contract Documents.

B. CCITF may not approve or accept any portion of the Work.

C. CCITF may not assume any duties of Contractor.

D. CCITF has no authority to stop the Work unless life-threatening health or safety conditions exist.

3.2 CONTRACTOR RESPONSIBILITIES

A. Deliver to CCITF at agreed upon location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.

B. Cooperate with CCITF personnel, and provide access to the Work.

C. Provide incidental labor and facilities to provide access to Work to be tested, to obtain and handle samples at the site or at source of products to be tested, and to facilitate tests and inspections, storage and curing of test samples.

D. Contractor shall notify Owner, Architect, CCITF and SCITF twenty-four (24) hours prior to expected time for operations requiring inspection and testing services.

E. Contractor shall provide corrective action when notified of defects.

F. In the event that the Contractor takes exception to CCITF or SCITF inspection report, the Contractor shall schedule a meeting, if necessary, with the Owner, CCITF, SCITF in an effort to resolve any conflict.

G. The Contractor shall arrange and pay for any re-testing found necessary to substantiate the validity of the Contractor’s claim at no additional cost to the Owner.

3.3 SCHEDULE OF INSPECTIONS AND TESTS

A. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1. Specification Section number and title.
2. Entity responsible for performing tests and inspections.
3. Description of test and inspection.
4. Identification of applicable standards.
5. Identification of test and inspection methods.
6. Number of tests and inspections required.
7. Time schedule or time span for tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

END OF SECTION 01 40 02

SECTION 01 42 00 - REFERENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."

D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.

H. “Manufacturing”: Refers to the final assembly of components into the building product.

I. “Ozone depleting substances”: Materials and chemical compounds that are destructive to the ozone layer. CFCs and HCFCs, aerosol sprays and other similar substances are considered “ozone depleting

J. “Post-Consumer Recycled Content”: Building material generated by collection after use by consumers, installed in a project. LEED gives a higher value to post-consumer RCM.

K. “Post-Industrial Recycled Content”: Building material generated by collection of waste material or by-products of the manufacturing process.

L. "Provide": Furnish and install, complete and ready for the intended use.

M. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

N. “Rapidly Renewable Material”: Materials that substantially replenish themselves faster than traditional extraction demand and do not result in significant biodiversity loss, increase erosion, air quality impacts and that are sustainably managed.

O. “Recycled Content Materials”: Building materials that contain in aggregate, a minimum weighted average of post-consumer or post-industrial recycled content material.

P. “Salvage or Re-Used Materials”: Materials recovered from existing buildings and reprocessed for reuse in other buildings.

Q. “Volatile Organic Compounds (VOC)”: Carbon compounds that participate in atmospheric photochemical reactions and contribute to smog and air pollution.

1.3 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.4 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."

B. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

C. Forest Stewardship Council’s Principles and Criteria (www.fscus.org)

International Performance Measurement & Verification Protocol, Volume III: Concepts and Options for Determining Energy Savings in New Construction, April, 2003 (www.ipmvp.org)

D. References:

1. AA - Aluminum Association, Inc.; www.aluminum.org
2. ABC - Associated Air Balance Council; www.aabc.com.
3. AAMA - American Architectural Manufacturers Association; www.aamanet.org.
4. AASHTO - American Association of State Highway and Transportation Officials; www.transportation.org.
5. AATCC - American Association of Textile Chemists and Colorists; www.aatcc.org.
6. ABMA - American Bearing Manufacturers Association; www.americanbearings.org.
7. ABMA - American Boiler Manufacturers Association; www.abma.com.
8. ACI - American Concrete Institute; (Formerly: ACI International); www.abma.com.
9. ACPA - American Concrete Pipe Association; www.concrete-pipe.org.
10. AEIC - Association of Edison Illuminating Companies, Inc. (The); www.aeic.org.
11. AF&PA - American Forest & Paper Association; www.afandpa.org.
12. AGA - American Gas Association; www.aga.org.
13. AHAM - Association of Home Appliance Manufacturers; www.aham.org.
14. AHRI - Air-Conditioning, Heating, and Refrigeration Institute (The); www.ahrinet.org.
15. AI - Asphalt Institute; www.asphaltinstitute.org.
16. AIA - American Institute of Architects (The); www.aia.org.
17. AISC - American Institute of Steel Construction; www.aisc.org.
18. AISI - American Iron and Steel Institute; www.steel.org.
19. AITC - American Institute of Timber Construction; www.aitc-glulam.org.
20. AMCA - Air Movement and Control Association International, Inc.; www.amca.org.
21. ANSI - American National Standards Institute; www.ansi.org.
22. AOSA - Association of Official Seed Analysts, Inc.; www.aosaseed.com.
23. APA - APA - The Engineered Wood Association; www.apawood.org.
24. APA - Architectural Precast Association; www.archprecast.org.
25. API - American Petroleum Institute; www.api.org.
26. ARI - Air-Conditioning & Refrigeration Institute; (See AHRI).
27. ARI - American Refrigeration Institute; (See AHRI).
28. ARMA - Asphalt Roofing Manufacturers Association; www.asphaltroofing.org.
29. ASCE - American Society of Civil Engineers; www.asce.org.
30. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (See ASCE).
31. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers; www.ashrae.org.
32. ASME - ASME International; (American Society of Mechanical Engineers); www.asme.org.
33. ASSE - American Society of Safety Engineers (The); www.asse.org.
34. ASSE - American Society of Sanitary Engineering; www.asse-plumbing.org.
35. ASTM - ASTM International; www.astm.org.
36. ATIS - Alliance for Telecommunications Industry Solutions; www.atis.org.
37. AWI - Architectural Woodwork Institute; www.awinet.org.
38. AWMAC - Architectural Woodwork Manufacturers Association of Canada; www.awmac.com.
39. AWPA - American Wood Protection Association; www.awpa.com.
40. AWS - American Welding Society; www.aws.org.
41. AWWA - American Water Works Association; www.awwa.org.
42. BHMA - Builders Hardware Manufacturers Association; www.buildershardware.com.
43. BIA - Brick Industry Association (The); www.gobrick.com.

44. BICSI - BICSI, Inc.; www.bicsi.org.
45. BIFMA - BIFMA International; (Business and Institutional Furniture Manufacturer's Association); www.bifma.org.
46. CDA - Copper Development Association; www.copper.org.
47. CEA - Consumer Electronics Association; www.ce.org.
48. CFSEI - Cold-Formed Steel Engineers Institute; www.cfsei.org.
49. CGA - Compressed Gas Association; www.cganet.com.
50. CIMA - Cellulose Insulation Manufacturers Association; www.cellulose.org.
51. CISCA - Ceilings & Interior Systems Construction Association; www.cisca.org.
52. CISPI - Cast Iron Soil Pipe Institute; www.cispi.org.
53. CLFMI - Chain Link Fence Manufacturers Institute; www.chainlinkinfo.org.
54. CPA - Composite Panel Association; www.pbmdf.com.
55. CRI - Carpet and Rug Institute (The); www.carpet-rug.org.
56. CRRC - Cool Roof Rating Council; www.coolroofs.org.
57. CRSI - Concrete Reinforcing Steel Institute; www.crsi.org.
58. CSA - CSA International; (Formerly: IAS - International Approval Services); www.csa-international.org.
59. CSI - Construction Specifications Institute (The); www.csinet.org.
60. CTI - Cooling Technology Institute; (Formerly: Cooling Tower Institute); www.cti.org.
61. DASMA - Door and Access Systems Manufacturers Association; www.dasma.com.
62. DHI - Door and Hardware Institute; www.dhi.org.
63. ECA - Electronic Components Association; (See ECIA).
64. ECAMA - Electronic Components Assemblies & Materials Association; (See ECIA).
65. ECIA - Electronic Components Industry Association; www.eciaonline.org.
66. EIA - Electronic Industries Alliance; (See TIA).
67. EIMA - EIFS Industry Members Association; www.eima.com.
68. EJMA - Expansion Joint Manufacturers Association, Inc.; www.ejma.org.
69. ESD - ESD Association; (Electrostatic Discharge Association); www.esda.org.
70. ESTA - Entertainment Services and Technology Association; (See PLASA).
71. EVO - Efficiency Valuation Organization; www.evo-world.org.
72. FCI - Fluid Controls Institute; www.fluidcontrolsinstitute.org.
73. FIBA - Federation Internationale de Basketball; (The International Basketball Federation); www.fiba.com.
74. FIVB - Federation Internationale de Volleyball; (The International Volleyball Federation); www.fivb.org.
75. FM Approvals - FM Approvals LLC; www.fmglobal.com.
76. FM Global - FM Global; (Formerly: FMG - FM Global); www.fmglobal.com.
77. FSA - Fluid Sealing Association; www.fluidsealing.com.
78. GA - Gypsum Association; www.gypsum.org.
79. GANA - Glass Association of North America; www.glasswebsite.com.
80. GS - Green Seal; www.greenseal.org.
81. HI - Hydraulic Institute; www.pumps.org.
82. HMMA - Hollow Metal Manufacturers Association; (See NAAMM).
83. HPVA - Hardwood Plywood & Veneer Association; www.hpva.org.
84. HPW - H. P. White Laboratory, Inc.; www.hpwhite.com.
85. IAPSC - International Association of Professional Security Consultants; www.iapsc.org.
86. IAS - International Accreditation Service; www.iasonline.org.
87. IAS - International Approval Services; (See CSA).
88. ICBO - International Conference of Building Officials; (See ICC).
89. ICC - International Code Council; www.iccsafe.org.
90. ICEA - Insulated Cable Engineers Association, Inc.; www.icea.net.
91. ICPA - International Cast Polymer Alliance; www.icpa-hq.org.

92. ICRI - International Concrete Repair Institute, Inc.; www.icri.org.
93. IEC - International Electrotechnical Commission; www.iec.ch.
94. IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); www.ieee.org.
95. IES - Illuminating Engineering Society; (Formerly: Illuminating Engineering Society of North America); www.ies.org.
96. IESNA - Illuminating Engineering Society of North America; (See IES).
97. IEST - Institute of Environmental Sciences and Technology; www.iest.org.
98. IGMA - Insulating Glass Manufacturers Alliance; www.igmaonline.org.
99. IGSHPA - International Ground Source Heat Pump Association; www.igshpa.okstate.edu.
100. Intertek - Intertek Group; (Formerly: ETL SEMCO; Intertek Testing Service NA); www.intertek.com.
101. ISFA - International Surface Fabricators Association; (Formerly: International Solid Surface Fabricators Association); www.isfanow.org.
102. ISO - International Organization for Standardization; www.iso.org.
103. ISSFA - International Solid Surface Fabricators Association; (See ISFA).
104. ITU - International Telecommunication Union; www.itu.int/home.
105. LMA - Laminating Materials Association; (See CPA).
106. LPI - Lightning Protection Institute; www.lightning.org.
107. MBMA - Metal Building Manufacturers Association; www.mbma.com.
108. MCA - Metal Construction Association; www.metalconstruction.org.
109. MFMA - Metal Framing Manufacturers Association, Inc.; www.metalframingmfg.org.
110. MHIA - Material Handling Industry of America; www.mhia.org.
111. MMPA - Moulding & Millwork Producers Association; www.wmmpa.com.
112. MPI - Master Painters Institute; www.paintinfo.com.
113. MSS - Manufacturers Standardization Society of The Valve and Fittings Industry Inc.; www.mss-hq.org.
114. NAAMM - National Association of Architectural Metal Manufacturers; www.naamm.org.
115. NACE - NACE International; (National Association of Corrosion Engineers International); www.nace.org.
116. NADCA - National Air Duct Cleaners Association; www.nadca.com.
117. NAIMA - North American Insulation Manufacturers Association; www.naima.org.
118. NBI - New Buildings Institute; www.newbuildings.org.
119. NCMA - National Concrete Masonry Association; www.ncma.org.
120. NEBB - National Environmental Balancing Bureau; www.nebb.org.
121. NECA - National Electrical Contractors Association; www.necanet.org.
122. NeLMA - Northeastern Lumber Manufacturers Association; www.nelma.org.
123. NEMA - National Electrical Manufacturers Association; www.nema.org.
124. NETA - InterNational Electrical Testing Association; www.netaworld.org.
125. NFHS - National Federation of State High School Associations; www.nfhs.org.
126. NFPA - National Fire Protection Association; www.nfpa.org.
127. NFPA - NFPA International; (See NFPA).
128. NFRC - National Fenestration Rating Council; www.nfrc.org.
129. NLGA - National Lumber Grades Authority; www.nlga.org.
130. NOMMA - National Ornamental & Miscellaneous Metals Association; www.nomma.org.
131. NRCA - National Roofing Contractors Association; www.nrca.net.
132. NRMCA - National Ready Mixed Concrete Association; www.nrmca.org.
133. NSF - NSF International; www.nsf.org.
134. NSPE - National Society of Professional Engineers; www.nspe.org.
135. NSSGA - National Stone, Sand & Gravel Association; www.nssga.org.
136. NTMA - National Terrazzo & Mosaic Association, Inc. (The); www.ntma.com.
137. PCI - Precast/Prestressed Concrete Institute; www.pci.org.
138. PDI - Plumbing & Drainage Institute; www.pdionline.org.

139. RCSC - Research Council on Structural Connections; www.boltcouncil.org.
140. RFCI - Resilient Floor Covering Institute; www.rfci.com.
141. SAE - SAE International; www.sae.org.
142. SCTE - Society of Cable Telecommunications Engineers; www.scte.org.
143. SDI - Steel Deck Institute; www.sdi.org.
144. SDI - Steel Door Institute; www.steeldoor.org.
145. SEFA - Scientific Equipment and Furniture Association (The); www.sefalabs.com.
146. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (See ASCE).
147. SIA - Security Industry Association; www.siaonline.org.
148. SJI - Steel Joist Institute; www.steeljoist.org.
149. SMA - Screen Manufacturers Association; www.smainfo.org.
150. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; www.smacna.org.
151. SPFA - Spray Polyurethane Foam Alliance; www.sprayfoam.org.
152. SRCC - Solar Rating & Certification Corporation; www.solar-rating.org.
153. SSINA - Specialty Steel Industry of North America; www.ssina.com.
154. SSPC - SSPC: The Society for Protective Coatings; www.sspc.org.
155. SWI - Steel Window Institute; www.steelwindows.com.
156. TCNA - Tile Council of North America, Inc.; www.tileusa.com.
157. TEMA - Tubular Exchanger Manufacturers Association, Inc.; www.tema.org.
158. TIA - Telecommunications Industry Association (The); (Formerly: TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance); www.tiaonline.org.
159. TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance; (See TIA).
160. TMS - The Masonry Society; www.masonrysociety.org.
161. UL - Underwriters Laboratories Inc.; www.ul.com.
162. UNI - Uni-Bell PVC Pipe Association; www.uni-bell.org.
163. USGBC - U.S. Green Building Council; www.usgbc.org.
164. WASTEC - Waste Equipment Technology Association; www.wastec.org.
165. WDMA - Window & Door Manufacturers Association; www.wdma.com.
166. WI - Woodwork Institute; www.wicnet.org.
167. WWPA - Western Wood Products Association; www.wwpa.org.

E. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is believed to be accurate as of the date of the Contract Documents.

1. DIN - Deutsches Institut fur Normung e.V.; www.din.de.
2. IAPMO - International Association of Plumbing and Mechanical Officials; www.iapmo.org.
3. ICC - International Code Council; www.iccsafe.org.
4. ICC-ES - ICC Evaluation Service, LLC; www.icc-es.org.

F. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Information is subject to change and is up to date as of the date of the Contract Documents.

1. CPSC - Consumer Product Safety Commission; www.cpsc.gov.
2. DOC - Department of Commerce; National Institute of Standards and Technology; www.nist.gov.
3. DOE - Department of Energy; www.energy.gov.
4. EPA - Environmental Protection Agency; www.epa.gov.

5. FG - Federal Government Publications; www.gpo.gov.
6. OSHA - Occupational Safety & Health Administration; www.osha.gov.
7. USDA - Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; www.ars.usda.gov.
8. USDJ - Department of Justice; Office of Justice Programs; National Institute of Justice; www.ojp.usdoj.gov.

G. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. ADAAG; Americans with Disabilities Act (ADA), Architectural Barriers Act (ABA), Accessibility Guidelines for Buildings and Facilities (See USAB)
2. CFR - Code of Federal Regulations; Available from Government Printing Office; www.gpo.gov/fdsys.
3. FED-STD - Federal Standard; (See FS).
4. FS - Federal Specification; Available from DLA Document Services; www.quicksearch.dla.mil.
5. USAB - United States Access Board; www.access-board.gov.

H. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. CBHF; State of California; Department of Consumer Affairs; Bureau of Electronic and Appliance Repair, Home Furnishings and Thermal Insulation; www.bearhfti.ca.gov.
2. CCR; California Code of Regulations; Office of Administrative Law; California Title 24 Energy Code; www.calregs.com.
3. CDHS; California Department of Health Services; (See CDPH).
4. CDPH; California Department of Public Health; Indoor Air Quality Program; www.cal-iaq.org.
5. CPUC; California Public Utilities Commission; www.cpuc.ca.gov.
6. SCAQMD; South Coast Air Quality Management District; www.aqmd.gov.
7. TFS; Texas A&M Forest Service; Sustainable Forestry and Economic Development; www.txforestservice.tamu.edu.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 42 00

SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

B. Related Requirements:

1. Section 011000 "Summary" for work restrictions and limitations on utility interruptions.
2. Section 31200 “Earth Moving” for dewatering procedures.
3. Section 312319 "Dewatering" for disposal of ground water at Project site.
4. Section 321216 "Asphalt Paving" for construction and maintenance of asphalt pavement for temporary roads and paved areas.
5. Section 321313 "Concrete Paving" for construction and maintenance of cement concrete pavement for temporary roads and paved areas.

1.3 USE CHARGES

A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Architect, testing agencies, and authorities having jurisdiction.

B. Sewer Service: Contractor shall pay sewer-service use charges for sewer usage by all entities for construction operations.

C. Water Service: Contractor shall pay water-service use charges for water used by all entities for construction operations.

D. Electric Power Service:

1. At the staging area bounded by Graves, Madison, Forrest & Monument Streets State-owned electrical services are available at 208/120V at the JI Building main switchboard located in the Basement at the corner of Madison & Graves Street. The Contractor may, if he so elects, make temporary connections at this switch board on the State-owned system that has sufficient capacity which is up to a new 600A breaker to carry the added temporary load. If this is done, the Contractor shall be assessed a flat rate of $500.00 per month for power consumed during the period of construction. This monthly amount used for the duration of the project will be deducted from the contract value before final

payment is made to the Contractor. The State reserves the right to amend the assessed rate.

Temporary feeders shall be installed underground beneath Graves Street connected to the above referenced new SQD-style breaker in the QED Switchboard and equipment required for this temporary connection shall be at the expense of the Contractor. The Contractor shall at his expense restore the connection point on the State-owned system to its original condition at conclusion of the project. (See attached Drawing of the Contractor Staging Area Street Utility Site Plan.)

2. At the YDC (Youth Detention Center) construction site, State-owned electrical service is available at 480/277V at the OSTC/SUI Building basement, which presently sub feeds the BPRU building that is to be demolished. This is a BGE secondary service metered at the 480V level with a CT cabinet in the basement of OSTC switchboard. The Contractor may, if he so elects, make temporary connections at this panel on the State-owned system that has sufficient capacity to carry the added temporary load. This OSTC switchboard is fed from a BGE owned 15kV switch and 1000kVA transformer that are to be removed by BGE during the project. A temporary BGE transformer and contractor furnished main and feeder as required in other parts of this specification to refeed the OSTC switchboard. If temporary power is used from OSTC, the Contractor shall be assessed additionally a flat rate of $200.00 per month for power consumed during the construction period. This monthly amount used for the duration of the project will be deducted from the contract value before final payment is made to the Contractor. The State reserves the right to amend the assessed rate. Equipment required for this temporary connection shall be at the expense of the Contractor. The Contractor shall at his expense restore the connection point on the State-owned system to its original condition at conclusion of the project.

3. Where no adequate State-owned electrical services exist, the Contractor shall make arrangements with the local electric utility company for the provision of temporary service and pay for electricity used by all entities during the project construction (Owner, Architect, Testing Agencies, and Authorities Having Jurisdiction). All charges incurred for the provision and use of this temporary service shall be borne by the Contractor. Provide adequate service to start-up and test electrical systems and equipment if permanent power is not available.

4. In all cases the Contractor shall submit to the Owner's Representative for approval a sketch or sketches showing the route of all temporary connections with descriptions of wire sizes and types, protective devices and similar equipment to be used in providing the temporary service.

1.4 INFORMATIONAL SUBMITTALS

A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

1. Show route of all temporary electrical connections with locations of poles, descriptions of wire sizes and types, transformers, meters, protective devices and similar equipment to be used in providing temporary service.

B. Erosion- and Sedimentation-Control Plan: Show compliance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.

C. Temporary Utility Reports: Submit reports of tests, inspections, meter readings, and similar procedures performed on temporary utilities.

D. Implementation and Termination Schedule: Within 15 days of date established for submittal of Contractor's Construction Schedule, submit a schedule indicating implementation and termination of each temporary utility.

E. Moisture-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage.

1. Describe delivery, handling, and storage provisions for materials subject to water absorption or water damage.
2. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water-damaged Work.
3. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.

F. Dust- and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust- and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Identify further options if proposed measures are later determined to be inadequate. Include the following:

1. Locations of dust-control partitions at each phase of work.
2. HVAC system isolation schematic drawing.
3. Location of proposed air-filtration system discharge.
4. Waste handling procedures.
5. Other dust-control measures.

1.5 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

C. Accessible Temporary Egress: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for access to Project conference room and for any work within OSTC portion of SUI Building that inhibits egress or access to any exit or space.

1.6 PROJECT CONDITIONS

A. Temporary Utilities: At earliest feasible time, when acceptable to Owner, change over from use of temporary service to use of permanent service.

1. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

B. Conditions of Use: The following conditions apply to use of temporary services and facilities by all parties engaged in the Work:

1. Keep temporary services and facilities clean and neat.
2. Relocate temporary services and facilities as required by progress of the Work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide new materials. Undamaged, previously used materials in serviceable condition may be used if approved by Owner and Architect. Provide materials suitable for use intended.

B. Chain-Link Fencing: Minimum 2-inch, 0.148-inch- thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch- OD line posts and 2-7/8-inch- OD corner and pull posts, with 1-5/8-inch- OD top rails , with galvanized barbed-wire top strand.

C. Lumber and Plywood: Comply with requirements in Division 6 Section " Rough Carpentry."

D. Paint: Comply with requirements in Division 9 Section "Painting."

E. Tarpaulins: Fire-resistive labeled with flame-spread rating of 15 or less.

F. Water: Potable.

G. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10-mil minimum thickness, with flame-spread rating of 15 or less per ASTM E 84 and passing NFPA 701 Test Method 2.

H. Dust-Control Adhesive-Surface Walk-off Mats: Provide mats minimum 36 by 60 inches.

I. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

2.2 TEMPORARY FACILITIES

A. Field Offices and Facilities, General:

1. Security: Offices shall be located within perimeter fence enclosure. Modular units shall be secure
2. Provide prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

3. Provide all temporary offices and facilities within designated areas as shown on the staging plan on drawings. Placement and schedule duration shall be coordinated by the Contractor. Contractor is responsible to verify that all field offices, trailers and storage sheds shall be in accordance with the local Fire Marshall having jurisdiction.
4. Construction personnel will not be allowed to use parking areas designated for Owner, and Architect.
5. Subcontractors will not be allowed to have on-site construction trailers.
6. Contractor shall maintain the use of designated space for offices and sheds. This includes removal of weeds, debris, trash and clean-up of the area after removal of such temporary structures.
7. Temporary field offices and sheds shall not be used for living quarters.
8. Offices and sheds shall be of suitable design, maintenance and appearance, and meet the approval of the Owner and all applicable local codes.
9. All temporary offices including foundations must be removed within ten (10) days of written notice from the Owner, including restoration of grade. Structures not removed in a timely manner will be removed by the Owner at the Contractor's expense.
10. Offices shall be weathertight.
11. The office shall be set up, equipped and made ready for use at least 24 hours prior to the beginning of construction, and it shall remain until all work has been completed.

B. Contractor's Field Office: Of sufficient size to accommodate needs of Contractor.

1. Electronic Communication Service sufficient for Contractor's activities.
2. Minimum of 12 white adjustable-band protective helmets for visitors.
3. Minimum of 12 clear plastic safety eyeglasses for visitors.
4. Minimum of six pairs of yellow rubber pull-on boots for visitors, maintained clean.
5. One 10-inch outdoor weather high-low thermometer,
6. One rain gage.
7. Submittal Storage:

    a. Separate secure, lighted and ventilated storage room to maintain products and samples of individual Sections, minimum size 12 by 16 feet.
    b. Organize and construct Storage Room complete with plywood or steel shelves and bins to receive and maintain Submittal products and samples.
    c. Organize Submittal products and samples in accordance with the individual specification Divisions.
8. Provide electrical, water and sewer service, and trash removal and recycling service, to field offices.

9. Furniture required for Project-site documents including file cabinets, plan tables, plan racks, and bookcases.
10. Conference room of sufficient size to accommodate meetings of 20 individuals. Provide electrical power service and 120-V ac duplex receptacles, with no fewer than one receptacle on each wall. Furnish room with conference table, chairs, and 4-foot- square tack and marker boards. Provide ability for multiple use internet connectivity within conference room via hard or WI-FI capability.
11. Drinking water and private toilet.
12. Coffee machine and supplies.
13. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F.
14. Lighting fixtures capable of maintaining average illumination of 20 fc at desk height.

15. Provide one office for Owner's representatives; with data/internet and telecommunication capability;
16. Provide area and desk for Architect's representative to work when in field with data/internet and telecommunication capability;

C. Material Storage and Material/Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

1. Store combustible materials apart from building.
2. All temporary sheds including foundations must be removed within ten (10) days of written notice from the Owner, including restoration of grade. Structures not removed in a timely manner will be removed by the Owner at the Contractor's expense.
3. Sheds of combustible construction shall not be provided within at least seventy-five (75) feet from the new construction or within the new construction or as directed by the Owner.
4. Use of only Underwriters Laboratory approved heaters is permitted in field offices or storage sheds in compliance with OSHA and MOSHA requirements, and they shall have fire resistive material underneath and at the sides near partitions and walls.
5. Temporary storage of materials in the building and on the site will be limited to the same areas immediately under construction for materials intended for that particular portion of the work. Material, equipment and tools shall not be stored on site in excess of five (5) working days prior to installation or use without Owner approval. Contractor and Subcontractors must move any stored products, under their control, which interfere with operations of the Owner or separate Contractors as directed. The Contractor and Subcontractors shall cooperate in this regard.
6. Contractor shall provide sufficient protection for their materials and equipment from damages by weather or construction work.
7. During progress of work and upon completion of the work, remove all debris and leave the area in a clean and orderly condition.
8. Contractor and Subcontractors shall submit a receipt of shipment for all equipment stored on site or off-site to the Owner. No materials or equipment shall be removed from the site without the permission of the Owner.

9. Payments will be made for materials properly stored off site when site does not permit on-site storage and protection. Properly stored shall mean in an insured warehouse with the Owner being named as the insured, and all material identified as property of the Owner. The Contractor is responsible for all associated off-site storage costs, transportation, insurance, etc. The Owner will require verification in writing for all material so stored.

2.3 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

1. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.

B. Self-Contained Toilet Units: Single-occupant units of chemical, aerated recirculation, or combustion type; vented; fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material.

C. Drinking-Water Fixtures: Containerized, tap-dispenser, bottled-water drinking-water units, including paper cup supply. Where power is accessible, provide electric water coolers to maintain dispensed water temperature at 45 to 55 deg F (7.2 to 12.7 deg C).

D. Electrical Outlets: Properly configured, NEMA-polarized outlets to prevent insertion of 110- to 120-V plugs into higher-voltage outlets; equipped with ground-fault circuit interrupters, reset button, and pilot light.

E. Power Distribution System Circuits: Where permitted and overhead and exposed for surveillance, wiring circuits, not exceeding 125-V ac, 20-A rating, and lighting circuits may be nonmetallic sheathed cable.

F. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.

1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
2. Heating Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.
3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return-air grille in system and remove at end of construction and clean HVAC system as required in Section 017700 "Closeout Procedures".

2.4 WORK WITHIN OWNER OCCUPIED AREAS

A. Isolation of Occupied Areas: Proved floor-to-ceiling , solid, temporary partition assembly to isolate work areas within occupied OSTC portion of the SUI building.

B. Inmates Work Schedule: Hours of occupation are between 7:00 am and 3:30 pm.

C. Installation of the fire alarm and sprinkler systems shall occur between 4:00 pm and 6:00 am. An Owner’s security officer shall be present during the time of installation.

D. Maintain proper access and egress from temporary work areas with secure detention locks. Keys shall be provided to Owner.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

1. Locate facilities to limit site disturbance as specified in Section 011000 "Summary."

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.

1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
2. No utility services shall be interrupted by the Contractor to make connections, to relocate, or for any purpose without approval of the Owner.
3. Special attention shall be paid where interruptions of service is required within or adjacent to secure corrections facilities. Contractor shall coordinate with the Owner and obtain approval prior to any interruption to or installation within or adjacent to any Secure Corrections environment. The Contractor must prepare shut-down plan and schedule for review and approval. No additional time shall be permitted for the interruption unless agreed upon by all parties. Additional time or remobilization to perform the work affected by interruptions to secure corrections facilities shall be at the Contractor's expense.
4. Request for permission to shut down services shall be submitted in writing to the Owner not less than 15 days prior to date of proposed interruption. The request shall give the following information:

    a. Nature of Utility (Gas, L.P. or H.P., Water, Security, IT, Electrical, Etc.)
    b. Size of line and location of shutoff.
    c. Buildings and services affected.
    d. Hours and date of shutoff.
    e. Estimated length of time service will be interrupted.

5. Services will not be shut off until receipt of approval of the proposed hours and date from the Owner.
6. Shutoffs which will cause interruption of State and/or City work operations as determined by the Contractor shall be accomplished during regular non-work hours or on non-work days of the State and/or City without any additional cost to the State and/or City.
7. Operation of valves on water mains will be by State and/or City personnel. Where shutoff of water lines interrupts service to fire hydrants or fire sprinkler systems, the Contractor shall arrange his operations and have sufficient material and personnel available to complete the work without undue delay or to restore service without delay in event of emergency. All costs are to be borne by the Contractor.
8. Flow in gas mains which have been shut off shall not be restored until the CCITF through the Owner has determined that all items serviced by the gas line have been shut off.
9. Power Outages: The Contractor shall carefully plan his work with a view to limiting outages of the lighting and power. All temporary outages and/or interruptions necessary shall be planned at least seventeen (15) days in advance and submitted to the Owner, for approval. All total outages shall be on Saturdays, Sundays and holidays as approved by the Owner. Power shall be restored after each outage and shall be made operational for normal workday schedule.
10. **Maintenance of Power to The Occupational Skills Training Center (OSTC) functions in SUI Building:** The OSTC must remain occupied and in operation

during the construction period. The Contractor must provide temporary power to maintain operation and function of the OSTC at all times:

a. Provide 400kW generator 480/277V and feed the existing switchboard. Contractor will be responsible for fuel, cabling, and conduit between generator and switchboard.

OR

b. Coordinate with BGE to provide a temporary Medium Voltage switch, transformer, conduit, CT cabinet, metering and all associated appurtenances required to maintain power to the OSTC and other occupied areas of the SUI Building. Locate the temporary equipment on the sidewalk between Truxton street and the SUI Building. This will include new underground conduits from the nearest BGE manhole to the transformer and underground conduits from the BGE transformer to a CT cabinet located on the exterior of the SUI Building per BGE standards. Provide bollards around the transformer per BGE standards. Adjacent to the CT cabinet, provide a new 600A 480V breaker in a NEMA 3R enclosure and extend two sets of 4 # 350kcmil in 2-4" EMT conduits routed in the basement of the SUI Building to the existing-to-remain switchboard.

This reconnection or cutover from the existing to the temporary service shall be performed while the OSTC area is unoccupied (after 4:00pm and until 6:00am on weekdays, or else on weekends). The contractor shall be fully responsible to coordinate all aspects of the BGE work to maintain service to occupied areas of the SUI Building. The energy usage component of this service shall be paid by the Owner. An allowance as described in Section 01 21 00 SPECIALTY ALLOWANCES is included to cover the BGE cost for this service.

B. Alterations to the Utilities: Where changes and relocations of utility lines are noted to be performed by others, the Contractor shall give the Owner at least thirty (30) days written notice in advance of the time that the change or relocation is required. In the event that, after the expiration of thirty (30) days after the receipt of such notice by the Owner, such utility lines have not been changed or relocated and delay is occasioned to the completion of the work under this contract, the Contractor will be entitled to a time extension equal to the period of time lost by the Contractor after the expiration of said thirty (30) day period. Any modification to existing or relocated lines required as a result of the Contractor's method of operation shall be made wholly at the Contractor's expense and no additional time will be allowed for delays incurred by such modifications.

C. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.

1. Connect temporary sewers to as directed by authorities having jurisdiction.

D. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.

1. The Contractor will pay for water used on this project. Contractor shall exercise measures to conserve water.
2. Contractor shall provide and maintain a source for drinking water. Contractor shall be responsible to provide containers, paper cups, ice, hoses, etc. for their needs.

3. Immediately after award of contract, the Contractor shall furnish, install, maintain and subsequently remove a temporary hookup to the City potable water system where directed for construction purposes. Distribution of temporary water will be paid for by the Contractor. A minimum of two hose bibs shall be provided by the Contractor as directed. Extend branch piping with outlets located so water is available by hoses with threaded connections. Provide temporary pipe insulation to prevent freezing.

E. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

1. At no time are the permanent sanitary facilities of the project available to Contractor.
2. Disposable Supplies: Provide toilet tissue, paper towels, paper cups, and similar disposable materials for each facility. Maintain adequate supply. Provide covered waste containers for disposal of used material.
3. Toilets: Install self-contained toilet units. Shield toilets to ensure privacy. Provide separate facilities for male and female personnel.
4. Wash Facilities: Install wash facilities supplied with potable water at convenient locations for personnel who handle materials that require wash up. Dispose of drainage properly. Supply cleaning compounds appropriate for each type of material handled.
5. Provide safety showers, eyewash fountains, and similar facilities for convenience, safety, and sanitation of personnel.
6. Locate toilets and drinking-water fixtures so personnel need not walk more than two stories vertically to facilities.

F. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

1. Contractor shall pay and provide for temporary heat and cold weather protection as necessary to carry out the work and allow operations to continue during inclement or cold weather, to protect all work and materials against injury from dampness or cold, to dry out building, and to provide suitable working conditions for the installation and curing of materials.

    a. Heat and protection shall be provided to maintain specified, recommended, and approved environmental conditions and temperatures. The temperature shall not be allowed to reach a level that will cause damage to any portion of the work, including materials stored in the building, which may be subject to damage by low or high temperatures. Maintain minimum ambient temperature of 50 degrees F (10 degrees C) in areas where construction is in progress, unless indicated otherwise in specifications.
    b. Adequate venting, maintenance, care and supervision of such temporary heating and equipment shall be exercised so that finished work will not be damaged by its operation and to meet all state and city codes.
    c. Contractor in coordination with the Owner shall provide a plan for temporary heating and cold weather protection.

2. Contractor Use of Heating Plant:

a. Upon obtaining written approval from the Owner, the Contractor may, at his option, utilize the heating system installed under this contract to provide space heating prior to the time of completion of the building. All fuel or power for such space heating and for the required tests of heating equipment shall be furnished by the Contractor and shall be as specified.
b. The heating system shall be operated only by qualified personnel and shall be operated with all auxiliaries and in accordance with the manufacturer's instructions and good operating practice. Heating systems shall not be operated for space heating until the Owner is furnished a written statement signed by the Contractor certifying that all water treating equipment, combustion control equipment, and the safety controls have been properly installed and are operating satisfactorily. If at any time the Owner determines that the equipment is being improperly operated or maintained, the Contractor may be directed to discontinue its use.
c. Heating Systems shall be operated and controlled to prevent temperature in any room or space in the building from exceeding 90 degrees F.
d. Contractor shall, prior to the time of final acceptance of all work under this contract, place the heating system, related equipment, and ductwork in a condition equal to new. The heating systems shall be cleaned, lubricated, and adjusted, and parts and filters shall be replaced or cleaned, as required. Provide all necessary touch-up painting. Contractor shall pay for all costs for maintenance, attendance and restoration to "like new" condition of the system.
e. Contractor shall assume full responsibility for the entire heating system until final acceptance of the system by the Owner. Contractor shall pay the cost of extending warranty and guarantee periods on any permanent equipment used prior to substantial completion.

3. Interior or exterior surfaces damaged by the use of heating units shall be replaced with new materials at the Contractor's expense.

G. Isolation of Work Areas in Occupied Facilities (SUI Building and “D” Block): Prevent dust, fumes, and odors from entering occupied areas.

1. Prior to commencing work, isolate the HVAC system in area where work is to be performed according to coordination drawings.

a. Disconnect supply and return ductwork in work area from HVAC systems servicing occupied areas.
b. Maintain negative air pressure within work area using HEPA-equipped air-filtration units, starting with commencement of temporary partition construction, and continuing until removal of temporary partitions is complete.

2. Maintain dust partitions during the Work. Use vacuum collection attachments on dust-producing equipment. Isolate limited work within occupied areas using portable dust-containment devices.
3. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.

H. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.

1. Provide dehumidification systems when required to reduce substrate moisture levels to level required to allow installation or application of finishes.
2. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
3. Utilize existing ventilation equipment. Extend and supplement equipment with temporary fan units as required to maintain clean air for construction operations.

I. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.

1. Install electric power service overhead unless otherwise indicated.
2. Regulations and Compliance:

   a. All temporary equipment and wiring for power, lighting and distribution requirements shall conform to National Electrical Code, OSHA requirements, and be in accordance with all other applicable provisions of federal, state and city governing laws, codes, and ordinances.
   b. All temporary wiring and distribution equipment shall be maintained so as not to constitute a hazard to persons or property.
   c. Contractor is responsible to provide an assured grounding program in accordance with OSHA regulations for their own electrical power requirements.

3. Power Service:

   a. Contractor shall provide, install, and pay for labor, equipment and materials required to make connections to local utility company and to provide temporary electrical service for power and light distribution. The Contractor shall coordinate the location of the electrical power and lighting.
   b. Contractor will provide for each construction trailer(s) a 120/208 volt (or 120/140 volt), 100 ampere single phase power source to which the Contractor can connect to. The cost of hook up and removal of temporary electrical service to trailer shall be Contractor's responsibility.
   c. Protection shall be provided for the power supply source complete with disconnect switch, overcurrent protection, and other required electrical devices.
   d. Contractor will provide the temporary electrical service to the temporary hoist.
   e. Power consumption shall not disrupt Owner's need for continuous service.
   f. Subcontractors requiring service of capacity or characteristics other than specified must make arrangements with the Contractor and pay for their own installation, removal, and service.
   g. Where 3 phase power is required, the Contractor must pick up service at the distribution panel located outside the building.

4. Power Distribution:

   a. Contractor will provide and maintain temporary power distribution. Construction power shall be 120/208 volts, 3 phase, 4 wire plus ground. Provide the following outlets together with feeders, branch wiring, grounding, distribution boxes, protective devices and ground fault interrupting devices.

      1) Power centers - on each floor of the new building, provide a minimum of two (2) power centers or not less than one (1) per 10,000 SF rated not less than 100 amperes at 120/208 volt, 3

phase, 4 wire plus ground. Locate the power centers such that each will serve approximately equal areas and as far as possible, each shall be in the center of the respective area served.

2) 120 volt duplex outlets - Provide weatherproof, G.F.I. protected, 20 ampere grounded outlets at a minimum rate equal to 1 - duplex outlet per 400 square feet. Outlets may be grouped in clusters of up to six duplex types with corresponding pro-rated increase in area served, provided that every portion of the construction and remodeled premises can be reached from the nearest outlet using a flexible cord no more than 50 feet in length.

3) The necessary grounded portable cords, lamps, lightstands, and fuses from the distribution outlets to points of use shall be provided by Contractor to suit requirements.

5. As partitions are erected, locations of power distribution points shall be added or relocated.

J. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
2. Lighting shall be achieved using 120 volt guarded incandescent fixtures, or other suitable fixture types, to OSHA required minimum levels of illumination.
3. General interior lighting levels shall be a minimum of 25-foot candles.
4. Provide a minimum of 70-foot candles of lighting in Contractor field offices.
5. Higher lighting levels, 70 to 100-foot candles at direction of Owner or Architect shall be provided for detail finish work at no additional cost to the Owner.
6. 120 volt temporary lighting as required in interior work areas.
7. Provide adequate security lighting at guarded entrances outside storage areas, parking areas, and in areas of Contractor's, Owner's, and Architect's field offices and sheds.
8. As partitions are erected, locations of lighting distribution points shall be added or relocated.

K. Maintenance of Temporary Power and Lighting:

1. Contractor shall be responsible for the following:

a. Servicing, repairing and rearrangement of service equipment, temporary power, temporary lighting, and relamping.
b. Removal and disposal of temporary electrical power and lighting at completion of the project or when so directed by the Owner and repair of damage caused by new work.

L. Permanent Electrical Power and Lighting:

1. When permanent electrical power and lighting systems are in operating condition, they will be used for temporary power and lighting for construction purposes once the Contractor:

a. Obtains the approval of the Owner.
b. Assumes full responsibility for operation of the entire power and lighting systems and replacement of any burned out lamps.

c. Verifies that warranty dates will start upon the receipt of certificates of usage and occupancy and not during or before periods of construction.
d. Pays costs for operation, maintenance, and restoration of the systems.

M. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel.

1. Install Contractor's desired number of dedicated telephone line(s) for each field office.

2. Provide additional telephone lines for the following:
   a. Provide one telephone line for Owner's use.

3. At each telephone, post a list of important telephone numbers.

   a. Police and fire departments.
   b. Ambulance service.
   c. Contractor's home office.
   d. Contractor's emergency after-hours telephone number.
   e. Architect's office.
   f. Engineers' offices.
   g. Owner's office.
   h. Principal subcontractors' field and home offices.

4. Provide superintendent with cellular telephone or portable two-way radio for use when away from field office.

5. Printer: "All-in-one" unit equipped with printer server, combining color printing, photocopying, scanning, and faxing.
6. Internet Service per Owner requirements..
7. Internet Security: Integrated software, providing software firewall, virus, spyware, phishing, and spam protection in a combined application.
8. Backup: External hard drive, with automated backup software providing daily backups.

3.3 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:

1. Provide construction for temporary offices, shops, and sheds located within construction staging area that is noncombustible according to ASTM E 136. Comply with NFPA 241.
2. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Traffic Controls: Comply with requirements of authorities having jurisdiction.

1. Protect existing site improvements to remain including curbs, pavement, and utilities.
2. Maintain access for fire-fighting equipment and access to fire hydrants.

C. Parking: Provide temporary parking areas for supervisory construction personnel in Contractor Administrative area.

1. Provide four reserved parking spaces for use by Owner and three reserved spaces Architect/Engineer adjacent to Field Office.
2. Provide reserved signage and designation at each parking stall.
3. Signage shall be non-corrosive metal, post mounted approximately 14-inches wide by 18-inches high.

D. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.

1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
2. Remove snow and ice as required to minimize accumulations.

E. Project Signs: The Contractor shall provide a project signs as indicated. No other signs or advertising shall be displayed on the premises without the approval of the Architect and Owner. This does not exclude the posting of required trade notice and cautionary signage by Contractor. Prepare Project identification and other signs in sizes as determined by Owner. Install signs where indicated to inform public and persons seeking entrance to Project. Do not permit installation of unauthorized signs.

1. Identification Signs: Install State Project identification signs as provided by Owner. Provide and install Architect's and Engineer's signs as indicated on drawings.
2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.

    a. Provide temporary, directional signs for construction personnel and visitors.

3. Maintain and touchup signs so they are legible at all times.

F. Waste Disposal Facilities: Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."

G. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 017300 "Execution."

H. Temporary Construction Aids:

1. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.

    a. Cranes, truck cranes, hoists, lifts and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.
    b. The Contractor shall furnish, install, maintain and operate a temporary material hoist for the convenience of the Contractor. The hoist shall be installed upon completion of the building frame and removed after permanent elevator service is operational. The hoist shall be minimum 4,000 lb. size capacity and shall be furnished free of charge during normal working hours. All contractors shall conform to the hoisting schedule

established by the Contractor. Hoisting requirements in excess of the capacity or size of this hoist shall be provided by Contractor at his expense.

c. The hoist shall not be used for the placement of concrete, exterior masonry or roofing materials or the transporting of workmen. The operating cost for all overtime hoisting shall be paid by the Contractor requiring such services. Upon the removal of the hoist, Contractor shall complete the portion of their work interrupted by the temporary openings at no additional cost to the Owner.

d. The operating cost for all use of the elevator shall be paid by the Contractor. No guarantee of elevator acceptability or use by Contractor is made or implied.

I. Temporary Elevator Use: Use of new elevators is not permitted .

J. Existing Elevator Use:

1. Use of Owner's existing freight elevator within SUI Building will be permitted under the following conditions:
   a. Access to the elevator must be coordinated with Owner and Owner's security officer.
   b. Elevator can used for moving material
   c. Elevator is used and scheduled in coordination with Owner and OSTC administration approval.
   d. Elevator use is coordinated and scheduled with Security.
   e. Elevator is cleaned and maintained in a condition acceptable to Owner.
   f. At Substantial Completion, restore elevators to condition existing before initial use, including replacing worn cables, guide shoes, and similar items of limited life.
   g. Do not load elevators beyond their rated weight capacity.
   h. Provide protective coverings, barriers, devices, signs, or other procedures to protect elevator car and entrance doors and frame. If, despite such protection, elevators become damaged, engage elevator Installer to restore damaged work so no evidence remains of correction work. Return items that cannot be refinished in field to the shop, make required repairs and refinish entire unit, or provide new units as required.

K. Temporary Stairs, Ladders, Ramps, Runways: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.

1. Contractor is to provide and maintain all necessary temporary stairs, ladders, ramps, and runways to facilitate conveyance of men, materials, tools, and equipment for proper execution of their work.
2. All protection and safety barricades, devices, covers, etc., shall be provided by Contractor as it relates to the safe conduct of the work and protection of people and property in their work area in accordance with OSHA and MOSHA requirements.
3. Temporary Use of Permanent Stairs: Use of new stairs for construction traffic will be permitted, provided stairs are protected and finishes restored to new condition at time of Substantial Completion. Cost of repair, replacement, or restoration to new condition shall be at Contractor's expense.

L. Temporary Scaffolding

1. Contractor is responsible for providing and maintaining any and all scaffolds and other staging, as required to complete the work. All such scaffolds and staging

equipment shall be erected, maintained and subsequently removed by Contractor in accordance with all applicable safety regulations.

M. Temporary Shoring and Bracing:

1. Provide, erect, maintain and remove all shoring and bracing of all walls, partitions and parapets requiring vertical reinforcement as required by local codes or laws, as required for the protection of workmen or the public, and as required to support them, in such a manner that they will be safe from falling or collapsing during the processing of the work.
2. In the event of damage to such work immediately make all repairs and replacements necessary to the approval of the Owner, and Architect, and at no additional cost.
3. Arrange bracing and shoring so as to not place stress on any portion of the completed work until the general construction thereof has proceeded far enough to provide sufficient strength.
4. Exercise care in the erecting and removal of shoring and bracing to prevent collapse of the work being supported.
5. Prior to the removal of all shoring and forms, the Contractor shall be responsible for temporary protection at the building floor perimeters and openings.

N. Temporary Barriers and Barricades:

1. The Contractor or Subcontractors performing excavation work shall be responsible to furnish, install and maintain temporary barricades and/or fencing of all open excavations until such time as the backfilling is complete. Flasher lights shall be provided on barricades and fencing by the Contractor in accordance with OSHA and MOSHA. As a minimum, all barricades across roads and walks shall have lights on them in working condition.
2. Contractor and Subcontractors shall provide and maintain in good repair barricades, overhead protection, guard rails, etc., as required by law or necessary for the protection of the public and personnel engaged in the work from hazards incidental to this contract. Do everything necessary to protect the Owner's employees, the public and workmen from injury or damage to vehicles or other property.
3. Provide barriers to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
4. Provide barricades and covered walkways required by governing authorities for public rights-of-way.
5. Immediately after the removal of all shoring and forms, the Contractor shall furnish, install, and maintain all necessary temporary guardrails and barricade systems at the building floor perimeters and openings. When temporary protection is disturbed for project work, Contractor for is responsible to reinstall to its original condition the guardrail or barricade system for the protection of the workers and others until final construction of perimeter exterior wall and/or shaft openings is completed. All other protection and safety barricades, devices, covers, etc., including those at all roof areas, shall be provided by the Contractor as it relates to the safe conduct of their work in accordance with all local, state and federal regulations and the requirements of the contract documents and shall be in accordance with the most stringent requirements.
6. Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting warning signs and lighting.

O. Existing Stair Usage: Use of Owner's existing stairs will be permitted, provided stairs are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore stairs to condition existing before initial use.

1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If stairs become damaged, restore damaged areas so no evidence remains of correction work.

2. Any stair that may be used within the OSTC portion of the existing SUI Building must receive prior approval from the Owner, the OSTC Administration, and Security and the schedule of use coordinated with those entities.

3.4 PROJECT IDENTIFICATION AND SIGNS INSTALLATION

A. Pick-up, transport, and erect Owner-and Architect-provided Project identification sign within 15 days following Notice-to-Proceed.

B. Erect signs at location designated by the Owner and/or Architect.

C. Erect Owner- and Architect-supplied signs and structures to withstand 75-miles/hour wind velocity.

D. Maintain signs and supports clean, repair deterioration and damages for duration of Contract.

3.5 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.

B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

1. Comply with work restrictions specified in Section 011000 "Summary."
2. Restrict use of pipe threading activities and use of cutting oils to areas outside building with one or more dedicated sand filled pipe cutting area(s) that are constructed to collect 100 percent of all waste oil and pipe threading debris; clean daily.

3. Approximate size of “sand pit” is 10’-0” wide by 10’-0” long by 8” deep, minimum.

C. Temporary Erosion and Sedimentation Control: Comply with requirements specified in Section 312500 "Erosion and Sediment Control".

1. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant- protection zones.
2. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
3. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the course of Project.

4. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

D. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

E. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using environmentally safe materials.

F. Temporary Site Enclosure Fence:

1. There will be two types of site enclosure conditions required for this project:

a. Contractor provided construction site enclosure fence and gate that separates project site from public way. This fence shall extend primarily along E. Eager Street (from corner of Greenmount Ave. west to junction of complex Security fence) and Greenmount Ave. (from SUI Building north to corner of E. Eager Street). Extent of fence shall be as indicated Drawings.

1) Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.
2) Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to Owner.
3) Equip with vehicular and pedestrian gates with locks for required access.
4) The Contractor shall repair or replace fencing damaged as a result of their operation. Contractors shall remove and replace fencing and gates required to provide access for oversized items.

b. Contractor provided Corrections-type Security Fence and Gate that separates project site from Corrections Complex. This fence shall extend primarily within Forrest St. along the west and northwest boundaries of the project site. Extent of fence shall be as indicated Drawings.

1) Before construction operations begin, furnish and install site enclosure fence in a manner that will secure project site from Corrections complex.
2) Equip with motorized Security-type vehicular gate that only the Owner and Corrections Complex Security controls. Contractor will not have authorized access of this gate. Location of gate shall be as indicated on the Drawings.
3) Equip with Security-type pedestrian gate with electronic controlled access that ties back to existing Security Guard Station. Only the Owner and Corrections Complex Security controls. Contractor will not have authorized access of this gate. Location of gate shall be as indicated on the Drawings.
4) The Contractor shall repair or replace fencing damaged as a result of their operation. Contractors shall remove and replace fencing and gates required to provide access for oversized items.

G. Security:

1. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each work day.
2. Provide security to protect Field Offices, including Contractor's and Owner's offices, from unauthorized entry, vandalism, or theft.
3. The Contractor, at its own expense, shall provide the services of guards, watchmen protective service or other means of site security 24/7.
4. Subcontractors, at their own cost and expense, may provide a watchman, protective service or other means of site security as they deem necessary.
5. Contractor shall advise the Owner of any theft or damage which might delay the execution of the work and furnish the Owner with a copy of any theft report filed with local, county or state agencies.
6. Owner assumes no responsibility for loss, theft or damage to the Contractor's materials or for damage to the in-place work before the completion of the construction. In the instance of any such loss, theft or damage, the Contractor shall be responsible to renew, restore or remedy the work, tools, equipment and construction in accordance with requirements of the contract documents without additional cost to the Owner.
7. The Owner is not responsible for damage, liability, theft, casualty or other hazard to the automobiles or other vehicles, nor to injury including death to occupants of automobiles or other vehicles on the Owner's property.
8. The Contractor may establish additional security policies and procedures. All Subcontractors will be required to cooperate with the Contractor in implementing these procedures.
9. Site-parked equipment, operable machinery and hazardous parts of the new construction subject to mischief and accidental operation shall be inaccessible, locked or otherwise made inoperable when left unattended.
10. Provide security and facilities to protect Work, and existing adjacent facilities, and Owner's operations from unauthorized entry, vandalism, or theft.
11. Coordinate with Owner's security program, especially related to work within, or adjacent to, secure correctional facilities.

H. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.

I. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.

1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.

J. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas within the basement of the SUI Building as indicated on the Drawings..

1. Construct dustproof partitions with gypsum wallboard with joints taped on occupied side, and fire-retardant-treated plywood on construction operations side.
2. Insulate partitions to control noise transmission to occupied areas.
3. Seal joints and perimeter. Equip partitions with gasketed dustproof doors and security locks where openings are required.

K. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.

1. Prohibit smoking in construction areas.
2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction. Welding, flame cutting, or other operations involving the use of flame, arcs, or sparking devices will not be allowed without adequate protection and shielding without prior permission of the Owner. All combustible and flammable material shall be removed from the immediate area. Material shall be protected with a fire resistant tarpaulin to prevent sparks, flames, or hot metal from reaching materials. The Contractor shall provide the necessary personnel and fire fighting equipment to effectively control incipient fires resulting from welding, flame cutting, or other operations involving the use of flame, arcs or sparking devices. Provide fire extinguishers in the immediate area of the work which involves welding or open flame.
3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.
5. Contractor and Subcontractors shall assume full responsibility and take all necessary precautions to guard against and eliminate all possible fire hazards and to prevent damage to any construction work, building materials, equipment, temporary field offices, storage sheds, and all other property, both public and private. The location of the nearest corporation or public fire alarm box and the telephone number of the local fire department shall be conspicuously posted by the Contractor throughout the field offices and in the building structure adjacent to their work. Take precautions to prevent fire hazards in accordance with all fire protection and prevention laws and codes.
6. Contractor or his responsible agent will be required to inspect, at the close of daily operations, each area in which work was performed to insure all necessary safeguards regarding fire protection have been taken. Contractor shall review the entire project at least once a week to make certain all conditions and requirements have been adhered to as set forth herein.
7. No open fires shall be permitted. Contractor and Subcontractors shall not be allowed to start fires with gasoline, kerosene or other highly flammable materials.
8. Not more than a one day supply of flammable liquids such as oil, gasoline, paint or paint solvent shall be brought into any building at any one time. All flammable liquids having a flash point of 110 degrees F or below, which must be brought into any building, shall be confined to Underwriter's Laboratories' labeled safety cans. The bulk supply of all flammable liquids shall be detached at least 75 feet from the building and from yard storage of building materials. Spigots on drums containing flammable liquids are prohibited on the project site. Drums are to be equipped with approved vent pumps.
9. Combustible materials shall not be stored or left overnight within the confines of the permanent building. This includes all internal combustion engines using gas or fuel oil. Hoisting of flammable or combustible materials to the roof shall only be in quantities as needed for immediate use.
10. Only fire resistant tarpaulins shall be used on this project.
11. The Contractor will provide and maintain in working order at all times during construction not less than four (4) fire extinguishers conveniently located for each floor area having 50,000 square feet or less. One (1) additional fire extinguisher

will be provided for each additional 15,000 square feet of floor area. In addition, the Contractor may provide water and sand barrels, buckets, shovels, and garden hoses at strategic locations.

12. Fire extinguishers provided by the Contractor shall be "all purpose", and not a water type, to meet the approval of the Fire Underwriter's Laboratory, and will be inspected at regular intervals and recharged if necessary.
13. In areas of flammable liquids, asphalt or electrical hazards, extinguishers of the 15 lb. carbon dioxide type or 20 lb. dry chemical type shall be provided.
14. Contractor agrees that, in the event of fire, all their workmen and all the Subcontractor's workmen anywhere on site will assist in extinguishing the fire.
15. Temporary Fire Standpipe System:

    a. The Fire Protection Contractor shall furnish, install and maintain a temporary fire standpipe system in all parts of building for use of fire department during construction.
    b. Permanent risers shall be installed as floor slabs are cast. If permanent valves are not yet provided, provide temporary capped 2 1/2 inch hose valves on each floor with temporary cap or plug on top.

16. Provide permanent cross connections or provide temporary cross connections.

L. Protection of Building, Material, and Work: The Contractor shall at all times protect and preserve all materials (including stored materials), supplies and equipment, structures of every description (including property furnished or owned by others) and all work performed. All reasonable requests of the Owner to enclose or specially protect such property shall be complied with. If, determined that material, equipment, supplies and work performed are not adequately protected by the Contractor, such property may be protected by the Owner the cost thereof may be charged to the Contractor or deducted from any payment due him.

1. The Contractor shall provide protection for all parts of the building and its contents wherever work under this contract is performed. Contractor shall be responsible for all damage to the project including the existing building and grounds due to their operations under this contract. Repair or replacement of damaged items shall be to the satisfaction of the Owner.
2. Contractor shall provide temporary dustproof enclosures or partitions and ceilings for protection when required, in locations specified in the specifications and/or drawings, as required to separate work areas from other work areas, to prevent penetration of dust and moisture into occupied or other work areas, and to prevent damage to materials and equipment. Temporary enclosures or partitions shall be constructed of framing and sheet materials with closed joints and sealed edges at intersections with adjacent surfaces; maximum Flame Spread Rating of 75 in accordance with ASTM E84.
3. The interior of the building and its content shall be protected and secured from inclement weather, vandalism, and theft during the construction period. The Contractor shall be held liable for all damages attributable to noncompliance with this requirement. Provide temporary weather-tight insulated closure of exterior openings to accommodate acceptable working conditions and protection for products, to allow for temporary heating and maintenance of required ambient temperatures as stated above, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.
4. Provide temporary and removable protection for installed products. Control activity in immediate work area to minimize damage.
5. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

6. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
7. Contractor shall not load or permit any part of a structure to be loaded with a weight that will endanger its safety.
8. Prohibit traffic from landscaped areas.
9. Roof Protection:

    a. Contractor, Subcontractors, or any employee under their jurisdiction, shall be responsible for damages to roofing, sheet metal and roof structure while performing work on the roof. Repair work shall be performed at the expense of the contractor responsible for the damage.
    b. Protect roof surfaces while performing work. No construction materials will be allowed to be placed on roof surfaces.
    c. Protect installed Work and provide special protection where specified in individual specification Sections.

10. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

M. Protection of Underground Facilities:

1. Contractor shall provide and maintain proper shoring and bracing for existing underground utilities, sewers, and building foundations, encountered during their excavation work, to protect them from collapse or movement, or other type of damage until such time as they are to be removed, incorporated into the new work or can be properly backfilled upon completion of new work. See Paragraph, Interruption of Utilities.
2. Contractor shall consider it imperative that existing utility services such as drains, sewers, water lines, gas lines, electric feeders, telephone wires, etc., or any of their adjuncts be completely safeguarded and he shall conduct his operations accordingly. Should the Contractor damage such utilities they shall be carefully repaired as required by the City of Baltimore, the Baltimore Department of Public Works, and Utility Companies having jurisdiction. All repair work connected with such damages and all City and Utility Company charges shall be done and paid for by the Contractor and for which additional payment will not be allowed.

    a. Pursuant to State Law, the Contractor is advised to contact "MISS UTILITY" at 1-800-257-7777, Toll Free, for utility locations within and adjacent to the limits of this contract at least 48 hours before beginning construction. Failure to do so may subject the Contractor to a fine up to One Thousand Dollars ($1,000.00) or ten (10) times the costs of utility repairs, in the event any utility is interrupted. Contractor is advised that a fee will be charged for this service. All fees are the responsibility of the contractor. Provide documentation to Owner of such contact.
    b. Manhole frames and covers, handboxes, inlet gratings, and the like which must be raised, lowered or in any way adjusted as a result of the work required under this contract, shall be so relocated by the Contractor at his own expense. All such work shall be done under the supervision of the Baltimore City and the Department of Public Works or the Utility Companies having jurisdiction. The Contractor must give at least twenty-four (24) hours notice before the time he proposed to do the work.
    c. Protection of Storm Drains: It shall be the responsibility of the Contractor to see to it that the work under this contract is planned and conducted such that the operations of the Baltimore City's storm water drain system will not be affected. Nothing which could contribute to its stoppage shall

be allowed to enter the system. Should the operation of storm drains be impaired as a result of the Contractor's default of the above stipulations, he shall restore them to proper operation at his own expense to the satisfaction of the Owner.

d. Utilities and/or other services which are shown, or not shown but encountered, shall be protected by the Contractor from any damage caused as a result of work and operations, unless or until they are abandoned. If the utilities or services are damaged from their work or operations the Contractor shall immediately repair any damage and restore the utilities and services to an equal or better condition than that which existed prior to the damage. The Contractor will be responsible for all liabilities or claims resulting from such damage and will defend and hold harmless and indemnify Owner from any claims or law suits.

N. Protection of City Owned Property:

1. All existing City owned equipment within or adjacent to the work area shall be protected by the Contractor from damage caused by construction operations. Existing work damaged by construction operations shall be promptly repaired by the Contractor at his own expense.
2. The Contractor shall take such additional measures as may be directed by the Owner to prevent damage or injury to City property.

3.6 MAINTENANCE OF ACCESS, TRAFFIC REGULATION, AND PARKING

A. Closing Streets and Traffic Controls:

1. Closing Streets: When operations in connection with contract work necessitate the closing of streets and parking lots, it shall be the Contractor's responsibility to give adequate notice to Baltimore City, the Baltimore City Department of Transportation, and the Owner for such street or parking lot closing. Contractor shall submit for approval the procedures and formal plan of all necessary street and parking lot closings.
2. All barricades, warning signs, lights, temporary signals, markers, pavement markings, and other protective devices shall conform to the requirements of the latest edition of the Manual on Uniform Traffic Control Devices for Streets and Highways and all special contract requirements pertaining to such devices in the contract. The Contractor shall take all necessary precautions for the protection of the work and the safety of the public.

B. Parking Requirements: Parking of automobiles of workmen and equipment shall be as directed by the Contractor in coordination with the Owner. At no time are ANY vehicles to be parked, whether attended or not, in the Owner's, or Architect’s parking spaces, entrances or drives. Any material delivery, which will tie up the Owner's, or Architect’s parking spaces, entrances or drives in excess of one (1) hour shall be prescheduled with the Owner.

1. There shall be no parking by the Contractor or Sub-contractors on Forrest Street, Monument Street, Greenmount Avenue, or Eger Street within three blocks surrounding the Baltimore City Corrections Facility.

C. Access to Site and Building:

1. Access to the site for automobiles, equipment, supplies and vehicles of the Contractor shall be over existing paved roads and/or streets.
2. Contractor and construction, material, or equipment delivery access to the worksite shall be as designated by the Contractor in coordination with the Owner. Selected entrances to the construction site will remain open during normal working hours for the use of all Contractors.
3. Construct and maintain temporary roads accessing public thoroughfares to serve construction area. Extend and relocate as Work progress requires. Provide detours necessary for unimpeded traffic flow.
4. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate to support loads and to withstand exposure to traffic during construction period. Locate temporary roads and paved areas in same location as permanent roads and paved areas. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.

    a. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
    b. Prepare subgrade and install subbase and base for temporary roads and paved areas according to Division 2 Section "Earthwork."
    c. Recondition base after temporary use, including removing contaminated material, regrading, proofrolling, compacting, and testing.
    d. Delay installation of final course of permanent hot-mix asphalt pavement until immediately before Substantial Completion. Repair hot-mix asphalt base-course pavement before installation of final course according to Division 2 Section "Hot-Mix Asphalt Paving."
    e. Provide and maintain access to fire hydrants, free of obstructions.
    f. Provide means of removing mud from vehicle wheels before entering streets.
    g. If required, the Contractor shall at all times maintain a clean and safe passageway for the Owner's operations and personnel in adjacent existing areas and maintain clearances adjacent to and in connection with the work performed. Access to the site for automobiles, equipment, supplies and vehicles of the Contractor shall be over existing paved roads and/or streets.

D. Maintenance of Traffic and Public Safety:

1. In accordance with the Baltimore City Department of Transportation, and the Department of Public Works requirements and specifications, all requirements pertinent to the proper maintenance of vehicular and pedestrian traffic flow shall be compiled with as they apply to and for the life of this contract. The Contractor will contact those Baltimore City Departments having jurisdiction to obtain, when required, consent to do and to arrange for the doing of those things necessary for the public convenience and safety and for the maintenance of traffic.
2. Baltimore City has classed certain roadways as "main arterials." These arterials must be kept open to traffic at all times and no work whatsoever shall be done on them nor shall they be used, when working on areas adjacent to them, during period of rush-hour traffic.
3. The Contractor shall coordinate with the City as to the use and hours of any roadways. Should it become necessary to completely stop the flow of traffic, the Contractor must notify the Baltimore City Departments having jurisdiction sufficiently in advance so that all necessary arrangements can be made.

    a. No work shall be started before 9:30 a.m. which will affect in any way both those one-way and dualized arterials on which the period of rush-hour

traffic occurs in the morning. Correspondingly, no work shall be carried on which will affect in any way such arterials after 4:00 p.m. where the period of rush-hour traffic occurs in the afternoon. The time period during which work will be permitted, which will affect in any way the arterials which are subject to both morning and evening periods of rush-hour traffic, will be limited to 9:30 a.m. to 4:00 p.m. During the periods when rush-hour traffic is not in evidence, at least one-half of each arterial affected by the work must be kept open to traffic. Should it become necessary to completely stop the flow of traffic, the Owner and the City of Baltimore Departments having jurisdiction must be notified sufficiently in advance so that all necessary arrangements can be made.

4. Under no circumstances will the storage of construction equipment and materials be permitted on the above-mentioned arterials. The storage of such equipment and materials on other streets and roadways will not be permitted except by special arrangements with the Owner and the City of Baltimore Departments having jurisdiction. Where permitted, materials and equipment shall be stored in such a manner so that the safety of pedestrian and vehicular traffic will be assured.
5. Earth, fill material, rubble, stones, etc., dropped on the surface of any roadways shall be removed immediately. Equipment such as forms and other items needed to be placed on the roadways as part of the work to be done shall be removed just as soon as feasible. Such placement shall be done in such as way as to obstruct vehicular flow as little as possible.

3.7 PROGRESS CLEANING

A. Snow Removal: Remove snow and ice for the proper protection and execution of work. Keeping public traffic areas and circulation routes free of snow shall be the responsibility of the Contractor.

B. Cleanup and Rubbish Removal

1. All waste and trash shall be properly contained, recycled and/or disposed of full compliance with 013510, Sustainable Project Requirements, and 017419, Construction Waste Management and Disposal
2. The Contractor will provide and maintain the project jobsite and staging area dumpsters for both recycling and trash. Contractor shall be responsible for daily cleanup and removal from the construction area and placement in dumpster of all debris and waste resulting from their operations.
3. Contractor shall include in their base bid the cost for and be responsible for cleanup, transporting and removal from the site of their identifiable debris including but not limited to, bulky debris, packaging, containers, unused materials and equipment, and materials unsuitable for disposal by standard commercial procedures (i.e., masonry and concrete materials, steel, crates, cartons, other packaging, combustible items, etc.). Misuse of dumpsters will result in actual costs applied for clean-up costs for the Contractor(s) at fault. Contractor shall provide one person one day a week for up to eight (8) hours for each five (5) tradesmen employed at the site for the purposes of performing an over-all project clean-up. Trash and debris from the operation shall be placed in dumpsters provided by the Contractor.
4. The Contractor or its Subcontractors shall perform all cleanup on the project. Costs for cleanup shall be borne by the Contractor and the Contractor shall be responsible for all cleanup including identifiable debris. Weekly reports and invoices for clean-up activities will be issued by the Contractor to the Owner.

Delinquent payment of these invoices will be deducted from the payment for the Contractor's next application for payment.

5. The Owner's facilities are not to be used by any Contractor for the disposal of their trash or debris of their work.
6. Contractors are responsible to leave their work in a clean condition. This includes, but is not limited to, removal of all grease, dust, dirt, stains, labels, fingerprints and other foreign matter. Contractors will be responsible for control of dust generated by his work operations and will be responsible for a daily area clean-up.
7. The Contractor shall provide unidentifiable clean-up and prorate the cost among the subcontractors.
8. The Contractor must use all necessary measures to restrict any debris, liquids of any kind, or garbage from entering the navigable water resources. The Contractor will immediately remedy any breach of this clause and charge the responsible contractor.
9. Remove debris and rubbish from mechanical or electrical chases, plenums, shafts, crawl spaces, and other closed or remote spaces, prior to enclosing the space.
10. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

3.8 SPOIL OF WASTE MATERIALS

1. All surplus material or unsuitable material made available or left over from excavation or sitework shall be removed from the site by the Contractor at his expense. The materials shall become the property of the Contractor and shall be disposed of by him in a legal manner in accordance with all federal, state, and municipal regulations.

3.9 MOISTURE AND MOLD CONTROL

A. Contractor's Moisture-Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.

B. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:

1. Protect porous materials from water damage.
2. Protect stored and installed material from flowing or standing water.
3. Keep porous and organic materials from coming into prolonged contact with concrete.
4. Remove standing water from decks.
5. Keep deck openings covered or dammed.

C. Partially Enclosed Construction Phase: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:

1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
2. Keep interior spaces reasonably clean and protected from water damage.
3. Periodically collect and remove waste containing cellulose or other organic matter.
4. Discard or replace water-damaged material.

5. Do not install material that is wet.
6. Discard, replace, or clean stored or installed material that begins to grow mold.
7. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.

D. Controlled Construction Phase of Construction: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:

1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
2. Use permanent HVAC system to control humidity.
3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.

    a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective.
    b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
    c. Remove materials that cannot be completely restored to their manufactured moisture level within 48 hours.

3.10 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
2. Prevent water-filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.

C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape

development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.

3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."
4. Remove signs, framing, supports, and foundations at completion of Project, restore the area, and return signage to Owner and Architect.

3.11 SCHEMATIC DIAGRAM OF CONSTRUCTION STAGING AREA

A. As indicated on Civil drawings

END OF SECTION 01 50 00

01 50 60 INDOOR AIR QUALITY PLAN & PROCEDURES DURING CONSTRUCTION

Part 1 General

1.1 Related Documents

A. Drawings and General Provisions of Contract, including General Conditions and other Division 1 Specification Sections, apply to the work of this section.

B. Coordinate Construction IAQ Plan with independent Commissioning Authority's work and schedule.

1.2 Related Work

A. Section 01 10 00 – Summary of Work

B. Section 01 35 00 – Sustainable Project Requirements

C. Section 01 91 13 – General Commissioning Requirements

1.3 Summary

A. Sections include:

1. LEED Submittal Requirements for this section (see paragraph 1.7)
2. Indoor air quality procedures (see paragraph 3.2)
3. Control measures (see paragraph 3.3)
    a. HVAC Protection
    b. Source Control
    c. Pathway Interruption
    d. Housekeeping
    e. Scheduling

1.4 References

A. Reference Standards: In addition to requirements shown or specified, comply with applicable provisions of the following:

1. SMACNA IQA Guidelines for Occupied Buildings Under Construction, First Edition 1995. Sheet Metal and Air Conditioning Contractors' National Association, Inc. 4201 Lafayette Center Drive, Chantilly, VA 20151-1209.

2. USGBC LEED Reference Guide, current edition (Leadership in Energy and Environmental Design) Green Building Rating System. www.usgbc.org

1.5 Definitions

A. Volatile Organic Compounds (VOCs): are any carbon compounds that participate in atmospheric photochemical reactions (excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides and carbonates, and ammonium carbonate).

B. Type A Finishes: Materials and finishes with potential for short-term levels of off-gassing from chemicals inherent in their manufacturing process, or which are applied in form requiring vehicles or carriers for spreading which release high levels of particulate matter in the process of installation and/ or curing. Including, but not limited to:

1. Composite wood products, specifically including particleboard from which millwork, doors, or furniture may be fabricated.

2. Adhesives, sealants, and glazing compounds, specifically those with petrochemical vehicles or carriers.

3. Wood preservatives, finishes, and paint.

4. Control and/ or expansion joint fillers.

5. Hard finishes requiring adhesive installation.

6. Gypsum board and associated finish processes.

C. Type B Finishes: Materials and finishes which are woven, fibrous, or porous in nature and tend to absorb chemicals off-gassed by Type A finishes or may be adversely affected by particulates. These materials become “skins” for deleterious substances which may be released much later, or collectors of contaminants that may promote subsequent bacterial growth. Including, but not limited to:

1. Carpet and padding.

2. Insulation exposed to air stream.

3. Acoustic ceiling materials.

4. Tectum acoustic wall panels.

5. Upholstered furnishings.

6. Materials that can be categorized as both Type A and Type B.

1.6 System description

A. Indoor Air Quality: Minimize air concentrations of certain pollutants in completed project at time of Owner Occupancy. Maximum allowable indoor air concentrations of certain pollutants have been established. Concentrations must be at or below these standards prior to building acceptance.

B. Indoor Air Quality: Indoor occupied spaces of facility shall comply with the following standards:

1. Carbon Monoxide: Not to exceed 9 PPM + no greater than 2 PPM above outdoor levels.

2. Carbon Dioxide: Not to exceed 800 PPM.

3. Airborne Mold and Mildew: Simultaneous indoor and outdoor readings.

4. Maximum Air Concentration Standards: Indoor room air concentration levels, emission rates and qualities of contaminants shall not exceed the following limits at time of substantial completion prior to occupancy of facility and installation of office furniture, occupants, and occupant activities.

MAXIMUM INDOOR AIR CONCENTRATION STANDARDS*

Indoor Contaminants	**Maximum Air Concentration Levels**
Formaldehyde	50 parts per billion
Total Volatile Organic Compounds (TVOC)	500 micrograms per cubic meter
4-Phenylcyclohexene (4-PCH)**	6.5 micrograms per cubic meter
Total Particulates (PM 10)	50 micrograms per cubic meter
Carbon Monoxide (CO)	9 parts per million and no greater than 2 parts per million above outdoor levels

*All levels must be achieved prior to acceptance of the building. The levels do not account for contributions from office furniture, occupants, and occupant activities.

** 4-phenylcyclohexene is an odorous contaminant constituent in carpets with styrene-butadienelatex rubber (SBR).

TLV-TWA Threshold Limit Value – Time Weighted Average

MERV- Minimum Efficiency Reporting Value (for filtration media)

Or current indoor contaminant levels allowed by the current LEED Rating program.

1.7 Submittals

A. General: Submit in accordance with Section 013300/ Submittals,

B. Informational Submittals: Submit the following:

1. A materials log book is required that includes MSDS sheets and additional information on chemical content of selected materials, including Volatile Organic Compounds (VOC) in terms of grams per liter (g/L) highlighted showing compliance with specification requirements. This log book shall be maintained by the contractor throughout the life of the project, shall be updated monthly to include any newly approved products, shall be available at all times to the Owner's Representative, and shall be submitted at the conclusion of construction.

2. Indoor Air Quality Plan to outline measures to minimize contamination in the building during construction prior to Owner occupancy.

3. Provide photographs of protected materials, duct sealing and other measures taken at regular intervals throughout the period of construction.

4. Provide Cut Sheets of filtration media used during construction and installed immediately prior to occupancy highlighting MERV values. MERV values shall comply with the current LEED rating system as noted in the applicable LEED for Schools Reference Guide.

5. Coordinate and incorporate all work described herein with construction schedules.

6. Passive Indoor Air Quality Test results.

Based on results of passive indoor air quality testing, Owner reserves the right to require active indoor air quality testing.

C. Qualification Data: Indoor Air Quality Consultant's qualification data.

D. If required, Active Indoor Air Quality Test results.

1.8 Quality Assurance

A. Indoor Air Quality Consultant Qualifications: Owner shall retain services of a recognized independent expert in testing of indoor air quality with access to proper testing equipment, with minimum of five years experience in testing of indoor air quality.

B. Regulatory Requirements: Comply with applicable codes, laws, rules, and regulations of authorities having jurisdiction concerning indoor air quality.

1.9 Low-emitting Materials

A. Adhesives, sealants, and sealant primers shall meet or be within the VOC limits of the current LEED Rating system as noted in the applicable LEED Reference Guide.

B. Paints and coatings shall meet or be within the VOC and chemical component limits of the current LEED Rating system as noted in the applicable LEED Reference Guide.

C. Flooring Systems and adhesives shall meet or be within the limits of the current LEED Rating system as noted in the applicable LEED Reference Guide.

D. Composite Wood- shall meet or be within the limits of the current LEED Rating system as noted in the applicable LEED Reference Guide.

1.10 Project conditions

Environmental Requirements: Comply with requirements of other sections as appropriate.

1.11 Sequence and scheduling

General: Sequence and schedule work in accordance with other sections as appropriate.

1.12 System start up

Starting of Systems: Comply with Sections 019113/ COMMISSIONING REQUIREMENTS

Part 2 PRODUCTS

2.1 Indoor air quality testing equipment

A. Passive Testing Equipment: Passive monitoring test kit to measure formaldehyde levels and total VOC levels, list three primary VOCs detected, and identify mold and other particulates collected. Include analysis and written report of tested air.

1. Acceptable Product: IAQ Test Kit, Air Quality Sciences, Atlanta, GA, 770-933-0638.

B. Active Testing Equipment: As recommended and provided by Air Quality Testing Consultant.

Part 3 EXECUTION

3.1 Preparation

A. Indoor Air Quality Plan: Within 30 days of Notice to Proceed, prepare an Indoor Air Quality Plan tailored to the project, to ensure indoor air quality to comply with specified requirements, including but not limited to the following:

1. Identify Type A and Type B finishes in project.

2. Schedule and sequence installation of Type A and Type B finishes.

3. Provide tracking of submittals and MSDS sheets that relate to VOC compliance.

4. Describe method, rate, and schedule of ventilation during construction operations.

5. Schedule Indoor Air Quality testing conforming to the requirements of LEED credit EQ3.2 (option 2).

6. Schedule baseline IAQ testing after construction ends and prior to occupancy, using testing protocols consistent with the U.S. Environmental Protection Agency Compendium of Methods for the Determination of Air Pollutants in Indoor Air and as additionally detailed in the LEED for Schools Reference Guide credit

EQ3.2 (option 2). Construction Manager's schedule should include this item in project schedule.

3.2 Indoor Air Quality

A. General: Schedule and sequence construction and provide ventilation during construction to maximize indoor air quality after occupancy.

1. Schedule and sequence application of finishes to:

a. Install Type A Finishes that off-gas significant quantities of deleterious material during curing.

b. Ensure dissipation of emissions from Type A finishes before installation of Type B Finishes.

c. Install Type B Finishes (absorptive materials).

d. Avoid absorption of Type A Finish emissions by Type B Finishes.

e. All absorptive materials either stored on site or installed shall be protected from moisture throughout the course of construction.

f. Avoid subsequent release of unwanted substances in indoor spaces and mechanical systems after facility occupancy.

B. Temporary Heating and Ventilating: Comply with Section 015000 Construction Facilities and Temporary Control.

3.3 Control Measures

A. HVAC PROTECTION: All HVAC equipment shall be protected from collecting not only dust but also odors which can "stick" to porous materials in the system and later be released. Specific HVAC protection requirements generally apply to either the return side, central filtration, or supply side of the system. Identify in the Indoor Air Quality plan the methods to be utilized for HVAC protection.

1. Return Side: The return side of an HVAC system is, by definition, under negative pressure and thus capable of drawing in nearby construction dust and odor. HVAC shall not be used by the Contractor during construction period.

a. The entire system shall be shut down during all construction activities unless otherwise agreed to by the Owner's Representative and the Commissioning Agent.

b. The system shall be isolated from the surrounding environment as much as possible (e.g., all tiles in place for a ceiling plenum, duct and air handler leaks repaired) to prevent induction of pollutants.

c. All return system openings in (or immediately adjacent to) the construction area shall be sealed with plastic.

d. The mechanical room shall not be used to store construction or waste materials.

2. Central Filtration: Where major dust loading is expected to impact operating HVAC systems, upgrade filter efficiency. For example, filters with 60 to 80% dust spot efficiency may provide increased protection, if minimum airflow can be maintained. Where other control options for construction related odors are not deemed effective, provide filtration with media such as activated charcoal or potassium permanganate.

3. Supply Side: Diffusers, VAV boxes, and ducts may be adequately protected in most cases where the above measures are implemented. When the system is off for the duration of construction, diffusers and window units shall also be sealed in plastic for further protection. Ducts, diffusers, and window units shall be inspected upon completion of the work for the amount of deposited particulate resent and cleaned. If significant dust deposits are observed in the system during construction, some particulate discharge can be expected during start-up. When such a discharge is only minor, delaying occupancy only long enough to clean up the dust. In more severe cases, install temporary coarse filters on diffusers or clean the ducts. The condition of the main filters shall be checked whenever visible particulates are discharged from the system or as directed by the Owner's Representative.

4. Duct Cleaning: Clean the ducts and associated equipment during construction when the system becomes contaminated due to inadequate protection during the construction process. Provide specialized equipment and professional expertise as needed to ensure that dust is effectively removed and contained to the satisfaction of the Owner's Representative and the Commissioning Agent. The sequence in which duct cleaning occurs in the overall construction process needs to be carefully considered to avoid recontamination.

B. SOURCE CONTROL: The most effective type of pollution control is generally at the source. A variety of options are available depending on the type of products and equipment needed for the construction project. When any of the following control options appear to be feasible, costs should be compared to other measures (pathway interruption, intensified housekeeping, and scheduling changes) during the construction project. Although solvent content is often reduced, air quality advantages may be limited (e.g., most paints and adhesives stop significant off-gassing within a few weeks anyway). Product emission data is available from manufacturers and can be stated either as total VOCs or by specific compound. The time period of the testing is important (emissions should be expected to decline). Identify in the Indoor Air Quality plan source control methods to be utilized.

1. Modifying Equipment Operation: Use of equipment may need to be restricted in order to meet IAQ objectives. This will involve changing operating procedures. Examples of such controls include:

a. Restricting traffic volume or prohibiting idling of motor vehicles where emissions could be drawn into occupied areas.

b. Switching from diesel to bottled gas for equipment such as generators of forklifts (emissions are cleaner but still potentially harmful under some circumstances). Use of electric forklifts and other equipment shall be considered when feasible, since they do not burn fossil fuels, thus eliminating exposure to combustion gas emissions.

c. Switching equipment such as chain saws from gasoline-powered to electric (job may take longer due to reduced performance).

d. Cycling equipment off when not needed.

2. Changing Work Practices:

a. For some tasks (e.g., paint stripping) provide techniques which produce less airborne dust.

b. Provide painting techniques, which release less odor.

c. Provide cleaning practices that raise less dust (see Paragraph 3.3.D.3).

3. Local Exhaust: Pollution sources shall be directly exhausted to the outside. This shall be done through a portable exhaust fan vented to the outside and attached to the work site by flex duct. Depending on the nature of the material and the location of the exhaust, special filtration of the exhaust may or may not be necessary. Any emissions to the outside must be in compliance with applicable regulations and shall be directed well away from intakes.

4. Air cleaning: Where exhaust is not feasible, local recirculation of air through a portable air cleaner shall be provided. The type of filter shall be suitable for the material being controlled (e.g., charcoal or potassium permanganate for many odors, a moderate to high efficiency filter for dust).

5. Cover or Seal: VOC emissions are a result of evaporation from an exposed surface. Reducing the exposed surface reduces emissions. Provide the following measure including but not limited to:

a. An enclosed tanker or closed/ hooded kettle for roofing.

b. Containers of wet products shall be kept closed as much as possible.

c. Waste materials which can release odor or dust shall be covered or sealed.

d. A surface which is a persistent odor source shall be controlled by applying a sealer.

C. PATHWAY INTERUPTION: Provide methods that prevent and interrupt potential contaminant pathways and air movement from the work site. Identify in the Indoor Air Quality plan major pathways for the project. In the Indoor Air Quality Plan utilize the following five different factors to achieve environmental control:

1. *Depressurize the work area.* This shall be accomplished by adjusting the balance of the HVAC and exhaust systems or installing portable exhaust fans. Construction worker comfort may have to be a secondary consideration when cutting off conditioned air to the work site becomes necessary to help establish negative pressure environment. Some ventilation of the construction space will still be needed to dilute contaminants. This may be provided by air drawn into the work site from adjoining areas. Air exhausted to achieve negative pressure may or may not need to be filtered, depending on the nature of the materials, location of exhaust, and any applicable regulations. Care must be taken not to exhaust air where it can be drawn back into the building. When increasing the amount of air supplied to the space, it is imperative that the HVAC system itself remains protected from construction emissions. As a general rule, the work site shall be exhausted at a rate at least 10% greater than the rate of supply in order to maintain an effective negative pressure.

2. *Pressurize occupied space.* Increasing supply air and or reducing return exhaust air in the building during construction will help exclude airborne dust and odors. While HVAC systems generally shut down at night, consideration shall be given to temporarily extending the fan schedule. Overnight pressurization could help prevent dust and odor from migrating into the space. When increasing the amount of air supplied to the occupied space, it is imperative that the HVAC

system itself remains protected from construction emissions. Any temporary rebalancing during construction should be carefully planned with the Commissioning Agent and executed.

3. *Erect barriers to contain construction area.* Barriers can range from simple dust curtains for jobs generating only minor amounts of nuisance dust to a continuous plastic seal around the site, allowing for only the controlled inflow of make-up air. For non-asbestos projects, the extent of the barrier should be based on the materials involved and the implications of dust and odor escaping from the site. Id such a release is not considered a hazard and can be easily corrected by housekeeping, then a partial barrier or sealing of holes may be sufficient. Where no odor or dust can be tolerated outside the work area, a barrier approaching that required for asbestos projects may be needed. Barriers shall be designed in conjunction with favorable pressure differentials. Pressurization can only be achieved with a real partition between areas with pressure differences. In general, full containment of a work site with barriers, capping of return air ducts, and the application of negative pressure may be needed for spaces undergoing significant construction activities, and requirements shall be as directed by the Owner's Representative.

4. *Relocate pollutant sources.* When project equipment of staging area coincide with critical airflow pathways equipment shall be moved to a more favorable location in regard to air quality. For example, in a roofing job, tar tankers shall be located as far away from intakes as possible. Special care shall be taken to protect mechanical rooms with air handling equipment (e.g., store construction products and waste materials elsewhere).

5. *Temporarily seal the building.* Where construction emissions are occurring on the roof or adjacent to a building, contaminants may be drawn in through the outside air intake or (if the building is under negative pressure) other entries or cracks. If contaminant levels are unacceptable then the Owner's Representative or the Commissioning Agent shall direct the Contractor to seal the intake dampers. Special activities in the building that require outside air for dilution shall be temporarily discontinued. Control of the outside source may also necessitate closing or sealing exterior doors, the top of the elevator shaft, etc.

D. HOUSEKEEPING: As dust accumulates at a construction site, it will become airborne when disturbed by nearby activity. Similarly, spills or excess applications of products containing solvents will increase odors at a construction site. Finally, leaving the work site wet or even just damp for more than a day could result in the growth of mold and bacteria. Attention to site cleaning is, therefore, important to maintaining IAQ during construction. In the Indoor Air Quality Plan utilize these specific actions in regard to controlling contaminants at the work site including but not limited to:

1. Suppressing dust with wetting agents or sweeping compounds.

2. Increasing the cleaning frequency for dust.

3. Switching to a more efficient dust collection method (e.g., a damp rag, wet mop, or vacuum equipped with a high efficiency particulate filter or wet scrubber will discharge less material back into the air than conventional vacuuming, sweeping, or dusting).

4. Ensuring that all surfaces (including higher ledges, behind furniture, and inside mechanical equipment) are kept clean.

5. Removing spills or excess applications of solvent-containing products as soon as possible. Care shall be taken as to the selection of spot removers and cleaning agents (in general, products should be low odor emitters or used after hours with sufficient ventilation).

6. Removing accumulated water and keeping work areas as dry as possible (using dehumidification if necessary).

7. Vacuuming with HEPA filtered vacuum cleaners prevents aerolization of settled dust.

8. Protecting porous materials such as insulation from exposure to moisture (note: items which become wet/ damp will be replaced)

E. SCHEDULING: In the Indoor Air Quality Plan utilize construction sequencing to reduce absorption of VOCs by materials that act as sinks or contaminant sources. Complete application of wet and odor-emitting materials such as paints, sealants, and coatings before installing sink materials such as ceiling tiles, carpets, insulation, gypsum products, and fabric covered furnishings are installed. Materials directly exposed to moisture through precipitation, plumbing leaks, or condensation from HVAC system are susceptible to microbial contamination and shall be replaced at no additional cost to the Owner. Contractor shall conduct activities with a high pollution potential during off

hours. For example, if roofing emissions cannot be excluded from the building, the work shall be performed on an evening shift. Similarly, any work which disrupts the HVAC system or introduces odor into the system shall be done during unoccupied hours when possible. Where off-gassing odors are a major concern, work may have to be completed at the beginning of a weekend in order to allow new products time to air out sufficiently. Where occupants cannot be relocated, starting time may need to be delayed until late morning in order to accommodate clean-up of late night construction work.

The above measures assume that construction work is being rescheduled in order to avoid potentially harmful exposure to the general population.

F. At the end of the construction and prior to Owner occupancy, conduct air quality testing in full compliance with the requirements of LEED credit EQ3.2 (option 2).

3.4 Field quality control

A. Indoor Air Quality Testing Conditions: Facility has achieved Substantial Completion except for indoor air quality testing.

1. Final Cleaning: Completed.

2. HVAC Systems: Started, tested, balanced, Commissioned, cleaned, construction filters replaced and systems operating normally as specified.

3. Facility: Not occupied and Owner provided furnishings and equipment not yet installed.

B. Baseline IAQ Testing:

1. HVAC System Verification: To assure compliance with recognized standards for indoor air quality including ASHRAE Standard 62-1999 or latest version, the Owner's independent testing and balancing agency shall verify the performance of each HVAC system including but not limited to space temperature and space humidity uniformity, outside air quantity, filter installation, drain pan operation, and any obvious contamination sources.

2. Indoor Air Quality Testing: Upon verification of HVAC system operation, the independent Air Quality Testing Consultant shall test levels of indoor air contaminants for compliance with specified requirements.

a. A Test plan shall be submitted for the approval of the Owner's representative. The plan shall specify procedures, times, instrumentation, and sampling methods that will be employed.

b. The number of sampling locations will vary depending upon the size of the building. Contaminant levels are to be measured in an area agreed upon by the Contractor and the Owner's Representative.

c. Collect air samples on three consecutive days during normal school hours (between the hours of 8:00 am and 3:00 pm) with building operating at normal HVAC rates. Average the results of each three-day tests cycle to

determine compliance or non-compliance of indoor air quality for each air-handling zone tested.

d. Sample and record outside air levels of formaldehyde and contaminants at outside air intake of each respective air handling unit simultaneously with indoor tests to establish basis of comparison for these contaminant levels. Indoor testing will be done in the breathing zone; between 4' and 7' from the floor.

e. Acceptance of respective portions of buildings by the Owner is subject to compliance with specified limits of indoor air quality contaminant levels.

C. Passive Indoor Air Quality Testing: Provide and install Passive Indoor Air Quality Testing Equipment in space to be occupied as directed by Owner's Representative and in accordance with testing equipment manufacturer's recommendations.

1. Conduct passive test for 7 days with facility operating at specified HVAC rates and conditions.

2. Include analysis and written report of tested air by testing equipment provider.

3. If initial test results do not indicate compliance with specified indoor air quality standards, provide additional ventilation and take additional measures as required and accepted by Owner to achieve compliance.

4. Cost of Subsequent Passive Testing required because of failure to comply with specified standards shall be the responsibility of the Contractor.

D. Active Indoor Air Quality Testing: After results of passive testing have been submitted, Owner retains the right to require active indoor air quality testing by Air Quality Testing Consultant.

1. Testing: As determined by Owner based on recommendations of Air Quality Testing Consultant.

2. Cost of Initial Active Testing: By Owner

3. If initial test results do not indicate compliance with specified indoor air quality standards, provide additional ventilation and take additional measures as required and accepted by Air Quality Testing Consultant to achieve compliance.

4. Cost of Subsequent Active Testing Required Because of Failure to Comply with Specified Standards: By Contractor.

E. Compliance: Indoor air quality shall conform to paragraph 1.6 above.

F. Test Reports: Prepare test reports showing the results and location of each test, a summary of the HVAC operating conditions, a listing of any discrepancies and recommendations for corrective actions, if required.

1. Include certification of test equipment calibration with each test report.

G. If any test fails the standard, the Contractor is responsible to ventilate the building with 100% outside air until the building passes both air quality tests and duct inspections. Retesting shall be performed at no additional expense to the Owner.

SECTION 01 60 00 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

B. Related Requirements:

1. Section 012100 "Allowances" for products selected under an allowance.
2. Section 012300 "Alternates" for products selected under an alternate.
3. Section 012500 "Substitution Procedures" for requests for substitutions.
4. Section 014200 "References" for applicable industry standards for products specified.

1.3 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

1.4 ACTION SUBMITTALS

A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within 21 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

a. Form of Approval: As specified in Section 013300 "Submittal Procedures."

B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 013300 "Submittal Procedures." Show compliance with requirements.

1.5 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Packaging and Transportation

1. Require supplier to package finished products in boxes or crates for protection during shipment, handling, and storage.
2. Protect sensitive products against exposure to elements and moisture.
3. Protect sensitive equipment and finished against impact, abrasion, and other damage.

C. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.

3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected. Confirm that:

    a. Quantities are correct.
    b. Accessories and installation hardware are correct.
    c. Containers and packages are intact and labels legible.

D. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.

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1.7 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
3. See other Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Section 017700 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.
5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
6. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.

B. Product Selection Procedures:

1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
3. Products:

    a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered unless otherwise indicated.
    b. Nonrestricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.

4. Manufacturers:

    a. Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered unless otherwise indicated.
    b. Nonrestricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements.

Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.

5. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.

1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 012500 "Substitution Procedures" for proposal of product.

D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

A. Conditions for Consideration: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:

1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 60 00

SECTION 01 73 00 - EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. Product engineering as required per technical specifications
4. Installation of the Work.
5. Cutting and patching.
6. Coordination of Owner-installed products.
7. Progress cleaning.
8. Starting and adjusting.
9. Protection of installed construction.

B. Related Requirements:

1. Section 011000 "Summary" for limits on use of Project site.
2. Section 013300 "Submittal Procedures" for submitting surveys.
3. Section 017700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.
4. Section 024119 "Selective Demolition" for demolition and removal of selected portions of the building.
5. Section 078413 "Penetration Firestopping" for patching penetrations in fire-rated construction.
6. Section 017419 "Construction Waste Management and Disposal" for cutting and patching materials to be included in construction waste material recycling.

1.3 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For land surveyor or professional engineer to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified herein.

B. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.

C. Cutting and Patching Plan: Submit plan describing procedures at least 10 days prior to the time cutting and patching will be performed. Include the following information:

1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
3. Products: List products to be used for patching and firms or entities that will perform patching work.
4. Dates: Indicate when cutting and patching will be performed.
5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.

    a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.

D. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

E. Certified Surveys: Submit three (3) paper copies signed by land surveyor . Also, submit an electronic copy of same in format to be determined.

F. Final Property Survey: Submit three (3) paper copies showing the Work performed and record survey data. Also, submit an electronic copy of same in format to be determined.

1.5 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind required within the technical specifications.

C. Submit evidence of Surveyor’s or Professional Engineer’s current in force E & O insurance coverage in the form of an Insurance Certificate.

D. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection

2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include the following:

    a. Primary operational systems and equipment.
    b. Fire separation assemblies.
    c. Air or smoke barriers.
    d. Fire-suppression systems.
    e. Mechanical systems piping and ducts.
    f. Control systems.
    g. Communication systems.
    h. Fire-detection and -alarm systems.
    i. Conveying systems.
    j. Electrical wiring systems.
    k. Operating systems of special construction.

3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:

    a. Water, moisture, or vapor barriers.
    b. Membranes and flashings.
    c. Exterior curtain-wall construction.
    d. Sprayed fire-resistive material.
    e. Equipment supports.
    f. Piping, ductwork, vessels, and equipment.
    g. Noise- and vibration-control elements and systems.

4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

E. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

F. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

1.6 PROJECT RECORD DOCUMENTS

A. Maintain a complete and accurate log of control and survey work as it progresses.

B. On completion of caissons, grade beams, foundation walls, utilities, and major site improvements, prepare a certified survey illustrating dimensions, locations, angles, and elevations of construction and site work.

C. Submit Record Documents under provisions of Section 017839, “Project Record Documents”.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

1. For projects requiring compliance with sustainable design and construction practices and procedures, use products for patching that comply with sustainable design requirements.

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.
2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, water, and fire service piping; and underground electrical, gas, and IT/Telecom cabling services.
2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

3. Contractor shall provide underground utility surveys for all contract work with in Forrest Street and Greenmount Avenue.

C. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

D. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:

1. Description of the Work.
2. List of detrimental conditions, including substrates.
3. List of unacceptable installation tolerances.
4. Recommended corrections.

E. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

F. Promptly notify Owner, and Architect of any discrepancies discovered. The Contractor shall remedy at his own cost any condition, installation, or product which was provided as a result of a known discrepancy or problem, or as a result of a lack of coordination between trades.

G. Contractor shall be responsible to take such field measurements as may be required to determine the size of ordered material. In the event "guaranteed dimensions" are required, the General Contractor shall advise the applicable Subcontractors by use of drawings, templates or mock-ups of the required conditions.

H. As the work progresses, the Contractor shall lay out the exact locations of work his contract as a guide to all trades. Prior to any installation, the General Contractor shall exchange layout drawings and coordinate the work and be subject to verification.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to Baltimore City Department of Public Works, BGE, Verizon, or other local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Owner and Agency Construction Manager not less than five business days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Owner’s written permission.

C. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

D. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

E. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Section 013100 "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.

B. As work under contract commences, the condition of preceding work by the General Contractor or its subcontractors, or work by others under separate contract (Owner, Baltimore City, BGE, Verizon, etc.), shall be verified and accepted by the General Contractor. Verification may, at the General Contractor's discretion, include a joint review with the subsequent subcontractors, and/or separate contract entities, and previous subcontractor(s) and/or separate contract entities, to note any corrective work required, damage to previous work, verification of elevations, tolerances, levels and plumbness, critical dimensions, surface conditions, and similar items affecting the work under the contract and particularly items which prevent acceptance by the General Contractor and its subsequent subcontractors. The verification review procedures and findings shall be documented in writing, signed by all parties, and copies provided to the Owner. Any corrective work necessary to satisfy requirements of the contract documents shall be performed promptly by the General Contractor to prevent delay to the work. After corrective work is accomplished the General Contractor shall furnish written acceptance of the work as noted above.

C. General: Engage a land surveyor to lay out the Work using accepted surveying practices.

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
2. Establish limits on use of Project site.
3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
4. Inform installers of lines and levels to which they must comply.
5. Check the location, level and plumb, of every major element as the Work progresses.
6. Notify Owner and Architect when deviations from required lines and levels exceed allowable tolerances.
7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

D. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.

E. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

F. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

G. All work, and in particular piping, ducts, conduit and similar items, shall be neatly and carefully laid out to provide the most useful space utilization and the most orderly appearance. Except as otherwise indicated or directed, piping and similar work shall be installed as close to above ceiling floor slabs and walls as conditions reasonably permit, located to prevent interference with other work or with the use of the spaces. Valves shall be located in inconspicuous but accessible locations before proceeding with any work where exposed to view. The General Contractor, and its subcontractors, shall carefully plan the layout and review any questionable installations with the Owner and Architect. Access panels in security detention ceilings, gypsum wallboard ceilings, of other type non-removable or secure ceilings are unacceptable unless approved by the Architect or shown specifically on the drawings.

3.4 FIELD ENGINEERING

A. Identification: Owner will identify existing benchmarks, control points, and property corners.

B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

D. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.

E. Final Property Survey: Engage a land surveyor to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor , that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.

1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.
2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

3.5 SURVEYS FOR MEASUREMENT AND PAYMENT

A. Perform surveys to determine quantities of unit cost work, including control surveys to establish measurement reference lines. Notify Owner prior to starting work.

B. The General Contractor shall sign surveyor's field notes or keep duplicate field notes and shall calculate and certify quantities for payment purposes.

C. If a proper survey has not been completed to determine quantities for unit cost work, the Owner shall have full discretion to make a reasonable determination of quantity.

3.6 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
4. Maintain minimum headroom clearance of 96 inches (2440 mm) in occupied spaces and 90 inches (2300 mm) in unoccupied spaces.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.

F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.7 CUTTING AND PATCHING

A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

C. Temporary Support: Provide temporary support of work to be cut.

D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching according to requirements in Section 011000 "Summary."

F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.

G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
6. Proceed with patching after construction operations requiring cutting are complete.

H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.

    a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
    b. Restore damaged pipe covering to its original condition.

3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

    a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.

I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.8 OWNER-INSTALLED PRODUCTS

A. Site Access: Provide access to Project site for Owner's construction personnel.

B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel.

1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
2. Preinstallation Conferences: Include Owner's construction personnel at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

3.9 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F (27 deg C).
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

a. Use containers intended for holding waste materials of type to be stored.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 017419 "Construction Waste Management and Disposal."

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

1. During the hollow metal grouting activities, block and prevent masonry grout material from entering sanitary sewer building drainage system. As a minimum, maintain protection until all hollow metal grout access holes are permanently welded closed.

K. Cleaning of Field Offices:

1. Collect and dispose of all trash generated by the Contractor and Owner field offices on a daily basis.
2. Broom clean and remove trash from Contractor and Owner field offices on a daily basis at 3:00 PM.
3. Wet mop Contractor and Owner field offices every Friday at 3:00 PM.
4. Remove debris, trash and clean project limits and field offices at the direction of the Owner at no additional cost to the Owner within 24 hours of receiving written direction.

3.10 STARTING AND ADJUSTING

A. Notify Owner fourteen (14) days prior to the start-up of each equipment or system.

B. Coordinate startup and adjusting of equipment and operating components with requirements in Section 019113 "General Commissioning Requirements."

C. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

D. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

E. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

F. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Section 014000 "Quality Requirements."

G. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, or other conditions which may cause damage.

H. Verify that tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

I. Verify wiring and support components for equipment are complete and tested.

J. Execute start-up under supervision of responsible manufacturer's representative, and General Contractors' personnel in accordance with manufacturers' instructions. Owner shall be notified to observe start-up fourteen (14) days prior to start-up.

K. Procedure for testing shall consist of step by step instructions to verify systems parameters, components, and functioning.

L. Provide authorized representative to be present at site to inspect, check and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.

M. Submit a written report in accordance with Section, 014000, “Quality Requirements”. Section 014001, “Quality Control Program”, and Section 014202, “Inspection, Testing and Laboratory Services”, that equipment or system has been properly installed and is functioning correctly.

N. Provide for commissioning in accordance with Section 019113, “General Commissioning Requirements.”

O. Demonstration and Instructions: Provide for demonstration and Instructions as specified in Section 017900 “Demonstration and Training”.

3.11 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.12 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in this Section, Article 3.7, herein, "Cutting and Patching."

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to their specified condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 01 73 00

SECTION 01 74 19 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

B. LEED Credits: This plan relates to LEED Credits MRc2.1 and 2.2. Exemplary performance for an Innovation & Design Credit equals 95% recycling waste materials rate for one additional point.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for the following:

1. Salvaging nonhazardous demolition and construction waste.
2. Recycling nonhazardous demolition and construction waste.
3. Disposing of nonhazardous demolition and construction waste.

B. Related Requirements:

1. Section 024116 "Structure Demolition" for disposition of waste resulting from demolition of buildings, structures, and site improvements, and for disposition of hazardous waste.
2. Section 024119 "Selective Demolition" for disposition of waste resulting from partial demolition of buildings, structures, and site improvements, and for disposition of hazardous waste.
3. Section 042000 "Unit Masonry" for disposal requirements for masonry waste.
4. Section 047200 “Cast Stone Masonry” for disposal requirements for excess cast stone and cast stone waste.
5. Section 311000 "Site Clearing" for disposition of waste resulting from site clearing and removal of above- and below-grade improvements.

1.3 DEFINITIONS

A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.

C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.

F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.4 PERFORMANCE REQUIREMENTS

A. General: Achieve end-of-Project rates for salvage/recycling of 75 percent by weight of total non-hazardous solid waste generated by the Work. Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials, including the following:

1. Demolition Waste:

a. Minor Tree Landscaping
b. Asphalt paving.
c. Concrete, including concrete caissons.
d. Concrete reinforcing steel.
e. Brick.
f. Concrete masonry units.
g. Wood studs.
h. Wood joists.
i. Plywood and oriented strand board.
j. Structural and miscellaneous steel.
k. Rough hardware.
l. Roofing.
m. Insulation.
n. Doors and frames.
o. Door hardware.
p. Windows.
q. Glazing.
r. Metal studs.
s. Gypsum board.
t. Acoustical tile and panels.
u. Carpet.
v. Equipment.
w. Cabinets.
x. Plumbing fixtures.
y. Piping, including below grade utility piping.
z. Supports and hangers.
aa. Valves.
bb. Sprinklers.
cc. Mechanical equipment.
dd. Refrigerants.
ee. Electrical conduit.
ff. Copper wiring.
gg. Lighting fixtures.
hh. Lamps.
ii. Ballasts.
jj. Electrical devices.
kk. Switchgear and panelboards.
ll. Transformers.
mm. Exterior light poles

nn. Miscellaneous site amenities, signage, tree grates, fencing, gates, flagpoles, etc.

2. Construction Waste:

a. Masonry and CMU.
b. Concrete reinforcing
c. Concrete
d. Lumber.
e. Wood sheet materials.
f. Metals.
g. Roofing.
h. Insulation.
i. CarpetGypsum board.
j. Piping.
k. Ceiling systems
l. Glazing
m. Tile
n. HVAC ductwork
o. Electrical conduit.
p. Packaging: Regardless of salvage/recycle goal indicated in "General" Paragraph above, salvage or recycle 100 percent of the following uncontaminated packaging materials:

1) Paper.
2) Cardboard.
3) Boxes.
4) Plastic sheet and film.
5) Polystyrene packaging.
6) Wood crates.
7) Plastic pails.

q. .

1.5 ACTION SUBMITTALS

A. Waste Management Plan: Submit plan within 30 days of date established for the Notice to Proceed.

B. Inform construction workers and major sub-contractors of the project's waste recycling goals, process for recycling construction and demolition waste, weight ticket tracking and submittal dates.

C. Discuss CDWR plan at Pre-Bid Meeting, Pre-Construction Meeting and regularly scheduled Construction LEED Coordination Progress Meetings.

1.6 INFORMATIONAL SUBMITTALS

A. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit report. Use Form CWM-7 for construction waste and Form CWM-8 for demolition waste . Include the following information:

1. Material category.

2. Generation point of waste.
3. Total quantity of waste in tons.
4. Quantity of waste salvaged, both estimated and actual in tons.
5. Quantity of waste recycled, both estimated and actual in tons.
6. Total quantity of waste recovered (salvaged plus recycled) in tons.
7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.

B. Waste Reduction Calculations: Before request for Substantial Completion, submit calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.

C. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.

D. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.

E. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

F. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

G. LEED Submittal: Submit documentation to USGBC, signed by Contractor, tabulating total waste material, quantities diverted and means by which it is diverted, and statement that requirements for the credit have been met. Respond to questions and requests from USGBC regarding construction waste management and disposal until the USGBC has made its determination on the project's LEED certification application. Document correspondence with USGBC as informational submittals.

H. Qualification Data: For waste management coordinator and refrigerant recovery technician.

I. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.7 QUALITY ASSURANCE

A. Waste Management Coordinator Qualifications: Experienced firm, with a record of successful waste management coordination of projects with similar requirements.

1. Firm employs a LEED-Accredited Professional, certified by the USGBC, as waste management coordinator.
2. Waste management coordinator may also serve as LEED coordinator.
3. For LEED Waste Management, see Section 018113, “Sustainable Design Requirements”.

B. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.

C. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

D. Waste Management Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to waste management including, but not limited to, the following:

1. Review and discuss waste management plan including responsibilities of waste management coordinator.
2. Review requirements for documenting quantities of each type of waste and its disposition.
3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
5. Review waste management requirements for each trade.

1.8 WASTE MANAGEMENT PLAN

A. General: Develop a waste management plan according to ASTM E 1609 and requirements in this Section. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis. Distinguish between demolition and construction waste. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.

B. Waste Identification: Indicate anticipated types and quantities of demolition site-clearing and construction waste generated by the Work. Use Form CWM-1 for construction waste and Form CWM-2 for demolition waste . Include estimated quantities and assumptions for estimates.

C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Use Form CWM-3 for construction waste and Form CWM-4 for demolition waste . Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.

1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
3. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers. (Ex: Chesapeake Habitat for Humanity)
4. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
5. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
6. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location where materials separation will be performed.

D. Cost/Revenue Analysis: Indicate total cost of waste disposal as if there was no waste management plan and net additional cost or net savings resulting from implementing waste management plan. Use Form CWM-5 for construction waste and Form CWM-6 for demolition waste . Include the following:

1. Total quantity of waste.
2. Estimated cost of disposal (cost per unit). Include hauling and tipping fees and cost of collection containers for each type of waste.
3. Total cost of disposal (with no waste management).
4. Revenue from salvaged materials.
5. Revenue from recycled materials.
6. Savings in hauling and tipping fees by donating materials.
7. Savings in hauling and tipping fees that are avoided.
8. Handling and transportation costs. Include cost of collection containers for each type of waste.
9. Net additional cost or net savings from waste management plan.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.

1. Comply with operation, termination, and removal requirements in Section 015000 "Temporary Facilities and Controls."

B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan. Coordinator shall be present at Project site full time for duration of Project.

C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work.

1. Distribute waste management plan to everyone concerned within three days of submittal return.
2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.

D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
2. Comply with Section 015000 "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

3.2 SALVAGING DEMOLITION WASTE

3.3 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

A. General: Recycle paper and beverage containers used by on-site workers.

B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Contractor .

C. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.

D. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.

1. Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.

    a. Inspect containers and bins for contamination and remove contaminated materials if found.

2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect from the weather.
5. Remove recyclable waste from Owner's property and transport to recycling receiver or processor.

3.4 RECYCLING DEMOLITION WASTE

A. Asphalt Paving: Grind asphalt to maximum 1-1/2-inch (38-mm) size.

1. Crush asphaltic concrete paving and screen to comply with requirements in Section 312000 "Earth Moving" for use as general fill.

B. Asphalt Paving: Break up and transport paving to asphalt-recycling facility.

C. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.

1. Pulverize concrete to maximum 1-1/2-inch (38-mm) size.
2. Crush concrete and screen to comply with requirements in Section 312000 "Earth Moving" for use as satisfactory soil for fill or subbase.

D. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.

1. Pulverize masonry to maximum 3/4-inch (19-mm) size.

    a. Crush masonry and screen to comply with requirements in Section 312000 "Earth Moving" for use as general fill .
    b. Crush masonry and screen to comply with requirements in Section 329300 "Plants" for use as mineral mulch.

2. Clean and stack undamaged, whole masonry units on wood pallets.

E. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, panel products, and treated wood materials.

F. Metals: Separate metals by type.

1. Structural Steel: Stack members according to size, type of member, and length.
2. Remove and dispose of bolts, nuts, washers, and other rough hardware.

G. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.

H. Acoustical Ceiling Panels and Tile: Stack large clean pieces on wood pallets and store in a dry location.

I. Metal Suspension System: Separate metal members including trim, and other metals from acoustical panels and tile and sort with other metals.

J. Carpet: Roll large pieces tightly after removing debris, trash, adhesive, and tack strips.

1. Store clean, dry carpet in a closed container or trailer provided by Carpet Reclamation Agency or carpet recycler.

K. Carpet Tile: Remove debris, trash, and adhesive.

1. Stack tile on pallet and store clean, dry carpet in a closed container or trailer provided by Carpet Reclamation Agency or carpet recycler.

L. Piping and Underground Utilities: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves, sprinklers, and other components by type and size.

M. Conduit: Reduce conduit to straight lengths and store by type and size.

3.5 RECYCLING CONSTRUCTION WASTE

A. Packaging:

1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
2. Polystyrene Packaging: Separate and bag materials.
3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.

4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

B. Wood Materials:

1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.

a. Comply with requirements in Section 329300 "Plants" for use of clean sawdust as organic mulch.

C. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location.

1. Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.

a. Comply with requirements in Section 329300 "Plants" for use of clean ground gypsum board as inorganic soil amendment.

3.6 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

C. Disposal: Remove waste materials from Owner's property and legally dispose of them.

3.7 ATTACHMENTS

A. Form CWM-1 for construction waste identification.

B. Form CWM-2 for demolition waste identification.

C. Form CWM-3 for construction waste reduction work plan.

D. Form CWM-4 for demolition waste reduction work plan.

E. Form CWM-5 cost/revenue analysis of construction waste reduction work plan.

F. Form CWM-6 cost/revenue analysis of demolition waste reduction work plan.

G. Form CWM-7 for construction waste

H. Form CWM-8 for demolition waste.

END OF SECTION 01 74 19

FORM CWM-1: CONSTRUCTION WASTE IDENTIFICATION							
MATERIAL CATEGORY	**GENERATION POINT**	**EST. QUANTITY OF MATERIALS RECEIVED* (A)**	**EST. WASTE - % (B)**	**TOTAL EST. QUANTITY OF WASTE* (C = A x B)**	**EST. VOLUME CY (CM)**	**EST. WEIGHT TONS (TONNES)**	**REMARKS AND ASSUMPTIONS**
Packaging: Cardboard							
Packaging: Boxes							
Packaging: Plastic Sheet or Film							
Packaging: Polystyrene							
Packaging: Pallets or Skids							
Packaging: Crates							
Packaging: Paint Cans							
Packaging: Plastic Pails							
Site-Clearing Waste							
Masonry or CMU							
Lumber: Cut-Offs							
Lumber: Warped Pieces							
Plywood or OSB (scraps)							
Wood Forms							
Wood Waste Chutes							
Wood Trim (cut-offs)							
Metals							
Insulation							
Roofing							
Joint Sealant Tubes							
Gypsum Board (scraps)							
Carpet and Pad (scraps)							
Piping							
Electrical Conduit							
Other:							

* Insert units of measure.

FORM CWM-2: DEMOLITION WASTE IDENTIFICATION				
MATERIAL DESCRIPTION	**EST. QUANTITY**	**EST. VOLUME CY (CM)**	**EST. WEIGHT TONS (TONNES)**	**REMARKS AND ASSUMPTIONS**
Asphaltic Concrete Paving				
Concrete				
Brick				
CMU				
Lumber				
Plywood and OSB				
Wood Paneling				
Wood Trim				
Miscellaneous Metals				
Structural Steel				
Rough Hardware				
Insulation				
Roofing				
Doors and Frames				
Door Hardware				
Windows				
Glazing				
Acoustical Tile				
Carpet				
Carpet Pad				
Demountable Partitions				
Equipment				
Cabinets				
Plumbing Fixtures				
Piping				
Piping Supports and Hangers				
Valves				
Sprinklers				
Mechanical Equipment				
Electrical Conduit				
Copper Wiring				
Light Fixtures				
Lamps				
Lighting Ballasts				
Electrical Devices				
Switchgear and Panelboards				
Transformers				
Other:				

FORM CWM-3: CONSTRUCTION WASTE REDUCTION WORK PLAN

MATERIAL CATEGORY	GENERATION POINT	TOTAL EST. QUANTITY OF WASTE TONS (TONNES)	DISPOSAL METHOD AND QUANTITY			HANDLING AND TRANSPORTION PROCEDURES
			EST. AMOUNT SALVAGED TONS (TONNES)	EST. AMOUNT RECYCLED TONS (TONNES)	EST. AMOUNT DISPOSED TO LANDFILL TONS (TONNES)	
Packaging: Cardboard						
Packaging: Boxes						
Packaging: Plastic Sheet or Film						
Packaging: Polystyrene						
Packaging: Pallets or Skids						
Packaging: Crates						
Packaging: Paint Cans						
Packaging: Plastic Pails						
Site-Clearing Waste						
Masonry or CMU						
Lumber: Cut-Offs						
Lumber: Warped Pieces						
Plywood or OSB (scraps)						
Wood Forms						
Wood Waste Chutes						
Wood Trim (cut-offs)						
Metals						
Insulation						
Roofing						
Joint Sealant Tubes						
Gypsum Board (scraps)						
Carpet and Pad (scraps)						
Piping						
Electrical Conduit						
Other:						

FORM CWM-4: DEMOLITION WASTE REDUCTION WORK PLAN						
MATERIAL CATEGORY	GENERATION POINT	TOTAL EST. QUANTITY OF WASTE TONS (TONNES)	DISPOSAL METHOD AND QUANTITY			HANDLING AND TRANSPORTION PROCEDURES
			EST. AMOUNT SALVAGED TONS (TONNES)	EST. AMOUNT RECYCLED TONS (TONNES)	EST. AMOUNT DISPOSED TO LANDFILL TONS (TONNES)	
Asphaltic Concrete Paving						
Concrete						
Brick						
CMU						
Lumber						
Plywood and OSB						
Wood Paneling						
Wood Trim						
Miscellaneous Metals						
Structural Steel						
Rough Hardware						
Insulation						
Roofing						
Doors and Frames						
Door Hardware						
Windows						
Glazing						
Acoustical Tile						
Carpet						
Carpet Pad						
Demountable Partitions						
Equipment						
Cabinets						
Plumbing Fixtures						
Piping						
Supports and Hangers						
Valves						
Sprinklers						
Mechanical Equipment						
Electrical Conduit						
Copper Wiring						
Light Fixtures						
Lamps						
Lighting Ballasts						
Electrical Devices						
Switchgear and Panelboards						
Transformers						
Other:						

FORM CWM-5: COST/REVENUE ANALYSIS OF CONSTRUCTION WASTE REDUCTION WORK PLAN								
MATERIALS	TOTAL QUANTITY OF MATERIALS (VOL. OR WEIGHT) (A)	EST. COST OF DISPOSAL (B)	TOTAL EST. COST OF DISPOSAL (C = A x B)	REVENUE FROM SALVAGED MATERIALS (D)	REVENUE FROM RECYCLED MATERIALS (E)	LANDFILL TIPPING FEES AVOIDED (F)	HANDLING AND TRANSPORTATION COSTS AVOIDED (G)	NET COST SAVINGS OF WORK PLAN (H = D+E+F+G)
Packaging: Cardboard								
Packaging: Boxes								
Packaging: Plastic Sheet or Film								
Packaging: Polystyrene								
Packaging: Pallets or Skids								
Packaging: Crates								
Packaging: Paint Cans								
Packaging: Plastic Pails								
Site-Clearing Waste								
Masonry or CMU								
Lumber: Cut-Offs								
Lumber: Warped Pieces								
Plywood or OSB (scraps)								
Wood Forms								
Wood Waste Chutes								
Wood Trim (cut-offs)								
Metals								
Insulation								
Roofing								
Joint Sealant Tubes								
Gypsum Board (scraps)								
Carpet and Pad (scraps)								
Piping								
Electrical Conduit								
Other:								

FORM CWM-6: COST/REVENUE ANALYSIS OF DEMOLITION WASTE REDUCTION WORK PLAN

MATERIALS	TOTAL QUANTITY OF MATERIALS (VOL. OR WEIGHT) (A)	EST. COST OF DISPOSAL (B)	TOTAL EST. COST OF DISPOSAL (C = A x B)	REVENUE FROM SALVAGED MATERIALS (D)	REVENUE FROM RECYCLED MATERIALS (E)	LANDFILL TIPPING FEES AVOIDED (F)	HANDLING AND TRANSPORTATION COSTS AVOIDED (G)	NET COST SAVINGS OF WORK PLAN (H = D+E+F+G)
Asphaltic Concrete Paving								
Concrete								
Brick								
CMU								
Lumber								
Plywood and OSB								
Wood Paneling								
Wood Trim								
Miscellaneous Metals								
Structural Steel								
Rough Hardware								
Insulation								
Roofing								
Doors and Frames								
Door Hardware								
Windows								
Glazing								
Acoustical Tile								
Carpet								
Carpet Pad								
Demountable Partitions								
Equipment								
Cabinets								
Plumbing Fixtures								
Piping								
Supports and Hangers								
Valves								
Sprinklers								
Mech. Equipment								
Electrical Conduit								
Copper Wiring								
Light Fixtures								
Lamps								
Lighting Ballasts								
Electrical Devices								
Switchgear and Panelboards								
Transformers								

Other:								

FORM CWM-7: CONSTRUCTION WASTE REDUCTION PROGRESS REPORT

MATERIAL CATEGORY	GENERATION POINT	TOTAL QUANTITY OF WASTE TONS (TONNES) (A)	QUANTITY OF WASTE SALVAGED		QUANTITY OF WASTE RECYCLED		TOTAL QUANTITY OF WASTE RECOVERED TONS (TONNES) (D = B + C)	TOTAL QUANTITY OF WASTE RECOVERED % (D / A x 100)
			ESTIMATED TONS (TONNES)	ACTUAL TONS (TONNES) (B)	ESTIMATED TONS (TONNES)	ACTUAL TONS (TONNES) (C)		
Packaging: Cardboard								
Packaging: Boxes								
Packaging: Plastic Sheet or Film								
Packaging: Polystyrene								
Packaging: Pallets or Skids								
Packaging: Crates								
Packaging: Paint Cans								
Packaging: Plastic Pails								
Site-Clearing Waste								
Masonry or CMU								
Lumber: Cut-Offs								
Lumber: Warped Pieces								
Plywood or OSB (scraps)								
Wood Forms								
Wood Waste Chutes								
Wood Trim (cut-offs)								
Metals								
Insulation								
Roofing								
Joint Sealant Tubes								
Gypsum Board (scraps)								
Carpet and Pad (scraps)								
Piping								
Electrical Conduit								
Other:								

FORM CWM-8: DEMOLITION WASTE REDUCTION PROGRESS REPORT

MATERIAL CATEGORY	GENERATION POINT	TOTAL QUANTITY OF WASTE TONS (TONNES) (A)	QUANTITY OF WASTE SALVAGED		QUANTITY OF WASTE RECYCLED		TOTAL QUANTITY OF WASTE RECOVERED TONS (TONNES) (D = B + C)	TOTAL QUANTITY OF WASTE RECOVERED % (D / A x 100)
			ESTIMATED TONS (TONNES)	ACTUAL TONS (TONNES) (B)	ESTIMATED TONS (TONNES)	ACTUAL TONS (TONNES) (C)		
Asphaltic Concrete Paving								
Concrete								
Brick								
CMU								
Lumber								
Plywood and OSB								
Wood Paneling								
Wood Trim								
Miscellaneous Metals								
Structural Steel								
Rough Hardware								
Insulation								
Roofing								
Doors and Frames								
Door Hardware								
Windows								
Glazing								
Acoustical Tile								
Carpet								
Carpet Pad								
Demountable Partitions								
Equipment								
Cabinets								
Plumbing Fixtures								
Piping								
Supports and Hangers								
Valves								
Sprinklers								
Mechanical Equipment								
Electrical Conduit								
Copper Wiring								
Light Fixtures								
Lamps								
Lighting Ballasts								
Electrical Devices								
Switchgear and Panelboards								
Transformers								

Other:								

SECTION 01 77 00 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Substantial Completion procedures.
2. Final completion procedures.
3. Warranties.
4. Final cleaning.
5. Repair of the Work.

B. Related Requirements:

1. Section 012900 "Payment Procedures" for requirements for Applications for Payment for Substantial and Final Completion.
2. Section 013233 "Photographic Documentation" for submitting final completion construction photographic documentation.
3. Section 017300 "Execution" for progress cleaning of Project site.
4. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.
5. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
6. Section 017900 "Demonstration and Training" for requirements for instructing Owner's personnel.
7. Section 019113 “General Commissioning Requirements” for requirements for commissioning.
8. Divisions 02 through 33 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.3 ACTION SUBMITTALS

A. Product Data: For cleaning agents.

B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.

C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.4 CLOSEOUT SUBMITTALS

A. Certificates of Release: From authorities having jurisdiction.

B. Certificate of Insurance: For continuing coverage.

C. Field Report: For pest control inspection.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

B. Green Cleaning Plan: For maintenance of materials specified in other Sections.

1.6 SUBSTANTIAL COMPLETION PROCEDURES

1.7 PRE-COMMISSIONING CONSTRUCTION COMPLETION PROCEDURES

A. Pre-Commissioning Construction Completion: The completion of all construction work as required in preparation for the full facility Commissioning and LEED survey process.

B. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.

C. Submittals Prior to Pre-Commissioning Construction Completion: Complete the following a minimum of 14 days prior to requesting inspection for determining date of Pre-Commissioning Construction Completion. List items below that are incomplete at time of request.

1. Submit submittals specified in other Division 01 Sections, including operation and maintenance manuals required for Commissioning and LEED Surveys.
2. Submit Pre-Commissioning submittals required in Division 01 Section “General Commissioning Requirements”, and in individual Division 02 through 33 Sections.
3. Submit test/adjust/balance records.
4. Submit LEED submittals required in Division 01 Section “Sustainable Project Requirements” in individual Division 02 through 36 Sections.
5. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
6. Submit Punch-Lists in compliance with requirements of Division 01 Sections.

D. Procedures Prior to Commissioning and LEED Surveys: Complete the following a minimum of 14 days prior to requesting inspection for determining date of Commissioning start. List items below that are incomplete at time of request.

1. Complete Punch-list work
2. Complete startup and testing of systems and equipment.
3. Perform preventive maintenance on equipment used prior to Commissioning.
4. Participate with Commissioning Agent, Owner, Architect/Engineer and Agency Construction Manager in conducting inspections and walkthrough of all systems and equipment to be commissioned.
5. Participate with Commissioning Agent, Owner, Architect/Engineer and Agency Construction Manager in conducting inspections and walkthrough of all systems

and equipment required to be approved by the State Fire Marshall and local emergency responders.

E. Inspection: Submit a written request for inspection to determine Pre-Commissioning Construction Completion a minimum of 14 days prior to date the work will be completed and ready for Commissioning and LEED Surveys. On receipt of request, Commissioning Agent, Architect and Agency Construction Manager will either proceed with inspection or notify Contractor of unfulfilled requirements.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. The Architect/Engineer costs associated with a second Pre-Commissioning Construction Completion Punch-List Work and Inspection Observation, and subsequent observations, shall be deducted from the Contract Sum at the established labor rates of the Architect/Engineer, inclusive all travel and related other direct costs and expenses.

F. Results of Pre-Commissioning Construction Completion will form the basis of requirements for start of Commissioning and LEED Surveys.

1.8 COMMISSIONING

A. Perform Commissioning in accordance with Section 01 91 13 “General Commissioning Requirements” and Division 36 Sections.

B. Submit Schedule of Commissioning activities and estimated date of delivery for Final Commissioning Report.

1.9 SUBSTANTIAL COMPLETION PROCEDURES

A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.

B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect. Label with manufacturer's name and model number where applicable.

a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Architect's signature for receipt of submittals.

5. Submit test/adjust/balance records.
6. Submit sustainable design submittals not previously submitted.
7. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Advise Owner of pending insurance changeover requirements.
2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
3. Complete startup and testing of systems and equipment.
4. Perform preventive maintenance on equipment used prior to Substantial Completion.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 017900 "Demonstration and Training."
6. Advise Owner of changeover in heat and other utilities.
7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
9. Complete final cleaning requirements, including touchup painting.
10. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for final completion.

1.10 FINAL COMPLETION PROCEDURES

A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:

1. Submit a final Application for Payment according to Section 012900 "Payment Procedures."
2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list),

endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.

3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest-control final inspection report.
5. Submit notification of completion of all assigned LEED credit verification documents and the USGBC LEED Online credit scorecard and template forms to the Architect and the Sustainability Consultant.

B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.11 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
3. Include the following information at the top of each page:

    a. Project name.
    b. Date.
    c. Name of Architect.
    d. Name of Contractor.
    e. Page number.

4. Submit list of incomplete items in the following format:

    a. MS Excel electronic file. Architect will return annotated file.

1.12 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.

B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.

C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.

1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (215-by-280-mm) paper.
2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
4. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

D. Provide additional copies of each warranty to include in operation and maintenance manuals.

1.13 REINSPECTION FEES

A. Should status of completion of Work require reinspection by Architect/Engineer due to failure of Work to comply with Contractor's claims on initial, substantial and final completion inspections, Owner will deduct the amount of Architect/Engineer fees and costs for reinspection A/E Services from final payment to Contractor.

1. Contractor shall reimburse Owner for A/E Services at the rate of 2.75 times Direct Personnel Expense (DPE) and Other Direct Costs.

a. Direct Personnel Expense (DPE) is defined as direct salary of Architect and other personnel engaged on Project inclusive of costs of mandatory, and customary contributions and benefits related thereto, including employment taxes and other statutory employee benefits, insurance, sick leave, holidays, vacations, pensions, and similar contributions and benefits.
b. Other Direct Costs (ODCs) is defined as including, but not limited to, travel, meals, telephone, postage, facsimile, overnight delivery, and printing costs.
c. NOTICE: Anticipated cost for a second, and subsequent, Substantial and Final Completion Observation is approximately $35,000 each.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:

a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
d. Remove tools, construction equipment, machinery, and surplus material from Project site.
e. Remove snow and ice to provide safe access to building.
f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
h. Sweep concrete floors broom clean in unoccupied spaces.
i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
k. Remove labels that are not permanent.
l. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
m. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
n. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.

o. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.

1) Clean HVAC system in compliance with NADCA Standard 1992-01. Provide written report on completion of cleaning.

p. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
q. Leave Project clean and ready for occupancy.

C. Pest Control: Comply with pest control requirements in Section 015000 "Temporary Facilities and Controls." Prepare written report.

D. Construction Waste Disposal: Comply with waste disposal requirements in Section 017419 "Construction Waste Management and Disposal."

3.2 REPAIR OF THE WORK

A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.

B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.

1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.

a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.

3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION 01 77 00

SECTION 01 78 23 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

B. Manuals and training documents prepared by the Commissioning Agent to meet the requirements of the LEED NC credit Energy and Atmosphere c3 (EAc3) "Enhanced Commissioning".

1.2 SUMMARY

A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation and maintenance documentation directory.
2. Emergency manuals.
3. Operation manuals for systems, subsystems, and equipment.
4. Product maintenance manuals.
5. Systems and equipment maintenance manuals.

B. Related Requirements:
1. Section 013300 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
2. Section 019113 "General Commissioning Requirements" for verification and compilation of data into operation and maintenance manuals.
3. Divisions 02 through 33 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.3 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 CLOSEOUT SUBMITTALS

A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.

1. Architect and Commissioning Authority will comment on whether content of operations and maintenance submittals are acceptable.
2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

B. Format: Submit operations and maintenance manuals in the following format:

1. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Architect.

   a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
   b. Enable inserted reviewer comments on draft submittals.

2. Three paper copies. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves. Architect will return two copies.

C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect and Commissioning Authority will comment on whether general scope and content of manual are acceptable.

D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect and Commissioning Authority will return copy with comments.

1. Correct or revise each manual to comply with Architect's and Commissioning Authority's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's and Commissioning Authority's comments and prior to commencing demonstration and training.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information. Include a section in the directory for each of the following:

1. List of documents.
2. List of systems.
3. List of equipment.
4. Table of contents.

B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.

C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.

D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a

designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.2 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:

1. Title page.
2. Table of contents.
3. Manual contents.

B. Title Page: Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Name and contact information for Contractor.
6. Name and contact information for Construction Manager.
7. Name and contact information for Architect.
8. Name and contact information for Commissioning Authority.
9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
10. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

E. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.

1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

F. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.
   1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch (215-by-280-mm) paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.

      a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
      b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.

   2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
   3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
   4. Supplementary Text: Prepared on 8-1/2-by-11-inch (215-by-280-mm) white bond paper.
   5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.

      a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
      b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.3 EMERGENCY MANUALS

A. Content: Organize manual into a separate section for each of the following:

   1. Type of emergency.
   2. Emergency instructions.
   3. Emergency procedures.

B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:

   1. Fire.
   2. Flood.
   3. Gas leak.
   4. Water leak.
   5. Power failure.
   6. Water outage.
   7. System, subsystem, or equipment failure.
   8. Chemical release or spill.

C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

D. Emergency Procedures: Include the following, as applicable:

1. Instructions on stopping.
2. Shutdown instructions for each type of emergency.
3. Operating instructions for conditions outside normal operating limits.
4. Required sequences for electric or electronic systems.
5. Special operating instructions and procedures.

2.4 OPERATION MANUALS

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
2. Performance and design criteria if Contractor has delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:

1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.5 PRODUCT MAINTENANCE MANUALS

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

C. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

2.6 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents.

For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:

1. Standard maintenance instructions and bulletins.
2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1. Test and inspection instructions.
2. Troubleshooting guide.
3. Precautions against improper maintenance.
4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
5. Aligning, adjusting, and checking instructions.
6. Demonstration and training video recording, if available.

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.

B. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

D. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

F. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.

1. Do not use original project record documents as part of operation and maintenance manuals.
2. Comply with requirements of newly prepared record Drawings in Section 017839 "Project Record Documents."

G. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 01 78 23

SECTION 01 78 39 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for project record documents, including the following:

1. Record Drawings.
2. Record Specifications.
3. Record Product Data.
4. Miscellaneous record submittals.

B. Related Requirements:

1. Section 017300 "Execution" for final property survey.
2. Section 017700 "Closeout Procedures" for general closeout procedures.
3. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.3 CLOSEOUT SUBMITTALS

A. Owner shall retain the following dollars amounts until the Contractor provides record and LEED project documents:

1. Record Documents: $10,000.50
2. LEED Documents: $15,000.25

B. Record Drawings: Comply with the following:

1. Number of Copies: Submit copies of record Drawings as follows:

a. Initial Submittal:

1) Submit one paper-copy set(s) of marked-up record prints.
2) Submit PDF electronic files of scanned record prints.
3) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.

b. Final Submittal:

1) Submit three paper-copy set(s) of marked-up record prints.
2) Submit PDF electronic files of scanned record.

3) Print each drawing, whether or not changes and additional information were recorded.

C. Record Specifications: Submit one paper copy annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.

D. Record Product Data: Submit one paper copy and annotated PDF electronic files and directories of each submittal.

1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.

E. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit one paper copy and annotated PDF electronic files and directories of each submittal.

F. Reports: Submit written reportindicating items incorporated into project record documents concurrent with progress of the Work, including revisions, concealed conditions, field changes, product selections, and other notations incorporated.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.

1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.

a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
b. Accurately record information in an acceptable drawing technique.
c. Record data as soon as possible after obtaining it.
d. Record and check the markup before enclosing concealed installations.
e. Cross-reference record prints to corresponding archive photographic documentation.

2. Content: Types of items requiring marking include, but are not limited to, the following:

a. Dimensional changes to Drawings.
b. Revisions to details shown on Drawings.
c. Depths of foundations below first floor.
d. Locations and depths of underground utilities.
e. Revisions to routing of piping and conduits.
f. Revisions to electrical circuitry.
g. Actual equipment locations.
h. Duct size and routing.

i. Locations of concealed internal utilities.
j. Changes made by Change Order or Construction Work Change Directive.
k. Changes made following Architect's written orders.
l. Details not on the original Contract Drawings.
m. Field records for variable and concealed conditions.
n. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, prepare a full set of corrected digital data files of the Contract Drawings, as follows:

1. Format: Same digital data software program, version, and operating system as the original Contract Drawings.
2. Format: DWG, Version 2015, Microsoft Windows operating system.
3. Format: Annotated PDF electronic file.
4. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
5. Refer instances of uncertainty to Architect for resolution.
6. Architect will furnish Contractor one set of digital data files of the Contract Drawings for use in recording information.

a. See Section 013300 "Submittal Procedures" for requirements related to use of Architect's digital data files.
b. Architect will provide data file layer information. Record markups in separate layers.

C. Newly Prepared Record Drawings: Prepare new Drawings instead of preparing record Drawings where Architect determines that neither the original Contract Drawings nor Shop Drawings are suitable to show actual installation.

1. New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, or other modification.
2. Consult Architect for proper scale and scope of detailing and notations required to record the actual physical installation and its relation to other construction. Integrate newly prepared record Drawings into record Drawing sets; comply with procedures for formatting, organizing, copying, binding, and submitting.

D. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Format: Annotated PDF electronic file.

3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
4. Identification: As follows:

    a. Project name.
    b. Date.
    c. Designation "PROJECT RECORD DRAWINGS."
    d. Name of Architect.
    e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
4. For each principal product, indicate whether record Product Data has been submitted in operation and maintenance manuals instead of submitted as record Product Data.
5. Note related Change Orders, record Product Data, and record Drawings where applicable.

B. Format: Submit record Specifications as scanned PDF electronic file(s) of marked-up paper copy of Specifications.

2.3 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders, record Specifications, and record Drawings where applicable.

B. Format: Submit record Product Data as annotated PDF electronic file paper copy scanned PDF electronic file(s) of marked-up paper copy of Product Data.

1. Include record Product Data directory organized by Specification Section number and title, electronically linked to each item of record Product Data.

2.4 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

B. Format: Submit miscellaneous record submittals as scanned PDF electronic file(s) of marked-up miscellaneous record submittals.

1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.

B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's reference during normal working hours.

END OF SECTION 01 78 39

SECTION 01 79 00 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:

1. Demonstration of operation of systems, subsystems, and equipment.
2. Training in operation and maintenance of systems, subsystems, and equipment.
3. Demonstration and training video recordings.

B. Related Requirements:

1. Divisions 02 through 33 Sections for specific requirements for demonstration and training for products in those Sections.

1.3 INFORMATIONAL SUBMITTALS

A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.

1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.

B. Qualification Data: For facilitator, instructor, and videographer.

C. Attendance Record: For each training module, submit list of participants and length of instruction time.

D. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

1.4 CLOSEOUT SUBMITTALS

A. Demonstration and Training Video Recordings: Submit two copies within seven days of end of each training module.

1. Identification: On each copy, provide an applied label with the following information:

a. Name of Project.
b. Name and address of videographer.
c. Name of Owner
d. Name of Architect.
e. Name of Contractor.
f. Date of video recording.

2. Transcript: Prepared and bound in format matching operation and maintenance manuals. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as the corresponding video recording. Include name of Project and date of video recording on each page.
3. Electronic Copy of Transcript: Prepared in PDF electronic format. Include a cover sheet with same label information as the corresponding video recording and a table of contents with links to corresponding training components. Include name of Project and date of video recording on each page.
4. At completion of training, submit complete training manual(s) for Owner's use prepared and bound in format matching operation and maintenance manuals in PDF electronic file format on compact disc.

1.5 QUALITY ASSURANCE

A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 014000 "Quality Requirements," experienced in operation and maintenance procedures and training.

C. Videographer Qualifications: A professional videographer who is experienced photographing demonstration and training events similar to those required.

D. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:

1. Inspect and discuss locations and other facilities required for instruction.
2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
3. Review required content of instruction.
4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.6 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:

    a. System, subsystem, and equipment descriptions.
    b. Performance and design criteria if Contractor is delegated design responsibility.
    c. Operating standards.
    d. Regulatory requirements.
    e. Equipment function.
    f. Operating characteristics.
    g. Limiting conditions.
    h. Performance curves.

2. Documentation: Review the following items in detail:

    a. Emergency manuals.
    b. Operations manuals.
    c. Maintenance manuals.
    d. Project record documents.
    e. Identification systems.
    f. Warranties and bonds.
    g. Maintenance service agreements and similar continuing commitments.

3. Emergencies: Include the following, as applicable:

    a. Instructions on meaning of warnings, trouble indications, and error messages.
    b. Instructions on stopping.
    c. Shutdown instructions for each type of emergency.
    d. Operating instructions for conditions outside of normal operating limits.
    e. Sequences for electric or electronic systems.
    f. Special operating instructions and procedures.

4. Operations: Include the following, as applicable:

    a. Startup procedures.
    b. Equipment or system break-in procedures.
    c. Routine and normal operating instructions.
    d. Regulation and control procedures.
    e. Control sequences.
    f. Safety procedures.
    g. Instructions on stopping.
    h. Normal shutdown instructions.
    i. Operating procedures for emergencies.
    j. Operating procedures for system, subsystem, or equipment failure.
    k. Seasonal and weekend operating instructions.
    l. Required sequences for electric or electronic systems.
    m. Special operating instructions and procedures.

5. Adjustments: Include the following:

    a. Alignments.
    b. Checking adjustments.
    c. Noise and vibration adjustments.
    d. Economy and efficiency adjustments.

6. Troubleshooting: Include the following:

    a. Diagnostic instructions.
    b. Test and inspection procedures.

7. Maintenance: Include the following:

    a. Inspection procedures.
    b. Types of cleaning agents to be used and methods of cleaning.
    c. List of cleaning agents and methods of cleaning detrimental to product.
    d. Procedures for routine cleaning
    e. Procedures for preventive maintenance.
    f. Procedures for routine maintenance.
    g. Instruction on use of special tools.

8. Repairs: Include the following:

    a. Diagnosis instructions.
    b. Repair instructions.
    c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
    d. Instructions for identifying parts and components.
    e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 017823 "Operation and Maintenance Data."

B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.

B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
   1. Owner will furnish Contractor with names and positions of participants.

C. Scheduling: Demonstration and Training must occur after Substantial Completion and be completed prior to Final Completion. Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

   1. Submit preliminary schedule for Owner's approval, listing times and dates for demonstration of each item of equipment and each system, forty-five (45) days prior to proposed dates.
   2. Submit three copies of each pre-evaluation and site report and proposed video filmed demonstration seven days prior to filming, to ensure that the planned demonstrations and instructions are complete and accurate for the intended purpose.

D. Provide time and date of each proposed demonstration, hours devoted to demonstration, and a list of persons to be present to Owner.

E. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.

F. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of [**an oral**] [**a written**] [**a demonstration**] performance-based test.

G. Cleanup: Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

3.3 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

A. General: Engage a qualified commercial videographer to record demonstration and training video recordings. Record each training module separately. Include classroom

instructions and demonstrations, board diagrams, and other visual aids, but not student practice.

1. At beginning of each training module, record each chart containing learning objective and lesson outline.

B. Video: Provide minimum 640 x 480 video resolution converted to format file type acceptable to Owner, on electronic media.

1. Electronic Media: Read-only format compact disc acceptable to Owner, with commercial-grade graphic label.
2. File Hierarchy: Organize folder structure and file locations according to project manual table of contents. Provide complete screen-based menu.
3. File Names: Utilize file names based upon name of equipment generally described in video segment, as identified in Project specifications.
4. Contractor and Installer Contact File: Using appropriate software, create a file for inclusion on the Equipment Demonstration and Training DVD that describes the following for each Contractor involved on the Project, arranged according to Project table of contents:

    a. Name of Contractor/Installer.
    b. Business address.
    c. Business phone number.
    d. Point of contact.
    e. E-mail address.

C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to adequately cover area of demonstration and training. Display continuous running time.

1. Film training session(s) in segments not to exceed 15 minutes.

    a. Produce segments to present a single significant piece of equipment per segment.
    b. Organize segments with multiple pieces of equipment to follow order of Project Manual table of contents.
    c. Where a training session on a particular piece of equipment exceeds 15 minutes, stop filming and pause training session. Begin training session again upon commencement of new filming segment.

D. Light Levels: Verify light levels are adequate to properly light equipment. Verify equipment markings are clearly visible prior to recording.

1. Furnish additional portable lighting as required.

E. Narration: Describe scenes on video recording by audio narration by microphone while video recording is recorded. Include description of items being viewed.

F. Transcript: Provide a transcript of the narration. Display images and running time captured from videotape opposite the corresponding narration segment.

G. Preproduced Video Recordings: Provide video recordings used as a component of training modules in same format as recordings of live training.

END OF SECTION 01 79 00

SECTION 01 91 13 - GENERAL COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Commissioning. Commissioning is a systematic process of verifying that all building systems perform interactively according to the design intent and the owner's operational needs. This is achieved by beginning in the design phase and documenting design intent and continuing through construction, acceptance and the warranty period with actual verification of performance. The commissioning process shall encompass and coordinate the traditionally separate functions of system documentation, equipment start-up, control system calibration, testing and balancing, performance testing and training.

Commissioning during the construction phase is intended to achieve the following specific objectives according to the Contract Documents:

1. Verify that applicable equipment and systems are installed according to the manufacturer's recommendations and to industry accepted minimum standards and that they receive adequate operational checkout by installing contractors.
2. Verify and document proper performance of equipment and systems.
3. Verify that O&M documentation left on site is complete.
4. Verify that the Owner's operating personnel are adequately trained.

B. The commissioning process does not take away from or reduce the responsibility of the system designers or installing contractors to provide a finished and fully functioning product.

C. Abbreviations. The following are common abbreviations used in the *Specifications* and in the *Commissioning Plan.* Definitions are found in Section 1.6.

A/E	Architect and Design Engineer	FPT	Functional Performance Test
CA	Commissioning Authority	MC	Mechanical Contractor
CC	Controls Contractor	OE	Owner's Engineer
CT	Contractor	OPM	Owner's Project Manager
Cx	Commissioning	PFC	Pre-functional Checklist
Cx Plan	Commissioning Plan Document	Subs	Subcontractors to General
EC	Electrical Contractor	TAB	Test Adjust & Balance Contractor

1.2 COORDINATION

A. Commissioning Team. The members of the commissioning team consist of the Commissioning Authority (CA), Owner's Project Manager (OPM), Contractor (CT), Owner's Engineer (OE), the architect and design engineers (particularly the mechanical engineer), the Mechanical Contractor (MC), the Electrical Contractor (EC), the TAB representative, the Controls Contractor (CC), any other installing subcontractors or suppliers of equipment. If known, the Owner's building or plant operator/engineer is also a member of the commissioning team.

B. Management. The CA is hired by the Owner directly. The CA directs and coordinates the commissioning activities and reports to the Owner as part of the OPM team. All members work together to fulfill their contracted responsibilities and meet the objectives of the Contract Documents.

C. Scheduling. The CA will work with the CT according to established protocols to schedule the commissioning activities. The CT will provide sufficient notice to the CA for scheduling commissioning activities. The CT will integrate all commissioning activities into the master schedule. All parties will address scheduling problems and make necessary notifications in a timely manner in order to expedite the commissioning process.

The CT will provide the initial schedule of primary commissioning events at the commissioning scoping meeting. The *Commissioning Plan—Construction Phase* provides a format for this schedule. As construction progresses more detailed schedules are developed by the CT. The Commissioning Plan also provides a format for detailed schedules.

A minimum of 5 working days should be provided to schedule the CA for all ductwork leak testing, piping pressure tests, pipe flushing, equipment startups, TAB verifications, PFCs, FPTs, and other commissioning related items.

1.3 COMMISSIONING PROCESS

A. Commissioning Plan. The *Commissioning Plan* is provided by the CA and is binding on the Contractor. The commissioning plan provides guidance in the execution of the commissioning process. Just after the initial commissioning scoping meeting the CA will update the plan which is then considered the “final” plan, though it will continue to evolve and expand as the project progresses. The *Specifications* will take precedence over the *Commissioning Plan*.

B. Commissioning Process. The following narrative provides a brief overview of the typical commissioning tasks during construction and the general order in which they occur.

1. Commissioning during construction begins with a scoping meeting conducted by the CA where the commissioning process is reviewed with the commissioning team members.
2. Additional meetings will be required throughout construction, scheduled by the CA with necessary parties attending, to plan, scope, coordinate, schedule future activities and resolve problems.
3. Equipment documentation is submitted to the CA through formal submittals, including detailed start-up procedures.
4. The CT works with the Subs in developing start-up plans and startup documentation formats, including performing the pre-functional checklists.
5. In general, the checkout and performance verification proceeds from simple to complex; from component level to equipment to systems and intersystem levels with pre-functional checklists being completed before functional testing.
6. The Subs, under their own direction, execute and document the pre-functional checklists and perform start-up and initial checkout. The CA documents that the checklists and start-up were completed according to the approved plans. This may include the CA witnessing start-up of selected equipment.
7. The CA develops specific equipment and system functional performance test procedures. The CT and Subs are to review the procedures and provide comments back to the CA within 5 working days.

8. The procedures are executed by the Subs, under the direction of, and documented by the CA.
9. Items of non-compliance in material, installation or set-up are corrected at the Sub's expense and the system retested.
10. The CA reviews the O&M documentation for completeness.
11. Commissioning is completed before Substantial Completion.
12. The CA reviews, pre-approves and coordinates the training provided by the Subs and verifies that is was completed.
13. Deferred testing is conducted, as specified or required.

1.4 RELATED WORK

A. Specific commissioning requirements are given in the following sections of these specifications. All of the following sections apply to the Work of this section.

Section	Description
23 05 93 Testing Adjusting and Balancing For HVAC	Provides additional requirements for TAB contractor.
23 08 00 Mechanical Systems Commissioning	Provides additional requirements for the mechanical systems including HVAC and plumbing systems.
23 09 00 Automatic Temperature Controls	Provides additional requirements for the controls contractor.
26 08 00 Electrical Systems Commissioning	Provides additional commissioning requirements for electrical systems.
26 51 00 Interior Lighting	Provides additional commissioning requirements for the electrical systems.

1.5 RESPONSIBILITIES

A. The responsibilities of various parties in the commissioning process are provided in this section. The responsibilities of the mechanical contractor, testing, adjusting, and balancing (TAB) contractor, controls contractor, and plumbing contractor are in Division 23 and those of the electrical contractor in Division 26.

B. <u>All Parties</u>

1. Follow the Commissioning Plan.
2. Attend commissioning scoping meeting and commissioning meetings.

C. <u>Owner's Project Manager (OPM)</u>

1. OPM manages the CA contract.
2. Attend the commissioning scoping meeting and selected commissioning team meetings.

Construction and Acceptance Phase

1. Manage the contract of the A/E and of the CT.
2. Arrange for facility operating and maintenance personnel to attend various field commissioning activities and field training sessions according to the *Commissioning Plan—Construction Phase.*

3. Provide final approval for the completion of the commissioning work.

Warranty Period

1. Verify that any seasonal or deferred testing and any deficiency issues are addressed.

D. Architect (of A/E)

Construction and Acceptance Phase

1. Attend the commissioning scoping meeting and selected commissioning team meetings.
2. Perform normal submittal reviews, construction observations, as-built drawing preparation, O&M manual preparation, etc., as contracted.
3. Provide any design narrative for systems, schematic drawings of systems, details, and other information requested by the CA.
4. Coordinate resolution of system deficiencies identified during commissioning, according to the contract documents.
5. Prepare and submit final as-built design intent documentation for inclusion in the O&M manuals. Review and approve the O&M manuals.

Warranty Period

1. Coordinate resolution of design non-conformance and design deficiencies identified during warranty-period commissioning.

E. Mechanical and Electrical Designers/Engineers (of the A/E)

Construction and Acceptance Phase

1. Perform normal submittal review, construction observations, as-built drawing preparation, etc., as contracted. Site observations are to be completed just prior to system startup.
2. Provide any design narrative and sequences documentation requested by the CA. The designers shall assist (along with the contractors) in clarifying the operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.
3. Attend commissioning scoping meetings and other selected commissioning team meetings.
4. Participate in the resolution of system deficiencies identified during commissioning, according to the contract documents.
5. Prepare and submit the final as-built design intent and operating parameters documentation for inclusion in the O&M manuals. Review and approve the O&M manuals.
6. From the Contractor's red-line drawings, edit and update one-line diagrams developed as part of the design narrative documentation and those provided by the vendor as shop drawings for the chilled and hot water, condenser water, domestic hot water, supply, return and exhaust air systems and emergency power system.

Warranty Period

1. Participate in the resolution of non-compliance, non-conformance and design deficiencies identified during commissioning during warranty-period commissioning.

F. Commissioning Authority (CA)

The CA is not responsible for design concept, design criteria, compliance with codes, design or general construction scheduling, cost estimating, or construction management. The CA may assist with problem-solving non-conformance or deficiencies, but ultimately that responsibility resides with the Construction Manager and the A/E. The primary role of the CA is to develop and coordinate the execution of a testing plan, observe and document performance that systems are functioning in accordance with the documented design intent and in accordance with the Contract Documents. The Contractors will provide all tools to start, checkout and functionally test equipment and systems.

Construction and Acceptance Phase

1. Coordinate and direct the commissioning activities in a logical, sequential and efficient manner using consistent protocols and forms, centralized documentation, clear and regular communications and consultations with all necessary parties, frequently updated timelines and schedules and technical expertise.
2. Coordinate the commissioning work and, with the CT, Verifies that commissioning activities are being scheduled into the master schedule.
3. Revise, as necessary, the *Commissioning Plan—Construction Phase.*
4. Plan and conduct the commissioning scoping meeting and other commissioning meetings.
5. Request and review additional information required to perform commissioning tasks, including O&M materials, contractor start-up and checkout procedures.
6. Before start-up, gather and review the current control sequences and interlocks and work with contractors and design engineers until sufficient clarity has been obtained, in writing, to be able to write detailed testing procedures.
7. Review selected approved Contractor submittals applicable to systems being commissioned for compliance with commissioning needs, concurrent with the A/E reviews.
8. Write and distribute pre-functional tests and checklists.
9. Assist in developing an enhanced start-up and initial systems checkout plan with Subs.
10. Perform site visits, as necessary, to observe component and system installations. Attend selected planning and job-site meetings to obtain information on construction progress. Review construction meeting minutes for revisions/substitutions relating to the commissioning process. Assist in resolving any discrepancies.
11. May witness the HVAC piping test and flushing procedures, sufficient to be confident that proper procedures were followed. Document this testing and include the documentation in O&M manuals. Notify owner project manager of any deficiencies in results or procedures.
12. May witness ductwork testing and cleaning procedures, sufficient to be confident that proper procedures were followed. Confirm that the testing is being documented and include the documentation in O&M manuals. Notify owner's project manager of any deficiencies in results or procedures.
13. Approve pre-functional tests and checklist completion by reviewing pre-functional checklist reports and by selected site observation and spot checking.
14. Approve systems startup by reviewing start-up reports and by selected site observation.
15. Review TAB execution plan.
16. Verify air and water systems balancing by spot testing, by reviewing completed reports and by selected site observation.
17. With necessary assistance and review from installing contractors, write the functional performance test procedures for equipment and systems. This may include energy management control system trending, stand-alone data logger monitoring or manual functional testing. Submit to CT for review.
18. Analyze any functional performance trend logs and monitoring data to verify performance.

19. Coordinate, witness, and approve manual functional performance tests performed by installing contractors. Coordinate retesting as necessary until satisfactory performance is achieved.
20. Maintain a master deficiency and resolution log and a separate testing record. Provide the Cx Team with written progress reports and test results with recommended actions.
21. Review equipment warranties to verify that the Owner's responsibilities are clearly defined.
22. Oversee the training of the Owner's operating personnel.
23. Compile and maintain a commissioning record.
24. Review of the O&M manuals.
25. Provide a final commissioning report (as described in this section).

Warranty Period

1. Coordinate and supervise required Functional Performance Testing and deficiency corrections.

F. Contractor (CT)

Construction and Acceptance Phase

1. Facilitate the coordination of the commissioning work by the CA, and, with CA, Verify that commissioning activities are being scheduled into the master schedule.
2. Review the final *Commissioning Plan—Construction Phase*.
3. Attend a commissioning scoping meeting and other commissioning team meetings.
4. Perform the normal review of Contractor submittals.
5. Furnish a copy of all construction documents, addenda, change orders and approved submittals and shop drawings related to commissioned equipment to the CA.
6. Review the functional performance test procedures submitted by the CA, prior to testing.
7. Observe and witness completion of pre-functional checklists, start-up and functional testing of selected equipment.
8. Review commissioning progress and deficiency reports.
9. Coordinate the resolution of non-compliance and design deficiencies identified in all phases of commissioning.
10. Sign-off (final approval) on individual commissioning tests and documentation for startup checklist, PFCs, FPTS, TAB Reports, O & Ms, and Training Plan as being completed, ready and passing. Recommend completion of the commissioning process to the Owner's Project Manager.
11. Coordinate the training of owner personnel.
12. In each purchase order or subcontract written, include requirements for submittal data, O&M data, commissioning tasks and training.
13. Verify that all Subs execute their commissioning responsibilities according to the Contract Documents and schedule.
14. A representative shall attend a commissioning scoping meeting and other necessary meetings scheduled by the CA to facilitate the Cx process.
15. Prepare O&M manuals, according to the Contract Documents, including clarifying and updating the original sequences of operation to as-built conditions.
16. Include the cost of commissioning in the total contract price.

Warranty Period

1. Assist the CA as necessary in the seasonal or deferred testing and deficiency corrections required by the specifications.

2. Verify that Subs execute functional performance testing, witnessed by the CA, according to the specifications.
3. Verify that Subs correct deficiencies and make necessary adjustments to O&M manuals and as-built drawings for applicable issues identified in any seasonal testing.

1.6 DEFINITIONS

Acceptance Phase - phase of construction after start-up and initial checkout when functional performance tests, O&M documentation review and training occurs.

Approval - acceptance that a piece of equipment or system has been properly installed and is functioning in the tested modes according to the Contract Documents.

Architect/Engineer (A/E) - the prime consultant (architect) and sub-consultants who comprise the design team, generally the HVAC mechanical designer/engineer and the electrical designer/engineer.

Basis of Design - The basis of design is the documentation of the primary thought processes and assumptions behind design decisions that were made to meet the design intent. The basis of design describes the systems, components, conditions and methods chosen to meet the intent. Some reiterating of the design intent may be included.

Commissioning Authority (CA) - an independent agent, not otherwise associated with the A/E team members or the Contractor, though he/she may be hired as a subcontractor to them. The CA directs and coordinates the day-to-day commissioning activities. The CA does not take an oversight role like the CT. The CA shall report directly to the OPM.

Commissioning Plan - an overall plan, developed before or after bidding, that provides the structure, schedule and coordination planning for the commissioning process.

Contract Documents - the documents binding on parties involved in the construction of this project (drawings, specifications, change orders, amendments, contracts, *Cx Plan*, etc.).

Contractor (CT) - the Contractor responsible in the day-to-day activities of construction. In general, the CT is hired by the Owner and their responsibilities include the overall management of the project including supervising and on-site managing authority over the project's construction and subcontractors. The Contractor (CT) may also be referred to as the Prime Contractor, General Contractor or Construction Manager (CM).

Control system - the central building energy management control system.

Data logging - monitoring flows, currents, status, pressures, etc. of equipment using stand-alone data loggers separate from the control system.

Deferred Functional Tests – FPT's that are performed later, after substantial completion, due to partial occupancy, equipment, seasonal requirements, design or other site conditions that disallow the test from being performed.

Deficiency - a condition in the installation or function of a component, piece of equipment or system that is not in compliance with the Contract Documents (that is, does not perform properly or is not complying with the design intent).

Owner's Project Requirements (OPR) - a dynamic document that provides the explanation of the ideas, concepts and criteria that are considered to be very important to the owner. It is initially the outcome of the programming and conceptual design phases.

Design Narrative or Design Documentation - sections of either the OPR or Basis of Design.

Factory Testing - testing of equipment on-site or at the factory by factory personnel with an Owner's representative present.

Functional Performance Test (FPT) - test of the dynamic function and operation of equipment and systems using manual (direct observation) or monitoring methods. Functional testing is the dynamic testing of systems (rather than just components) under full operation (e.g., the chiller pump is tested interactively with the chiller functions to see if the pump ramps up and down to maintain the differential pressure set point). Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc. The systems are run through all the control system's sequences of operation and components are verified to be responding as the sequences state. Traditional air or water test and balancing (TAB) is not functional testing, in the commissioning sense of the word. TAB's primary work is setting up the system flows and pressures as specified, while functional testing is verifying that which has already been set up. The commissioning authority develops the functional test procedures in a sequential written form, coordinates, oversees and documents the actual testing, which is usually performed by the installing contractor or vendor. FPTs are performed after pre-functional checklists and startup is complete.

Indirect Indicators - indicators of a response or condition, such as a reading from a control system screen reporting a damper to be 100% closed.

Manual Test - using hand-held instruments, immediate control system readouts or direct observation to verify performance (contrasted to analyzing monitored data taken over time to make the "observation").

Monitoring - the recording of parameters (flow, current, status, pressure, etc.) of equipment operation using data loggers or the trending capabilities of control systems.

Non-Compliance - see Deficiency.

Non-Conformance - see Deficiency.

Over-written Value - writing over a sensor value in the control system to see the response of a system (e.g., changing the outside air temperature value from 50F to 75F to verify economizer operation). See also "Simulated Signal."

Owner-Contracted Tests - tests paid for by the Owner outside the CT's contract and for which the CA does not oversee. These tests will not be repeated during functional tests if properly documented.

Owner's Project Manager (OPM) - the contracting and managing authority for the owner over the design and/or construction of the project, a staff position.

Phased Commissioning - commissioning that is completed in phases (by floors, for example) due to the size of the structure or other scheduling issues, in order minimize the total construction time.

Pre-functional Checklist (PFC) - a list of items to inspect, and elementary component tests to conduct, to verify proper installation of equipment, provided by the CA to the Sub. Pre-functional checklists are primarily static inspections and procedures to prepare the equipment or system for initial operation (e.g., belt tension, oil levels OK, labels affixed, gages in place, sensors calibrated, etc.). However, some pre-functional checklist items entail simple testing of the function of a component, a piece of equipment or system (such as measuring the voltage imbalance on a three phase pump motor of a chiller system). The word pre-functional refers to before functional testing. Pre-functional checklists augment and are combined with the manufacturer's start-up checklist. Even without a commissioning process, contractors typically perform some, if not many, of the pre-functional checklist items a commissioning authority will recommend. However, few contractors document in writing the execution of these checklist items. Therefore, for most

equipment, the contractors execute the checklists on their own. The commissioning authority only requires that the procedures be documented in writing, and does not witness much of the pre-functional check listing, except for larger or more critical pieces of equipment.

Sampling - functionally testing only a fraction of the total number of identical or near identical pieces of equipment. Refer to Section 019113, Part 3.6. F.8 for details.

Seasonal Performance Tests - SFT's that are deferred until the system(s) will experience conditions closer to their design conditions.

Simulated Condition - condition that is created for the purpose of testing the response of a system (e.g., applying a hair blower to a space sensor to see the response in a VAV box).

Simulated Signal - disconnecting a sensor and using a signal generator to send an amperage, resistance or pressure to the transducer and DDC system to simulate a sensor value.

Specifications - the construction specifications of the Contract Documents.

Start-up - the initial starting or activating of dynamic equipment, including executing pre-functional checklists.

Subs - the subcontractors to the CT who provide and install building components and systems.

Test Procedures - the step-by-step process which must be executed to fulfill the test requirements. The test procedures are developed by the CA.

Test Requirements - requirements specifying what modes and functions, etc. shall be tested. The test requirements are not the detailed test procedures.

Trending - monitoring using the building control system.

Vendor - supplier of equipment.

Warranty Period - warranty period for entire project, including equipment components. Warranty begins at Substantial Completion and extends for at least one year, unless specifically noted otherwise in the Contract Documents and accepted submittals.

1.7 SYSTEMS TO BE COMMISSIONED

A. The systems to be commissioned in the project include but are not limited to:
   1. Mechanical systems – HVAC equipment
   2. Building automation systems – HVAC control systems
   3. Domestic hot water systems
   4. Lighting and day lighting controls
   5. Electrical distribution – Supporting equipment to be commissioned

B. TAB Verification Sampling Rate- Minimum sampling rates are as follows:
   1. Primary Equipment FPTs (AHUs, RTUs, MAUs, DOAS, Pumps, Chillers, Boilers, Heat Exchangers, etc.-) 25% with a minimum of 2 of each type and/or configuration.
   2. Secondary Equipment (EF/SF Fans, FCUs, VRFs, UHs, terminal equipment, terminal units, split systems, UHs, HPs, etc.)- 10% with a minimum of 3 of each type and/or configuration.

C. FPT Minimum Sampling Rates are as follows:
   1. Primary Equipment (AHUs, RTUs, MAUs, DOAS, Pumps, Chillers, Boilers, Heat Exchangers, etc.-) 50% with a minimum of 2 of each type and/or configuration.

2. FPTs- Secondary Equipment (EF/SF Fans, FCUs, VRFs, UHs, terminal equipment, terminal units, split systems, UHs, HPs, etc.)- 20% with a minimum of 3 of each type and/or configuration.

3. FPTS- Lighting systems and controls- 20% with a minimum of 5 of each type and/or configuration.

4. FPTs- Domestic Water System- 50% sampling with a minimum of 2 of each type and/or configuration.

D. PFC Sampling Rate- 100% to be performed by Contractor

1.8 SUBSTANTIAL COMPLETION

A. The commissioning related activities are to have the following minimum completion levels prior to Substantial Completion being issued:

BCDC Youth Detention Center Requirements for Substantial Completion		
Activity	**Description**	**Status- Minimum Completion Requirements**
Testing, Adjusting and Balancing		
Final TAB Report	Approved by Engineer, CA and Owner	100%
Commissioning		
Equipment Start-Up	Complete and Approved	100%
TAB Validation	Validation Check- Approved	100%
PFTs	Complete and Approved	100%
FPTs	1st Pass Attempt	100%
FPTs	Complete and Approved	75%
Cx Issues Log	Deficiency Resolution	75%
Training		
Training Plan	Submitted and Approved	100%
Training Sessions	Completed with Owner in Attendance	80%
Operation and Maintenance Manuals		
Draft Copy	Submitted and Approved	100%
Final Copy	Status copy forward to Owner	100%

1.9 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable LEED Credits
1. EAp1 – Fundamental Building Requirements
2. EAc3 – Enhanced Commissioning

B. LEED Requirements
1. Commissioning Plan, schedule, testing, and reporting to follow the current LEED reference Guide instructions, and coordinate Commissioning Activities with the CT and Owner.

2. EAc3 commissioning activities to include the following additional activities:
i. A minimum of one Cx Design Review during CDs
ii. CxA reviews contractor submittals
iii. CxA develops systems manual
iv. CxA verifies training completed
v. CxA reviews the project approximately 10 months after substantial completion of the project or as designated by the owner for a post occupancy meeting and walk through.

3. The Commissioning Agent will assist the LEED Consultant in submitting the credit documentation, final reports and other materials to complete the LEED Online template forms and credit verification for credits EAp1 and EAc3. The Commissioning Agent will assist the LEED Consultant in responding to the US Green Building Councils reviewer's comments for final acceptance of these credits.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. All testing equipment, materials, and labor required to perform startup and initial checkout, PFCs, FPTs, TAB Verification and all other related functional performance testing shall be provided by the Division Contractor for the equipment being tested. For example, the Mechanical Contractor of Division 23 shall ultimately be responsible for all testing equipment for the HVAC system and controls system in Division 23. Two-way radios shall be provided by the Division Contractor.

B. Special equipment, tools and instruments (only available from vendor, specific to a piece of equipment) required for testing equipment, according to these Contract Documents shall be included in the base bid price of the Contractor and left on site.

C. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the Specifications. If not otherwise noted, the following minimum requirements apply: Temperature sensors and digital thermometers shall have a certified calibration within the past year to an accuracy of 0.5°F and a resolution of + or - 0.1°F. Pressure sensors shall have an accuracy of + or - 1.0% of the value range being measured (not full range of meter), have 1 psi increment scale and have been calibrated within the last year. All equipment shall be calibrated according to the manufacturer's recommended intervals and when dropped or damaged. Calibration tags shall be affixed or certificates readily available.

PART 3 - EXECUTION

3.1 MEETINGS

A. Scoping Meeting. Within 60 days of commencement of construction, the CA will schedule, plan and conduct a commissioning scoping meeting with the entire commissioning team in attendance. Meeting minutes will be distributed to all parties by the CA. Information gathered from this meeting will allow the CA to revise the *Commissioning Plan* to its construction phase version, which will also be distributed to all parties.

B. Miscellaneous Meetings. Other meetings will be planned and conducted by the CA as construction progresses. These meetings will cover coordination, deficiency resolution and planning issues with particular subs. The CA will plan these meetings and will minimize unnecessary time being spent by Subs. The meetings may be held monthly, until the final months of construction when the frequency may be increased to accommodate the project schedule.

3.2 REPORTING

A. The CA will provide commissioning site observation reports with commissioning issues logs of non-conformance items, to the OPM and copy the CT, with increasing frequency as construction and commissioning progresses.

B. The CA will regularly communicate with all members of the commissioning team, keeping them apprised of commissioning progress and scheduling changes through memos, progress reports, etc.

C. Testing or review approvals and non-conformance and deficiency reports are made regularly with the review and testing as described in later sections.

D. The CA will be utilizing a web based information system to document and distribute the commissioning documentation including, but not limited to, Meeting Reports, Site Observation Reports, PFCs, FPTs, Issues Logs, scheduling commissioning activities, etc. The Owner, CT and Subs are required to utilize, receive information, distribute information, fill in testing reports, respond to issues and interact using the web base system on a daily basis from the project site. All team members are to provide their own laptop/computer with internet access for utilization of the web based system.

3.3 SUBMITTALS

A. At minimum, the Submittal Documentation will include the manufacturer and model number, the manufacturer's printed installation and detailed start-up procedures, full sequences of operation, O&M data, performance data, any performance test procedures, control drawings and details of owner contracted tests. In addition, the installation and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the Commissioning authority. All documentation requested by the CA will be included by the Subs in their O&M manual contributions.

B. The CA will review select submittals related to the commissioned equipment for conformance to the Contract Documents as it relates to the commissioning process, to the functional performance of the equipment, and adequacy for developing test procedures. This review is intended primarily to aid in the development of functional testing procedures and only secondarily to verify compliance with equipment specifications. The CA will notify the CT, OPM or A/E as requested, of items missing or areas that are not in conformance with Contract Documents and which require resubmission.

C. The CA may request additional design narratives, drawings, schematic, details or information from the A/E and Controls Contractor, depending on the completeness of the OPR documentation and sequences provided with the Specifications.

D. These submittals to the CA do not constitute compliance for O&M manual documentation. The O&M manuals are the responsibility of the Contractor, though the CA will review them.

3.4 PRE-FUNCTIONAL CHECKLISTS, START-UP AND INITIAL CHECKOUT

A. The following procedures apply to all equipment to be commissioned, according to Section 1.7, Systems to be Commissioned.

B. General. Pre-functional checklists are important to verify that the equipment and systems are installed and operational. It verifies that functional performance testing (in-depth system checkout) may proceed without unnecessary delays. Each piece of equipment receives full pre-functional checkout. No sampling strategies are used. The pre-functional testing for a given system must be successfully completed prior to formal functional performance testing of equipment or subsystems of the given system.

C. Start-up and Initial Checkout Plan. The primary role of the CA in this process is to verify that there is written documentation that each of the manufacturer-recommended procedures have been completed. Parties responsible for pre-functional checklists and startup are identified in the commissioning scoping meeting and in the checklist forms.

1. The CA drafts the prefunctional checklists to indicate required procedures to be executed as part of startup and initial checkout of the systems and the party responsible for their execution. Sample checklist for mechanical and electrical systems have been provided in Sections 230800 and 260800
2. These checklists and tests are provided by the CA to the Contractor. The Contractor determines which trade is responsible for executing and documenting each of the line item tasks and notes that trade on the form.
3. The subcontractor responsible for the purchase of the equipment develops the full start-up plan by combining (or adding to) the CA's checklists with the manufacturer's detailed start-up and checkout procedures from the O&M manual and the normally used field checkout sheets. The plan will include checklists and procedures with specific boxes or lines for recording and documenting the checking and inspections of each procedure and a summary statement with a signature block at the end of the plan.
4. The subcontractor submits the full start-up plan to the CA for review.
5. The CA reviews the procedures and the format for documenting them, noting any procedures that need to be added.
6. The full start-up procedures, PFCs and the approval form will be provided to the CT for review and approval.

D. Sensors, Valves, Dampers, Actuators and Device Calibration. All sensors (i.e., temperature, relative humidity, CO, CO_2, pressure, water, etc.), gauges, thermometers, airflow measuring stations, flow meters, and actuators, dampers, valves, controllers, level indicators, alarms, and devices shall be calibrated using the methods described below. Alternate methods may be used, if approved by the Owner before-hand. All test instruments shall have had a certified calibration within the last 12 months.

All procedures used shall be fully documented on the pre-functional checklists or other suitable forms, clearly referencing the procedures followed and written documentation of initial, intermediate and final results.

E. Sensor Calibration Methods

1. All Sensors - Verify that all sensor locations are appropriate and away from causes of erratic operation. Verify that sensors with shielded cable are grounded only at one end.
2. Sensors Without Transmitter - Standard Application. Make a reading with a calibrated test instrument within 6 inches of the site sensor. Verify that the sensor reading (via the permanent thermostat, gauge, or building automation system (BAS)) is within the tolerances in the table below of the instrument-measured value. If not, install offset in BAS, calibrate, or replace sensor.
3. Sensors With Transmitters - Standard Application. Disconnect sensor. Connect a signal generator in place of sensor. Connect ammeter in series between transmitter and BAS control panel. Using manufacturer's resistance-temperature data simulate minimum desired temperature. Adjust transmitter potentiometer zero until 4 mA is read by the ammeter. Repeat for the maximum temperature matching 20 mA to the potentiometer span or maximum and verify at the BAS. Record all values and recalibrate controller as necessary to conform with specified control ramps, reset schedules, proportional relationship, reset relationship and P/I reaction. Reconnect sensor. Make a reading with a calibrated test instrument within 6 inches of the site sensor. Verify that the sensor reading (via the permanent thermostat, gauge, or building automation system (BAS)) is within the tolerances in the table below of the instrument-measured value. If not, replace sensor and repeat. For pressure sensors, perform a similar process with a suitable signal generator.

4. Tolerances, Standard Applications - Tolerances for all sensors shall be as specified in section 230900 HVAC Instruments and Controls. If not listed or specified, the tolerance shall be +/- 1% of the readings in the operating range.

F. Valve and Damper Stroke Set-up and Check

1. EMS Readout. For all valve and damper actuator positions checked, verify the actual position against the BAS readout.

   Set pumps or fans to normal operating mode. Command valve or damper closed, visually verify that valve or damper is closed and adjust output zero signal as required. Command valve or damper open, verify position is full open and adjust output signal as required. Verify fail-safe operation. Command valve or damper to a few intermediate positions. If actual valve or damper position doesn't reasonably correspond, replace actuator or add pilot positioner (for pneumatics).
2. Closure for heating coil valves (NO): Set heating set point 20°F above room temperature. Observe valve open. Remove control air or power from the valve and verify that the valve stem and actuator position do not change. Restore to normal. Set heating set point to 20°F below room temperature. Observe the valve close. For pneumatics, by override in the EMS, increase pressure to valve by 3 psi (do not exceed actuator pressure rating) and verify valve stem and actuator position does not change. Verify fail-safe operation. Restore to normal.
3. Closure for cooling coil valves (NC): Set cooling set point 20°F above room temperature. Observe the valve close. Remove control air or power from the valve and verify that the valve stem and actuator position do not change. Restore to normal. Set cooling set point to 20°F below room temperature. Observe valve

open. For pneumatics, by override in the EMS, increase pressure to valve by 3 psi (do not exceed actuator pressure rating) and verify valve stem and actuator position does not change. Verify fail-safe operation. Restore to normal.

G. Execution of Pre-functional Checklists and Start-up.

1. Four weeks prior to startup, the Subs and vendors schedule start-up and check-out with the CT, and CA. The performance of the pre-functional checklists, startup and checkout are directed and executed by the Sub or vendor. When checking off pre-functional checklists, signatures may be required of other Subs for verification of completion of their work.
2. The CA shall observe, at minimum, the procedures for each piece of primary equipment, unless there are multiple units, (in which case a sampling strategy may be used).
3. For lower-level components of equipment, (e.g., VAV boxes, sensors, controllers), the CA shall observe a sampling of the pre-functional and start-up procedures. The sampling procedures are identified in the commissioning plan.
4. The Subs and vendors shall execute startup and provide the CA with a signed and dated copy of the completed start-up and pre-functional tests and checklists.
5. Only individuals that have direct knowledge and witnessed that a line item task on the pre-functional checklist was actually performed shall initial or check that item off. It is not acceptable for non-witnessing personnel to fill out these forms.

H. Deficiencies, Non-Conformance and Approval in Checklists and Start-up.

1. The Subs shall clearly list any outstanding items of the initial start-up and pre-functional procedures that were not completed successfully, at the bottom of the procedures form or on an attached sheet. **The procedures form and any outstanding deficiencies are provided to the CA within two days of test completion.**
2. The CA reviews the report and submits either a non-compliance report or an approval form to the CT and Sub. The CA shall work with the CT, Subs and vendors to correct and retest deficiencies or uncompleted items. The CA will involve the CT and others as necessary. The installing Subs or vendors shall correct all areas that are deficient or incomplete in the checklists and tests in a timely manner, and shall notify the CA as soon as outstanding items have been corrected and resubmit an updated start-up report and a Statement of Correction on the original non-compliance report. When satisfactorily completed, the CT recommends approval of the execution of the checklists and startup of each system to the CA using a standard form provided by the CA.
3. Items left incomplete, which later cause deficiencies or delays during functional testing may result in back charges to the responsible party. Refer to Part 3.7 herein for details.

3.5 PHASED COMMISSIONING

A. The project may require start-up and initial checkout to be executed in phases. This phasing will be planned and scheduled in a coordination meeting of the OPM, CT, CA, MC, TAB, CC, and EC. Results will be added to the master and commissioning schedule.

3.6 FUNCTIONAL PERFORMANCE TESTING

A. This sub-section applies to all commissioning functional testing for all divisions.

B. The general list of equipment and systems to be commissioned is found in Section 019113, Part 1.7. Samples of the equipment and modes to be tested are found in Sections 230800 and 260800.

C. The CA will direct the completion of the FPTs with the parties responsible for the installation of each system to be commissioned.

D. Objectives and Scope. The objective of functional performance testing is to demonstrate that each system is operating according to the documented Owner's Project Requirements and Contract Documents. Functional testing facilitates bringing the systems from a state of substantial completion to full dynamic operation. Additionally, during the testing process, areas of deficient performance are identified and corrected, improving the operation and functioning of the systems.

In general, each system should be operated through all modes of operation (seasonal, occupied, unoccupied, warm-up, cool-down, part- and full-load) where there is a specified system response. Verifying each sequence in the sequences of operation is required. Proper responses to such modes and conditions as power failure, freeze condition, low oil pressure, no flow, equipment failure, etc. shall also be tested. Specific modes required in this project are given in the sequence of operations noted on the drawings and other equipment specification sections where test requirements are found.

Prior to starting the FPTs, the PFCs need to be fully completed and approved, the TAB Report needs to be completed and approved by the engineer and owner, the TAB validation needs to be completed and approved, the deficient commissioning items corrected and the BAS/control system trends are to be provided. The controls systems trends to be provided should indicating a minimum of 14 consecutive days of trends indicating the HVAC systems are properly operational without any deficiencies, alarms or issues. The points to be trended will be provided by the CA and shall represent the proper operation of all of the systems.

E. Development of Test Procedures. Before test procedures are written, the CA shall obtain all requested documentation and a current list of change orders affecting equipment or systems, including an updated points list, program code, control sequences and parameters. The CA shall develop specific test procedures and forms to verify and document proper operation of each piece of equipment and system. Each installing contractor or vendor responsible to execute a test shall provide assistance to the CA in developing the procedures review (answering questions about equipment, operation, sequences, etc.). Prior to execution, the CA shall provide a copy of the test procedures to the installing contractors and vendors, who shall review the tests for feasibility, safety, equipment, and warranty protection. The CA may submit the tests to the A/E for review, if requested.

The purpose of any given specific test is to verify and document compliance with the stated criteria of acceptance given on the test form.

Representative test formats and examples (not designed or detailed for this facility) are found in the Sections 230800 and 260800. The test procedure forms developed by the CA shall include (but not be limited to) the following information:

1. System and equipment or component name(s)
2. Equipment location and ID number
3. Unique test ID number, and reference to unique pre-functional checklist and start-up documentation ID numbers for the piece of equipment.
4. Date

5. Project name
6. Participating parties
7. A copy of the specification section describing the test requirements
8. A copy of the specific sequence of operations or other specified parameters being verified
9. Formulas used in any calculations
10. Required pre-test field measurements
11. Instructions for setting up the test.
12. Special cautions, alarm limits, etc.
13. Specific step-by-step procedures to execute the test, in a clear, sequential and repeatable format.
14. Acceptance criteria of proper performance with a Yes/No check box to allow for clearly marking whether or not proper performance of each part of the test was achieved.
15. A section for comments
16. Signatures and date block for the CA, CT, HVAC Contractor, Electrical Contractor, TAB Contractor, and Controls Contractor
17. List all prerequisite that need to be completed prior to the start of the FPTs (i.e., TB Report Approved, TAB validation complete, PFCs complete and approved, etc.)

F. Test Methods.

1. Functional performance testing and verification may be achieved by manual testing (persons manipulate the equipment and observe performance) or by monitoring the performance and analyzing the results using the control system's trend log capabilities or by stand-alone data loggers. The CA may substitute specified methods or require an additional method to be executed, other than what was specified, with the approval of the OPM. The CA will determine which method is most appropriate for tests that do not have a method specified.
2. Simulated Conditions. Simulating conditions (not by an overwritten value) shall be allowed, though timing the testing to experience actual conditions is encouraged wherever practical.
3. Overwritten Values. Overwriting sensor values to simulate a condition, such as overwriting the outside air temperature reading in a control system to be something other than it really is, shall be allowed, but shall be used with caution and avoided when possible. Such testing methods often can only test a part of a system, as the interactions and responses of other systems will be erroneous or not applicable. Simulating a condition is preferable. e.g., for the above case, by heating the outside air sensor with a hair blower rather than overwriting the value or by altering the appropriate set point to see the desired response. Before simulating conditions or overwriting values, sensors, transducers and devices shall have been calibrated.
4. Simulated Signals. Using a signal generator which creates a simulated signal to test and calibrate transducers and DDC constants is generally recommended over using the sensor to act as the signal generator via simulated conditions or overwritten values.
5. Altering Set points. Rather than overwriting sensor values, and when simulating conditions is difficult, altering set points to test a sequence is acceptable. For example, to see the AC compressor lockout work at an outside air temperature below 55°F, when the outside air temperature is above 55°F, temporarily change the lockout set point to be 2°F above the current outside air temperature.
6. Indirect Indicators. Relying on indirect indicators for responses or performance shall be allowed only after visually and directly verifying and documenting, over the range of the tested parameters, that the indirect readings through the control

system represent actual conditions and responses. Much of this verification is completed during pre-functional testing.

7. Set-up. Each function and test shall be performed under conditions that simulate actual conditions as close as is practically possible. The Sub executing the test shall provide all necessary materials, system modifications, etc. to produce the necessary flows, pressures, temperatures, etc. necessary to execute the test according to the specified conditions. At completion of the test, the Sub shall return all affected building equipment and systems, due to these temporary modifications, to their pre-test condition.
8. Sampling. Multiple identical pieces of non-life-safety or otherwise non-critical equipment may be functionally tested using a sampling strategy. Significant application differences and significant sequence of operation differences in otherwise identical equipment invalidates their common identity. A small size or capacity difference, alone, does not constitute a difference. It is noted that no sampling by Subs is allowed in pre-functional checklist execution.

   A common sampling strategy referenced in the *Specifications* as the "xx% Sampling—yy% Failure Rule" is defined by the following example.

   xx = the percent of the group of identical equipment to be included in each sample.
   yy = the percent of the sample that if failing, will require another sample to be tested.

   The example below describes a 20% Sampling—10% Failure Rule.

   a. Randomly test at least 20% (xx) of each group of identical equipment. In no case test less than three units in each group. This 20%, or three, constitute the "first sample."
   b. If 10% (yy) of the units in the first sample fail the functional performance tests, test another 20% of the group (the second sample).
   c. If 10% of the units in the second sample fail, test all remaining units in the whole group.
   d. If at any point, frequent failures are occurring and testing is becoming more troubleshooting than verification, the CA may stop the testing and require the responsible Sub to perform and document a checkout of the remaining units, prior to continuing with functionally testing the remaining units.

G. Coordination and Scheduling. The Subs shall provide two (2) week notice to the CT and the CA regarding their completion schedule for the pre-functional checklists and startup of all equipment and systems. The CA will schedule functional tests through the CT. The CA shall direct, witness and document the functional testing of all equipment and systems. The Subs shall execute the tests.

   In general, functional testing is conducted after pre-functional testing and startup has been satisfactorily completed. The control system shall be sufficiently tested and approved by the CT before it is used for TAB or to verify performance of other components or systems. The air balancing and water balancing is completed and debugged before functional testing of air-related or water-related equipment or systems. Testing proceeds from components to subsystems to systems. When the proper performance of all interacting individual systems has been achieved, the interface or coordinated responses between systems is checked.

H. Testing Costs. All testing equipment, labor, management, tools, devices, materials, temporary and permeant utilities, equipment, support or similar to successfully complete the PFCs and FPTs shall be provided by the CT and Subs at no additional cost.

I. Problem Solving. The CA will recommend solutions to problems found, however the burden of responsibility to solve, correct, and retest problems is with the CT, Subs, and A/E.

3.7 DOCUMENTATION, NON-CONFORMANCE AND APPROVAL OF TESTS

A. Documentation. The CA shall witness and document the results of all functional performance tests using the specific procedural forms developed for that purpose. Prior to testing, these forms are provided to the CT and to the Subs for review. The CA will include the filled out forms in the O&M manuals.

B. Non-Conformance.

1. The CA will record the results of the functional test on the procedure or test form. All deficiencies or non-conformance issues shall be noted and reported to the CT on the Commissioning Issues Log.
2. Corrections of minor deficiencies identified may be made during the tests at the discretion of the CA. In such cases the deficiency and resolution will be documented on the procedure form and shall not impact the progress of the testing.
3. Every effort will be made to expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the procedures. However, the CA will not be pressured into overlooking deficient work or loosening acceptance criteria to satisfy scheduling or cost issues, unless there is an overriding reason to do so at the request of the OPM.
4. As tests progress and a deficiency is identified, the CA discusses the issue with the CT and the executing contractor.
    a. When there is no dispute on the deficiency and the Sub accepts responsibility to correct it:
        1. The CA documents the deficiency and the Sub's response and intentions and they go on to another test or sequence. After the day's work, the CA reports the deficiency on the Commissioning Issues Log to the CT. A copy is forwarded to the CT and Sub. The Sub corrects the deficiency, signs a statement of correction certifying that the equipment is ready to be retested and sends it back to the CA.
        2. The CA reschedules the test and the test is repeated.

    b. If there is a dispute about a deficiency, regarding whether it is a deficiency or who is responsible:
        1. The deficiency shall be documented on Commissioning Issues Log with the Sub's response and a copy given to the CT and to the Sub representative assumed to be responsible.
        2. Resolutions are made at the lowest management level possible. Other parties are brought into the discussions as needed. Final interpretive authority is with the CA. Final acceptance authority is with the Owner's Project Manager.
        3. The CA documents the resolution process.
        4. Once the interpretation and resolution have been decided, the appropriate party corrects the deficiency, signs the statement of correction on the non-compliance form and provides it to the CA. The CA reschedules the test and the test is repeated until satisfactory performance is achieved.

5. The Contractor shall respond in writing to the CA and OPM at least as often as commissioning meetings are being scheduled concerning the status of each ap-

parent outstanding discrepancy identified during commissioning. Discussion shall cover explanations of any disagreements and proposals for their resolution.

6. If any commissioning test or activity has more than two failed attempts (i.e., original test and 1 retest, etc.), the CA will be entitled to be reimbursed for the time and costs of any additional testing, coordination and/or efforts beyond the second failed attempt. The CA will be paid directly by the Owner and the Owner will back charge the CT or General Contractor for the costs.

C. Failure Due to Manufacturer Defect. If 10%, or three, whichever is greater, of identical pieces (size alone does not constitute a difference) of equipment fail to perform to the Contract Documents (mechanically or substantively) due to manufacturing defect, not allowing it to meet its submitted performance spec, all identical units may be considered unacceptable by the OPM. In such case, the Contractor shall provide the Owner with the following:

1. Within one week of notification from the OPM, the Contractor or manufacturer's representative shall examine all other identical units making a record of the findings. The findings shall be provided to the OPM within two weeks of the original notice.
2. Within two weeks of the original notification, the Contractor or manufacturer shall provide a signed and dated, written explanation of the problem, cause of failures, etc. and all proposed solutions which shall include full equipment submittals. The proposed solutions shall not significantly exceed the specification requirements of the original installation.
3. The OPM will determine whether a replacement of all identical units or a repair is acceptable.
4. Two examples of the proposed solution will be installed by the Contractor and the OPM will be allowed to test the installations for up to one week, upon which the OPM will decide whether to accept the solution.
5. Upon acceptance, the Contractor and/or manufacturer shall replace or repair all identical items, at their expense and extend the warranty accordingly, if the original equipment warranty had begun. The replacement/repair work shall proceed with reasonable speed beginning within one week from when parts can be obtained.

D. Approval. The CA notes each satisfactorily demonstrated function on the test form. Formal approval of the functional test is made later after review by the OPM and CA. The CA recommends acceptance of each test to the OPM using a standard form. The OPM gives final approval on each test using the same form, providing a signed copy to the CA and the Contractor.

3.8 OPERATION AND MAINTENANCE MANUALS

A. Standard O&M Manuals.

1. The specific content, quantity, format, and submission requirements for the standard O&M manuals are detailed in Section 017823 Operating, Maintenance and Data.
2. A/E Contribution. The A/E will include in the beginning of the O&M manuals a separate section describing the systems including:

a. The design intent narrative prepared by the A/E and provided as part of the bid documents, updated to as-built status by the A/E.
b. Simplified professionally drawn single line system diagrams on 8 ½" x 11" or 11" x 17" sheets. These shall include chillers, water system, and condenser water system, heating system, supply air systems, and exhaust systems and heaters. These shall show major pieces of equipment such as

pumps, chillers, boilers, control valves, expansion tanks, coils, service valves, etc.

3. CA Review and Approval. The CA shall briefly review the O&M manuals, documentation and redline as-builds *for systems that were commissioned* and other systems documentation that the CA should review, to verify compliance with the *Specifications.* The CA will communicate deficiencies in the manuals to the CT, OPM or A/E, as requested. Upon a successful review of the corrections, the CA recommends approval and acceptance of these sections of the O&M manuals to the CT, OPM or A/E. This work does not supersede the A/E's review of the O&M manuals according to the A/E's contract.

3.9 TRAINING OF OWNER PERSONNEL

A. The CT shall be responsible for training coordination and scheduling and ultimately for verifying that training is completed. The CT shall provide training and demonstration requirements as specified in each specification section and as noted below for the systems to be commissioned.

B. The CA shall be responsible for overseeing and approving the content and adequacy of the training of Owner personnel for commissioned equipment.

1. The CT shall interview the facility manager and lead engineer to determine the special needs and areas where training will be most valuable. The Owner and CA shall decide how rigorous the training should be for each piece of commissioned equipment. The CA shall communicate the results to the CT, Subs and vendors who have training responsibilities.
2. In addition to these general requirements, the specific training requirements of Owner personnel by Subs and vendors is specified in Division 23 and 26 and other sections where training requirements are found.
3. Each Sub and vendor responsible for training will submit a written training plan to the CA for review and approval prior to training. The plan will cover the following elements:

    a. Equipment (included in training)
    b. Intended audience
    c. Location of training
    d. Objectives
    e. Subjects covered (description, duration of discussion, special methods, etc.)
    f. Duration of training on each subject
    g. Instructor for each subject
    h. Methods (classroom lecture, video, site walk-through, actual operational demonstrations, written handouts, etc.)
    i. Instructor and qualifications
    j. Professional videotaping firm qualifications

4. For the primary HVAC equipment, the Controls Contractor shall provide a short discussion of the control of the equipment during the mechanical or electrical training conducted by others.
5. The CA reviews the overall training plan and coordinates and schedules, with the CT, the overall training for the commissioned systems. The OPM develops criteria for determining that the training was satisfactorily completed, including attending some of the training, etc. The CA recommends approval of the training to the CT using a standard form. The CT also signs the approval form.
6. Videotaping of the training sessions will be provided by the CT with CD's cataloged

by the CT, and added to the O&M manuals. The videotaping is to be by a professional firm that specializes in taping, editing and reproducing professional quality documents.

7. The mechanical design engineer shall at the first training session present the overall facility design concept and the design concept of each equipment section. This presentation shall include a review of all systems and equipment using the simplified system schematics (one-line drawings) including water systems, variable refrigerant systems, dx systems, supply air systems, exhaust system and outside air strategies.

3.10 DEFERRED TESTING

A. Unforeseen Deferred Tests. If any check or test cannot be completed due to the building structure, required occupancy condition or other deficiency, execution of checklists and functional testing may be delayed upon approval of the OPM. These tests will be conducted in the same manner as the seasonal tests as soon as possible. Services of necessary parties will be negotiated.

END OF SECTION 01 91 13

Set No._____

Project Manual
for
Construction of the

BCDC YOUTH DETENTION CENTER

at the
Baltimore City Detention Center
in the
Division of Pretrial Detention and Services (DPDS)

STATE OF MARYLAND
CONTRACT NO.: DPSCS KT-000-150-C01

5 FEBRUARY 2015

Department of Public Safety & Correctional Services
Stephen T. Moyer Secretary
David Bezanson, Assistant Secretary

Board of Public Works
Lawrence J. Hogan, Jr.,Governor
Peter Franchot, Comptroller
Nancy K. Kopp, Treasurer

Architect (A Joint Venture): **PSA-Dewberry + Penza Bailey Architects**

Joint Venture Prime / Contract Office
Penza Bailey Architects
401 Woodbourne Avenue
Baltimore, MD 21212

Joint Venture Prime / Security
PSA-Dewberry
401 SW Water Street #701
Peoria, IL 61602

Civil / Geotechnical / Environmental Engineer
EBA Engineering, Inc.
4813 Seton Drive
Baltimore, MD 21215

Structural Engineer
Hope Furrer Associates, Inc.
501 Fairmount Ave. Suite 205
Towson, MD 21286

Surveyor
Dewberry & Davis, LLC
3106 Lord Baltimore Drive
Baltimore, MD 21244

Mechanical / Plumbing / Elect. / IT / Telecom / MATV-CATV Fire Protection Engineer
Sidhu Associates, Inc.
11350 McCormick Drive #1000
Hunt Valley, MD 21031

Food Service / Laundry Consultant
R&R Designer, Inc.
5300 Holmes Run Parkway
Suite 1006
Alexandria, VA 22304

Landscape Architect
P.E.L.A. Design, Inc.
7400 York Road, Suite 403
Towson, MD 21204

Cost Estimator
Lewicki Estimating Services, Inc.
13600 Old Chatwood Place
Chantilly, VA 20151

Sustainability Consultant
TerraLogos Eco Architecture
2901 E. Baltimore Street, #300
Baltimore, MD 21224

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volume 2 of 6

Bid documents are available only online from eMaryland Marketplace (eMM). Those are the only official documents to be used by Bidders for this Invitation for Bid (IFB). The Bidders shall print on their own stationary the required documents for submitting their bid (as Construction BID Form, Bid Proposal Affidavit, BID Bond, etc.) and submit to the Owner (DPSCS, Division of Capital Construction and Facilities Maintenance) in a sealed envelope which clearly indicates that it contains a sealed bid for this project with the bid due date and the name and address of the Bidder.

Minority Business Enterprises (MBEs) are encouraged to participate and respond to this request for Bid.

CONFORMED DOCUMENT 3 APRIL 2015: This project manual contains sections revised during bidding, and is published for the Contractor's convenience for use during construction. It does not replace the Contract Documents, which comprise the Bid Documents plus revisions issued as Addenda.

VOLUME 1

DIVISION 00 – BIDDING AND CONTRACT REQUIREMENTS

DIVISION 01 - GENERAL REQUIREMENTS

VOLUME 2

DIVISION 02 – EXISTING CONDITIONS

DIVISION 03 - CONCRETE

DIVISION 04 – MASONRY

DIVISION 05 – METALS

DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

VOLUME 3

DIVISION 08 - OPENINGS

DIVISION 09 - FINISHES

DIVISION 10 - SPECIALTIES

DIVISION 11 - EQUIPMENT

VOLUME 4

DIVISION 21 – FIRE SUPPRESSION

DIVISION 22 – PLUMBING

DIVISION 23 - HEATING VENTILATING AND AIR CONDITIONING

VOLUME 5

DIVISION 26 - ELECTRICAL

DIVISION 27 - COMMUNICATIONS

DIVISION 28 - ELECTRONIC SAFETY AND SECURITY

DIVISION 31 - EARTHWORK

DIVISION 32 - EXTERIOR IMPROVEMENTS

DVISION 33 - UTILITIES

VOLUME 6

END OF TABLE OF CONTENTS

SECTION 02 20 00 - EXISTING BUILDING DRAWINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 EXISTING CONDITION INFORMATION

A. This Document provide Owner's information for Contractor’s convenience and are intended to supplement rather than serve in lieu of the Contractor’s own investigations. They are made available for Contractor’s convenience and information, but are **not** a warranty of existing conditions. This Document and its attachments are **not** part of the Contract Documents.

B. Existing drawings that include information on existing conditions including previous construction at Project site are available for viewing eMaryland Marketplace.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 02 20 00

SECTION 02 30 00 – SUBSURFACE INVESTIGATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes: Describes the accuracy and limitations of the information shown on the construction documents and the information contained in the geotechnical report.

1.3 INFORMATION NOT GUARANTEED

A. Information on the Drawings and in the Project Manual relating to subsurface conditions, natural phenomena, and existing utilities and structures is from the best source presently available.

B. Such information is furnished only for the information and convenience of the Contractor, and the accuracy or completeness of this information is not guaranteed.

1.4 GEOTECHNICAL REPORT:

A. A Geotechnical Report was prepared by EBA Engineering, Inc. for use by the Owner and the Architect/Engineer in the design of the Project.

B. The Geotechnical Report is for general information purposes only.

1.5 SUBSURFACE INVESTIGATION

A. All subsurface investigation data are made available only for the Contractor's convenience. The Owner, Architect, and Engineer will not be responsible for interpretation, assumptions, or conclusion made from this information.

B. The Geotechnical Report and subsurface investigation data are attached to these specifications as Appendix A and made part of this section.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 02 30 00

GEOTECHNICAL REPORT

BCDC YOUTH DETENTION CENTER

BALTIMORE, MARYLAND

Prepared for:

Department of Public Safety and Correctional Services
6776 Reisterstown Road, Suite 201
Baltimore, MD 21215

Submitted to:

PSA-Dewberry, Inc./Penza Bailey Architects, Inc., JV
401 Woodbourne Avenue
Baltimore, MD 21212

Prepared by:

4813 Seton Drive | Baltimore, MD 21215
(410) 358-7171 | www.ebaengineering.com

EBA Project No. 3532-01

August 2014

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Geotechnical Report

BCDC Youth Detention Center
Baltimore, Maryland

INTRODUCTION

EBA Engineering, Inc. (EBA) was retained by PSA-Dewberry, Inc. / Penza-Bailey Architects, Inc., a Joint Venture, to perform a geotechnical investigation for the proposed Youth Detention Center, which will be owned and operated by the Maryland Department of Public Safety and Correctional Services (DPSCS).

The purpose of the investigation was to determine the stratigraphy and engineering characteristics of the soils at the project site and provide recommendations for the design and construction of the proposed building in consideration of the subsurface conditions. This report presents the findings of the investigation and provides recommendations for the design and construction of the proposed building including foundations, slab support, and below grade walls as well as requirements for excavation, fill and backfill. The report appendices include a project site map, observation well details, soil boring and test hole location plan, typed soil boring and test hole logs and laboratory test results.

PROJECT DESCRIPTION

The proposed Youth Detention Center will be located in downtown Baltimore. The project site is bounded by East Eager Street on the north side, Greenmount Avenue on the east side, OSTC/SUI building on the south side and Forest Street on the west. The location of the project site is shown on the Project Site Map included in Appendix A. The proposed construction will include a new building that will house the 60-bed Youth Detention Center. The proposed structure will be 3 stories and the elevation of the ground floor will match the elevation of the ground floor of the existing SUI Building, noted to be 73.41 (feet) in the historical drawings. Neither a grading plan, a foundation plan nor sections with specific column locations and loads was available at the time this report was prepared.

The site is currently occupied by the 3-story BPRU Dormitory Building, 2-story SUI Building, paved parking lot and paved recreation yard. It is understood that the existing BPRU Building will be demolished to accommodate the new Youth Detention Center. Part of the existing SUI Building will be renovated to accommodate a portion of the new Youth Detention Center. The ground surface elevations at the perimeter of the site vary from approximately 76 (feet) near the northwest corner to 67 (feet) near the southeast corner.

GEOLOGIC SETTING

The project site lies in the Atlantic Coastal Plain physiographic province. According to

the Geologic Map of the Baltimore East Quadrangle, Maryland, published in 1979 by the Maryland Geological Survey, the area in the vicinity of the project site is covered with Coastal Plain sediments deposited during the Cretaceous Age. The Cretaceous Age sediments are identified as the Clay and Sand Facies of the Arundel Formation, which are a division of the Potomac Group. The sediments overlie residual soils, decomposed rock and bedrock. The bedrock is described as the Carroll Gneiss Member of the James Run Formation.

The clay facies of the Arundel Formation consists of gray, brown, black and red kaolinitic and illitic clays with locally interbedded quartz silt or sand lenses and pods. The clays are typically poorly bedded to massive with occasional color mottling. The sand facies consists of well sorted medium to quartz sand with locally abundant wood fragments. Thin sand beds are typically planar bedded with interspersed clay-silt laminae and very thin clay beds.

The residual soils and decomposed rock that overlie the bedrock were formed by the in-place weathering of the bedrock. The residual soil is completely weathered and may not possess relict features of the parent rock. Whereas decomposed rock is generally more coarse and rocky than residual soil and retains relict features of the parent rock such as coloring, discontinuities and bedding planes. Large cobble to boulder-sized fragments of rock are common in the weathered residuum. The residual soils and decomposed rock generally become harder and denser with increasing depth.

The Carroll Gneiss Member is from the Cambro-Ordovician Age and consists of fine- to medium-grained, generally layered biotite-quartz-plagioclase gneiss, locally with muscovite. Mica may be absent and magnetite present in some outcrops. Subordinate, concordant plagioclase-hornblende gneiss (amphibolite) occurs in layers within the Carroll Gneiss. The amphibolite layers are generally a few centimeters to a few decimeters thick, but they may be several meters thick in some localities.

PREVIOUS SUBSURFACE INFORMATION

Previous subsurface explorations were conducted at the site prior to the construction of the SUI Building and BPRU Building in 1964 and 1969, respectively. The previous subsurface information for the SUI Building includes thirteen soil boring logs. The borings were advanced to depths ranging from 25 to 50 feet. The previous boring logs indicate that there was pre-existing fill to depths ranging from 3 to 8 feet. The soils underlying the fill consisted of gravel, sand and clay. Disintegrated rock was encountered in the borings at depth ranging from 22 to 31 feet. Bedrock was not encountered in the borings. Water was observed in the previous borings at depths ranging from about 20 to 27 feet. These depths correspond to elevations ranging from about 45 to 47 (feet).

The previous subsurface information for the BPRU Building includes three soil borings logs. Each boring was advanced to a depth of 25 feet. The previous boring logs indicate that there was pre-existing fill to depths ranging from 7.5 to 8.5 feet. A concrete slab

was encountered in one of the borings at a depth of 6 feet. The soils underlying the fill consisted of gravel, sand and clay. Bedrock was not encountered in these borings.

SUBSURFACE EXPLORATION

The subsurface exploration program consisted of 5 soil borings, designated BP-1 through BP-3, BP-1A and BP-3A, and 1 test hole, designated TH-1. Borings BP-1A, BP-2, and BP-3 were advanced to auger refusal on bedrock at depths of 38.6 feet, 43.6 feet and 45.0 feet respectively. Boring BP-1 was terminated at a depth of 5.0 feet after an obstruction was encountered. Boring BP-3A was performed to collect a thin-walled tube sample and was terminated at a depth of 15.0 feet. Test Hole TH-1 was performed to locate the footing of the SUI Building. The as-drilled boring and test hole locations are shown on the Soil Boring and Test Hole Location Plan presented in Appendix B.

The soil borings were advanced by the hollow-stem auger drilling method using a truck-mounted drilling rig. Standard Penetration Tests (SPT) were generally performed at 2.5-foot intervals in the upper 10 feet of each boring and at 5-foot intervals thereafter. A soil sample was collected with a split-barrel sampler at each SPT location. Bulk soil samples were also obtained from Borings BP-1A and BP-2 and BP-3.

The test hole was performed by Accurate Infrastructure Data, Inc. (AID). The test hole was excavated to a depth of approximately 10 feet.

Groundwater observation wells were installed in Borings BP-1A and BP-2. Each observation well was constructed with 10 feet of one-inch diameter PVC casing and 10 feet of slotted (screen) pipe. A sand filter pack was placed around the screen from the bottom of the boring to approximately 15 or more above the top of the screen. A bentonite seal was placed above the sand filter pack to within about two feet of the surface. A flush-mounted steel cover was installed and grouted at the surface of each observation well. Details of the observation well installation are illustrated on the details included in Appendix C.

The groundwater and cave-in depths were measured in Boring BP-3 upon completion. The water level depths in the observation wells installed in Borings BP-1A and BP-2 were measured at completion and after 24 hours. All the boreholes, except those with observation wells, were backfilled with bentonite-cement grout after completion.

Descriptions of the soils encountered, SPT results, groundwater observations and other information are provided on the boring and test hole logs, which are presented in Appendix D. The ground surface elevations shown on the logs of Borings BP-1 through BP-3, BP-1A and BP-3A are estimated based on topographic information on the drawings provided by PSA-Dewberry. The soil descriptions/classifications provided on the logs were determined in accordance with the procedures as described in ASTM D2488 (ASTM International's version of the Unified Soil Classification System [USCS]).

LABORATORY TESTING

The soil samples collected from the borings were delivered to EBA's laboratory where a geotechnical engineer visually classified them. Selected soil samples were tested to determine the natural moisture content, particle size distribution, liquid limit, plasticity index, undrained shear strength, moisture-density relationship and consolidation properties of the soils. The laboratory test reports and a summary of the laboratory test results are presented in Appendix D.

Corrosivity tests were performed on selected soil samples collected from the soil borings. The tests included resistivity, pH, chloride content, sulfate content, and redox potential. The soil corrosivity test results are presented in Appendix E.

SUBSURFACE CONDITIONS

Asphalt Pavement

An asphalt pavement was encountered at the surface at the locations of all the borings. The thickness of the asphalt pavement at each location was approximately 3 inches. The thickness of the asphalt pavement at each location is noted in the "Remarks" column of the respective boring logs.

The underlying base course encountered in all the borings consisted of gravel. The base course thickness ranged from 3 to 5 inches. The thickness of the base course at each location is noted in the "Remarks" column of the respective boring logs.

Existing Fill

Existing Fill was encountered underlying the Asphalt Pavement in all the borings. The depth to the bottom of the Existing Fill ranged from 5 to 6 feet. The Existing Fill typically consisted of very loose to very dense, poorly graded SAND, silty SAND and stiff CLAY with varying amounts of gravel. The SPT N-values in this layer ranged from 3 to more than 50 blows per foot (bpf) and the average was 22 bpf.

The moisture contents of selected soil samples collected from this layer ranged from 4.0 to 18.7 percent. The liquid limits of selected samples from this layer ranged from NV to 47 and the plasticity indexes ranged from NP to 30. Moisture-density tests, conducted in accordance with ASTM D 1557, were performed on the bulk samples collected from BP-1A, BP-2 and BP-3. The moisture-density test results are presented in Table 1.

Table 1: Results of Moisture-Density Tests

Boring No.	Depth Interval (ft)	Maximum Dry Density (pcf)	Optimum Moisture Content (%)	USCS Soil Classification
BP-1A	1.0 – 8.0	121.1	9.1	SP
BP-2	1.0 – 8.0	136.0	6.1	SP-SM
BP-3	1.0 – 8.0	125.9	10.6	CL

The USCS symbols for the soils in this layer include SP-SM, SM, and CL based on the laboratory test results and visual classifications.

Arundel Formation Sand

Sand was found underlying the Existing Fill in Borings BP-2 and BP-1A. The depth to the bottom of this layer was 15 feet. The soils in the layer generally consisted of medium dense to very dense, poorly graded SAND and silty SAND with varying amounts of gravel. The SPT N-values in the layer ranged from 11 to 58 bpf with an average 36 bpf.

The moisture content of one selected sample collected from this layer was 4.2 percent. The USCS symbols for the soils in this layer were SP and SM based on visual classifications and laboratory test results.

Arundel Formation Clay

Clay was encountered underlying the Existing Fill in Boring BP-3, underlying the Sand layer in BP-1A and BP-2. The depth to the bottom of this layer ranged from 28 feet to 37.5 feet. This layer consisted of stiff to hard, sandy CLAY, and CLAY. The SPT N-values in this layer ranged from 10 to 39 bpf and the average was 23 bpf.

The moisture contents of selected samples collected from this layer ranged from 5.6 to 57.6 percent. The liquid limit of one selected sample from this layer was 55 and the plasticity index was 28. The USCS symbols for the soils in this layer were CL and CH based on visual classifications and laboratory test results.

The unconfined compressive strength of one selected sample from the Clay layer was 1,364 psf. One consolidation test was performed on the tube sample collected from this layer in Boring BP-3A. The compression index (C_c) was 0.27 and recompression index (C_r) was 0.05. The consolidation test results indicate that the Clay layer is over-consolidated and the overconsolidation ratio (OCR) is approximately 2.5.

Residual Soil

Residual soil was encountered underlying the Clay layer in Borings BP-2 and BP-3. The depth to the bottom of this layer ranged from 35 to more than 43.6 feet. The soils

in the layer generally consisted of dense, silty SAND and hard, CLAY. The SPT N-values in the layer ranged from 32 to 55 bpf with an average 46 bpf.

The moisture contents of two selected samples collected from this layer were 37.6 percent and 36.9 percent. The USCS symbols for the soils in this layer were SM and CL based on visual classifications and laboratory test results.

Decomposed Rock

Decomposed rock was encountered underlying the Clay layer in Boring BP-1A and the Residual Soil layer in Boring BP-2. The depth to the bottom of this layer ranged from 38.6 to more than 45 feet (i.e., exceeded the boring depths). The soils in the layer generally consisted of hard, CLAY and very dense, clayey SAND. The SPT N-values in this layer were more than 50 bpf.

The moisture content of one selected sample collected from this layer was 29.6 percent. The USCS symbols for the soils in this layer were SC and CL based on visual classifications and laboratory test results.

Bedrock

Auger refusal occurred in Borings BP-1A, BP-2 and BP-3 at depths of 38.6 feet, 43.6 feet and 45.0 feet respectively. It is believed that the auger refusal in each boring occurred on bedrock. Rock core drilling and sampling were not performed.

Water Level Observations in the Boreholes

The groundwater and cave-in depths were measured in Boring BP-3 upon completion. The water level depths in the observation wells installed in Borings BP-1A and BP-2 were measured at completion and after 24 hours. The measured water level and cave-in depths are recorded on the boring logs and summarized in Table 2.

Table 2 - Water Level and Cave-in Depth Observations

Boring No.	Approx. Ground Surface Elev. (ft)	At completion				After 24 hours			
		Water level Depth (ft)	Water level Elev. (ft)	Cave-in Depth (ft)	Cave-in Depth Elev. (ft)	Water level Depth (ft)	Water level Elev. (ft)	Cave-in Depth (ft)	Cave-in Depth Elev. (ft)
BP-1	76.3	N/A	--	N/A	--	*	--	*	--
BP-1A	76.3	25.0	51.3	**	--	15.1	61.2	**	--
BP-2	76.5	13.0	63.5	**	--	15.7	60.8	**	--
BP-3	73.5	Dry	--	33.5	40.0	*	--	*	--
BP-3A	73.5	N/A	--	N/A	--	*	--	*	--

Note: A water level of dry indicates that the borehole was dry at the cave-in depth.
*Backfilled upon completion.
* *An observation well was installed in Borings BP-1A and BP-2.

The water level depth observations are an indication of the groundwater level at the time of the investigation. Be advised that fluctuations in groundwater levels may occur due to variations in season, rainfall, construction activity, and other site-specific factors.

Soil Corrosivity

Soil corrosivity tests were performed on selected soil samples collected from the soil borings. The soil corrosivity test results are provided in Appendix G. The soil corrosivity test results are summarized in Table 3.

The laboratory soil test results indicate the presence of corrosive conditions for buried ferrous metal. The resistivity data suggests that very corrosive soils are located in the Existing Fill in an area encompassing Borings BP-1 and BP-3 and moderately corrosive soils are located in the Existing Fill in the vicinity of Boring BP-2.

Table 3 – Summary of Laboratory Soil Corrosion Test Results

Description of Test	Resistivity, as received — (Ohm-cm)	Minimum Resistivity AASHTO T 288 (Ohm-cm)	pH AASHTO T 289 —	Chloride AASHTO T 291 (ppm)	Sulfate AASHTO T 290 (ppm)	Redox ASTM D 1498 (mV)
Common Ranges of Corrosion Activity on Ferrous Metals	Extremely Corrosive: Less than 1,000 Very Corrosive: 1,000 to 5,000 Corrosive: 5,001 to 10,000 Moderately Corrosive: 10,001 to 25,000 Mildly Corrosive : Over 25,000		In general, the corrosion rate of ferrous metals increases below pH 5.0	Soils with chloride concentrations greater than 150 ppm will promote aggressive corrosion	Soils with sulfate concentrations greater than 150 ppm will generally contribute to higher rates of corrosion	Very Corrosive: Below 100 Moderately Corrosive:100 to 200 Slightly Corrosive: 200 to 400 Non-corrosive: Over 400
BP-1, S-2@3.5'-5.0'	7700	2100	8.3	12	5	395
BP-1A, S-3@ 6.0'-7.5'	130000	43000	8.3	6	<1	366
BP-2, S-2@ 3.5-5.0'	20000	10400	8.1	47	6	352
BP-3, S-2@3.5'-5.0'	10500	3400	8.5	27	<1	338

CONCLUSIONS AND RECOMMENDATIONS

Demolition

According to the historical drawings of the existing BPRU Building the structure is a three-story building with a partial basement on the north end. The basement floor level shown on the drawings is elevation 66.75 (feet). The structure is founded on spread footings and caissons.

The site preparation should begin by razing and removing the existing structure, pavements and other existing surface features such as sidewalks, curbs, light poles and fences.

The concrete slabs, footings, grade beams and pile caps in the existing building area should be removed. The existing caissons may be cut-off so that the tops are at least 2 feet below any proposed slabs, foundations and piping. The basement walls and floor slabs may remain in place, however it is recommended that the floor slab be broken up and left in place. The floor slab should be broken into pieces that are less than 9 square feet in area. The basement area should be backfilled with a free draining porous fill such as ASTM C33, Size No. 57 stone to approximately 2 feet below the proposed bottoms of the footings. The free draining material should be covered with a nonwoven geosynthetic fabric to serve as a separation layer. The remainder of the excavation should be backfilled with aggregate fill consisting of crusher run (CR-6).

The excavation should be backfilled according to the recommendations detailed in the “Fill and Backfill” section of this report. Backfilling of the building area and basement should be performed by the earthwork contractor, as they are typical more familiar with the means and methods of placing backfill than demolition contractors.

Building Foundations

The column loads of the new building are anticipated to be on the order of 500 kips and wall loads are anticipated to be on the order of 8 kips per linear foot of wall. No grading plans, foundation plans or sections with specific column locations and loads were available at the time this report was prepared.

Our analysis included an evaluation of the soil support for spread footings. Based on the subsurface conditions found in the borings performed in the vicinity of the proposed building, it appears that the footings will bear on the Existing Fill, the natural sand and clay of the Arundel Formation and the aggregate fill placed after demolition. The Existing Fill is not suitable for support of the footings due to its variable consistency and potential for excessive settlement. Therefore, it is recommended that the Existing Fill below the proposed footings be removed and replaced with compacted aggregate fill. The *Footing Subgrade Modification Detail* provided in Appendix F depicts the soil removal/replacement technique. As indicated in the detail, the removal of the Existing Fill should extend on a downward projection of 1H to 2V to the natural sand or clay of the Arundel Formation or a maximum depth equal to two times the least footing width. The bottom of the Existing Fill encountered in the borings ranged from elevation 65 to 70 (feet).

The building may be supported by spread footings founded on subgrades that have been modified as described above. The net allowable bearing capacity will be 4,000 psf after the subgrade has been modified. Footings that bear on the natural sand and clay of the Arundel Formation or the aggregate fill placed after demolition may be designed for an allowable bearing capacity of 4,000 psf. The total settlement of the footing is estimated to be 1.0 inch or less and differential settlement is not expected to exceed 0.5 inch.

It is recommended that the removal of the Existing Fill and existing building foundations, and replacement with compacted aggregate fill be observed by a geotechnical engineer and/or their designated representative during construction. Test pit excavations and penetrometer testing will be needed to assess the extent of the Existing Fill within the area of the building at the time of construction. Thus, it would be prudent to include contingencies in the construction estimate/budget to account for these conditions.

It should be noted that brick debris and concrete obstructions were encountered in some of the borings that may cause difficulty during construction. Field engineering may be required to evaluate issues that arise during construction if obstructions are encountered, that need to be removed and replaced with compacted aggregate fill.

Since the ground floor elevation of the new building is equal to that of the existing SUI Building, it is recommended that the bottoms of the new foundations be lowered to the same elevation as the existing foundations along the edge of the SUI

Building. In addition, the excavations for the new footings and other subsurface features should not extend beneath any existing foundations or extend below a plane extending down from the edge of the existing foundation at a slope of 1 horizontal to 1 vertical unless the existing foundation is underpinned or excavation support is used.

The seismic site class was evaluated by the SPT N-values method in accordance with the *International Building Code (2012)*. It is our opinion that the subsurface conditions at the site should be categorized as Site Class D.

Slabs-On-Grade

It is anticipated that the subgrades for slabs-on-grade will generally consist of soils of the Existing Fill, the sand and clay of the Arundel Formation and aggregate fill placed after demolition. The Arundel Formation contains medium stiff clay. The clay will generally provide fair to poor support for slabs-on-grade. Considering that portions of the subgrade soils have low support and poor drainage characteristics, it is recommended that at least four-inches of coarse aggregate be placed beneath the slabs-on-grade.

Slab subgrades should be proofrolled with a fully loaded tandem axle dump truck or equivalent in the presence of a geotechnical engineer or his designated representative. The purpose of the proof-roll is to locate any soft, wet, "pumping" or otherwise unsuitable pockets of soils.

The concrete slabs-on-grade should be reinforced with steel reinforcing bars or welded wire fabric. A layer of porous fill consisting of at least 4 inches of ASTM C33, Size No. 57 stone should be provided beneath the slabs. A polyethylene vapor barrier should be placed over the porous fill prior to concrete placement. The recommended modulus of subgrade reaction (k_s) for the design of the proposed slabs is 125 pounds per cubic inch (pci).

Below Grade Walls and Retaining Walls

The proposed building may have foundation walls that will also serve as earth retaining walls. These walls should be designed to support the lateral earth pressures imposed by backfill placed against the walls, hydrostatic pressures and appropriate surcharge loads. Recommendations for the design of these walls are detailed below.

At-rest earth pressure values should be used for conditions that do not allow movement of a wall away from the soil mass. An at-rest pressure coefficient, K_o, of 0.5 is recommended.

Active earth pressure values may be used when the conditions allow movement. The active earth pressure coefficient, K_a, should be estimated as $K_a = \tan^2(45 - \varphi/2)$.

Passive earth pressures occur when a buried structural element imposes a horizontal load on the soil mass. Typically, the coefficient of passive earth pressure, K_p, is calculated as $K_p = \tan^2(45 + \varphi/2)$.

The equivalent fluid pressure on the wall, p, may be calculated by the following equation, $p = K\sigma_v$; where, K is the earth pressure coefficient and σ_v is the vertical overburden stress at depth, z (z is the depth below grade behind the wall or the depth below the toe line in front of the wall). When the soil is in the at-rest state, $K = K_0$; when the soil is in the active state, $K = K_a$; and when the soil is in the passive state, $K = K_p$.

Based on the assumption that the fill and backfill recommendations contained in this report are followed during construction, the lateral earth pressures for structural fill and backfill may be calculated using an estimated unit weight of 130 pcf and an angle of internal friction of 32 degrees. The recommended horizontal friction coefficient between the soils and concrete footings is 0.4. Clayey soils should not be used as backfill for the walls due to the potential for expansion and high pressures caused by poor drainage.

Drainage behind foundation walls that will retain earth backfill on one side (i.e., below grade building walls) is recommended to ensure that there will be no hydrostatic pressures on the walls. Foundation drains should consist of a six-inch diameter slotted pipe placed on top of the footings at the bottom of the backfill. The drainage should be facilitated by placing free draining porous fill (i.e., coarse aggregate meeting the gradation requirements of ASTM C 33, Size No. 57) or prefabricated drains directly behind the walls. The porous fill or prefabricated drains should extend to the foundation drains.

Groundwater Control During Construction

It is anticipated that the bottom of the proposed building foundations will be at about elevation 69 (feet) and the excavation of Existing Fill will extend to about elevation 65 (feet). The groundwater elevations at the boring locations were found to range from approximately 60.8 to 61.2 (feet). Thus, groundwater is not anticipated in the excavations and dewatering will likely be limited to removing storm water runoff that flows into the excavation.

Fill and Backfill

All fill and backfill materials should be free of vegetation, topsoil, cobbles, boulders, trash, debris, frozen material, muck, organic matter and other deleterious materials. The fill and backfill should not contain rock, rubble and other non-degradable materials larger than four inches in any dimension.

Aggregate fill, consisting of crusher run aggregate CR-6, should be used to backfill voids created by the demolition work that are located below the proposed building foundations and slabs-on-grade.

Structural fill and backfill should be used adjacent to foundations, below paved areas, and behind walls and within 5 feet of building foundations. Soils considered suitable for use as select fill and backfill include soils classified as GP, GW, GM, GC, SP, SW, SM, and SC in accordance with ASTM D 2487. The liquid limit and plasticity index should not exceed 40 and 10, respectively. The maximum dry density of the soil, determined in accordance with ASTM D 1557, should be no less than 120 pcf.

Common fill and backfill should be used in unpaved areas more than 5 feet from foundations. Soils classified as GW, GP, GM, GC, SW, SP, SM, SC, ML and CL, in accordance with ASTM D 2487, are suitable for use as common fill and backfill. The maximum dry density, determined in accordance with ASTM D 1557, should be no less than 105 pcf.

Based on the information obtained from the borings, the excavated soils are expected to generally consist of poorly graded sand, silty sand, clayey sand, sandy clay, clay and fat clay (i.e., SP, SP-SM, SM, SC, CL, and CH). The silty sand, poorly graded sand, and poorly graded sand with silt will be suitable for backfill, but the clayey sand, sandy clay, clay and fat clay will not. Wet material should be dried and dry material should be moistened to within 2% of their optimum moisture contents prior to compaction. Therefore, some of the onsite soil will need to be moistened and the other onsite soil will require drying or mixing with drier materials prior to use as backfill.

All fill and backfill should be placed in horizontal layers of not more than 8 inches in loose thickness. It is recommended that each layer of common fill and backfill be compacted to no less than 92% of the maximum dry density determined in accordance with ASTM D 1557. Each layer of select fill and backfill should be compacted to no less than 95% of the maximum dry density determined in accordance with ASTM D 1557. Aggregate fill should be compacted to no less than 97% of the maximum dry density determined in accordance with ASTM D 1557. Each layer of fill and backfill should be compacted to the specified dry density prior to the addition of subsequent lifts. Wet material should be dried and dry material should be moisture to within 2% of their optimum moisture contents prior to compaction.

Excavation

The excavations for the proposed building foundations are estimated to range from approximately 8 to 12 feet deep. It is anticipated that soils of the Existing Fill, Sand and Clay strata will be encountered in the excavations. The groundwater elevations at the boring locations were found to range from approximately 13 to 15 feet deep. Thus, groundwater is not anticipated in the excavations and dewatering will likely be limited

to removing storm water runoff that flows into the excavation.

The guidelines for safe excavation using shielded excavations, temporary cut slopes and benching are presented in OSHA Excavations Standard Handbook, 29 CFR Parts 1926.650 through 1926.652 for depths less than 20 feet. It is recommended that the sides of excavations less than 5 feet deep be sloped or stepped back at a slope of 1.5 (horizontal) to 1 (vertical). Excavations greater than 5 feet deep should be supported with sheeting and shoring or some other suitable means of excavation support.

Inspection and Testing

All foundation and earthwork construction should be inspected by a testing agency experienced in similar work. The testing agency should observe the proofrolling of slab-on-grade subgrades, perform field density tests (i.e., compaction tests), and perform laboratory testing of aggregate, fill and backfill materials. All inspections and testing should be performed under the supervision of a registered professional engineer experienced in geotechnical engineering.

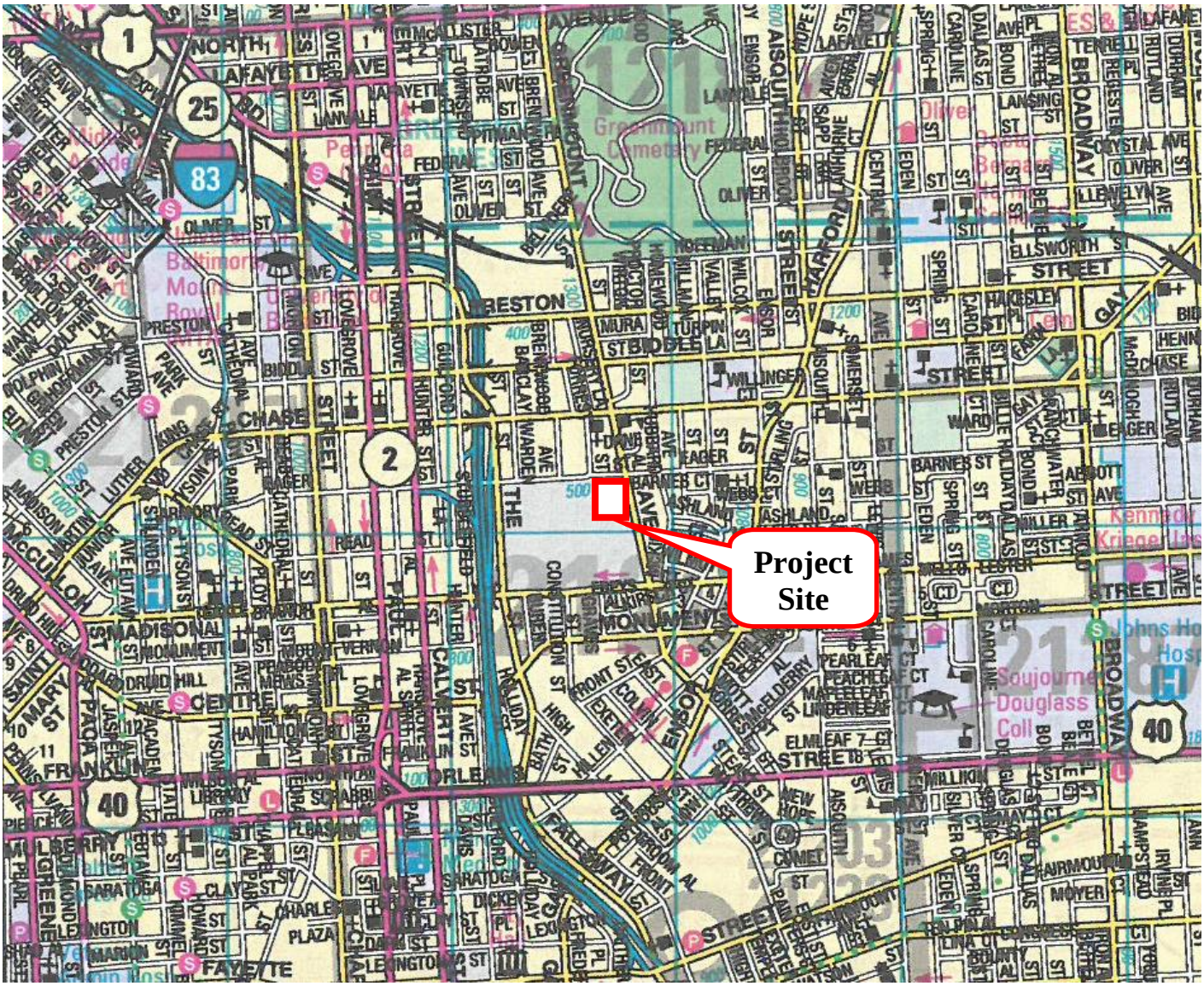
LIMITATIONS

The conclusions and recommendations presented in this report are based on the data collected during the geotechnical investigation. Variations in the subsurface conditions may be discovered during construction. EBA will be available to assist in determining a solution to any geotechnical problem that may arise during the construction of this project.

APPENDIX A

PROJECT SITE MAP

N



EBA ENGINEERING

EBA ENGINEERING, INC.
4813 Seton Drive
Baltimore, Maryland 21215

Project Name:

BCDC Youth Detention Center

Baltimore, Maryland

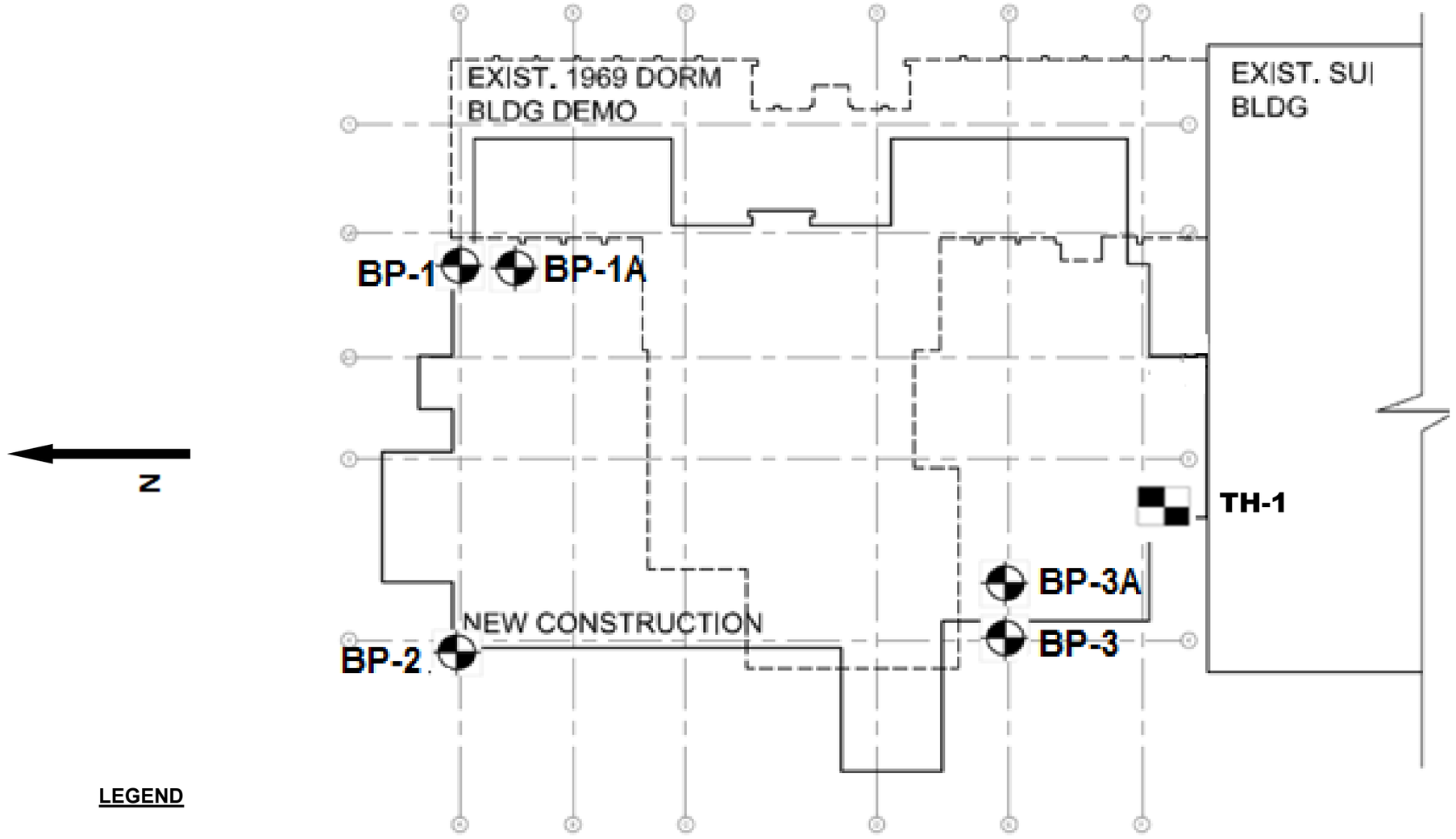
Project Site Map

Date: 8/21/14
Job No.: 3532-01

Prepared by: DD

APPENDIX B

SOIL BORING AND TEST HOLE LOCATION PLAN



LEGEND

Boring location

Test Hole

EBA ENGINEERING	**EBA ENGINEERING INC.** 4813 SETON DRIVE BALTIMORE, MD. 21215	BCDC Youth Detention Center **SOIL BORING AND TEST HOLE LOCATION PLAN** BALTIMORE , MARYLAND	
Not to Scale	DATE: August, 2014	EBA Project No.: 3532-01	Page 1 of 1

APPENDIX C

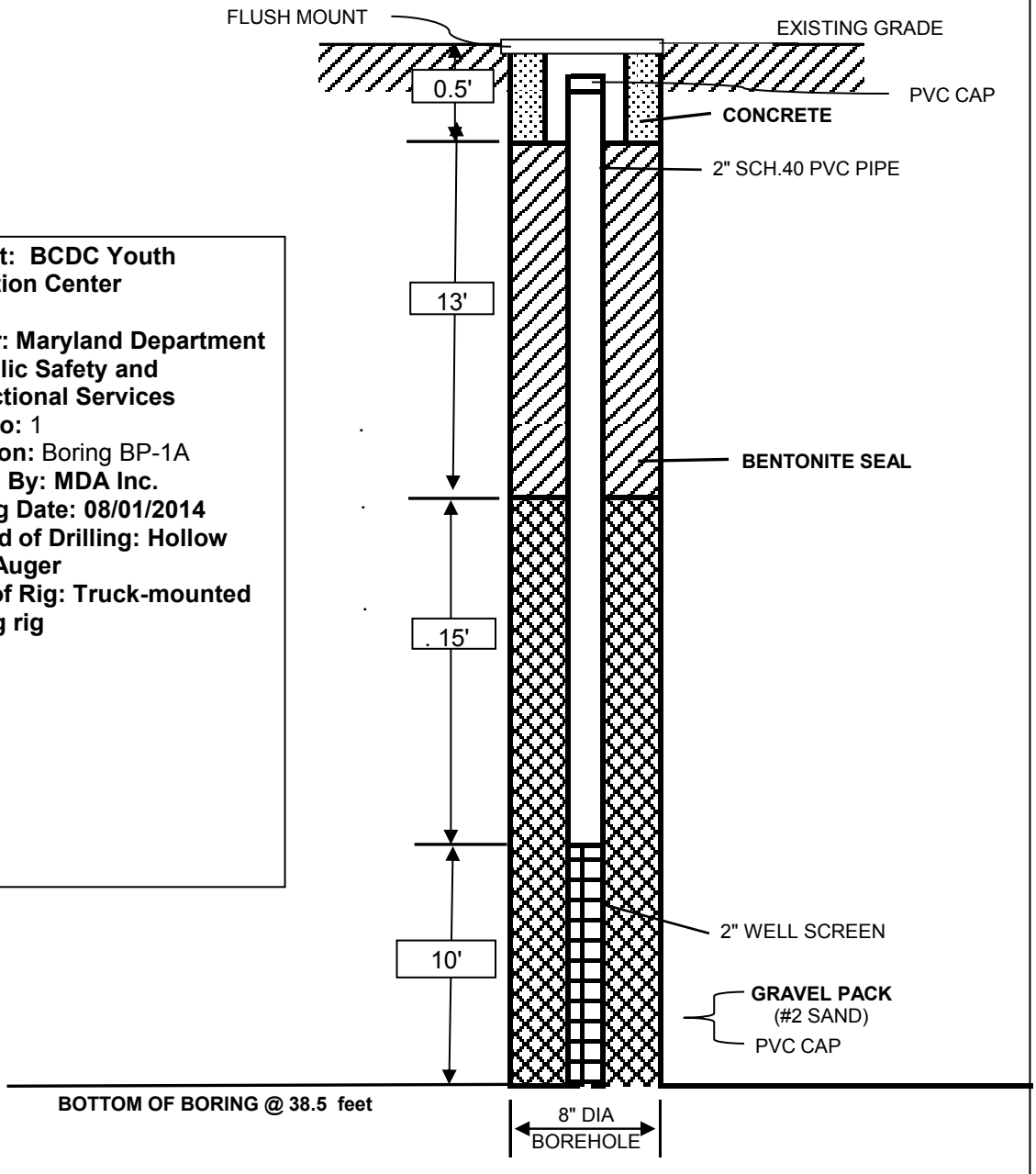
OBSERVATION WELL DETAILS

OBSERVATION WELL DETAIL

WELL # 1

Project: BCDC Youth Detention Center

Owner: Maryland Department of Public Safety and Correctional Services
Well No: 1
Location: Boring BP-1A
Drilled By: MDA Inc.
Drilling Date: 08/01/2014
Method of Drilling: Hollow Stem Auger
Type of Rig: Truck-mounted drilling rig



MONITORING WELL DETAIL

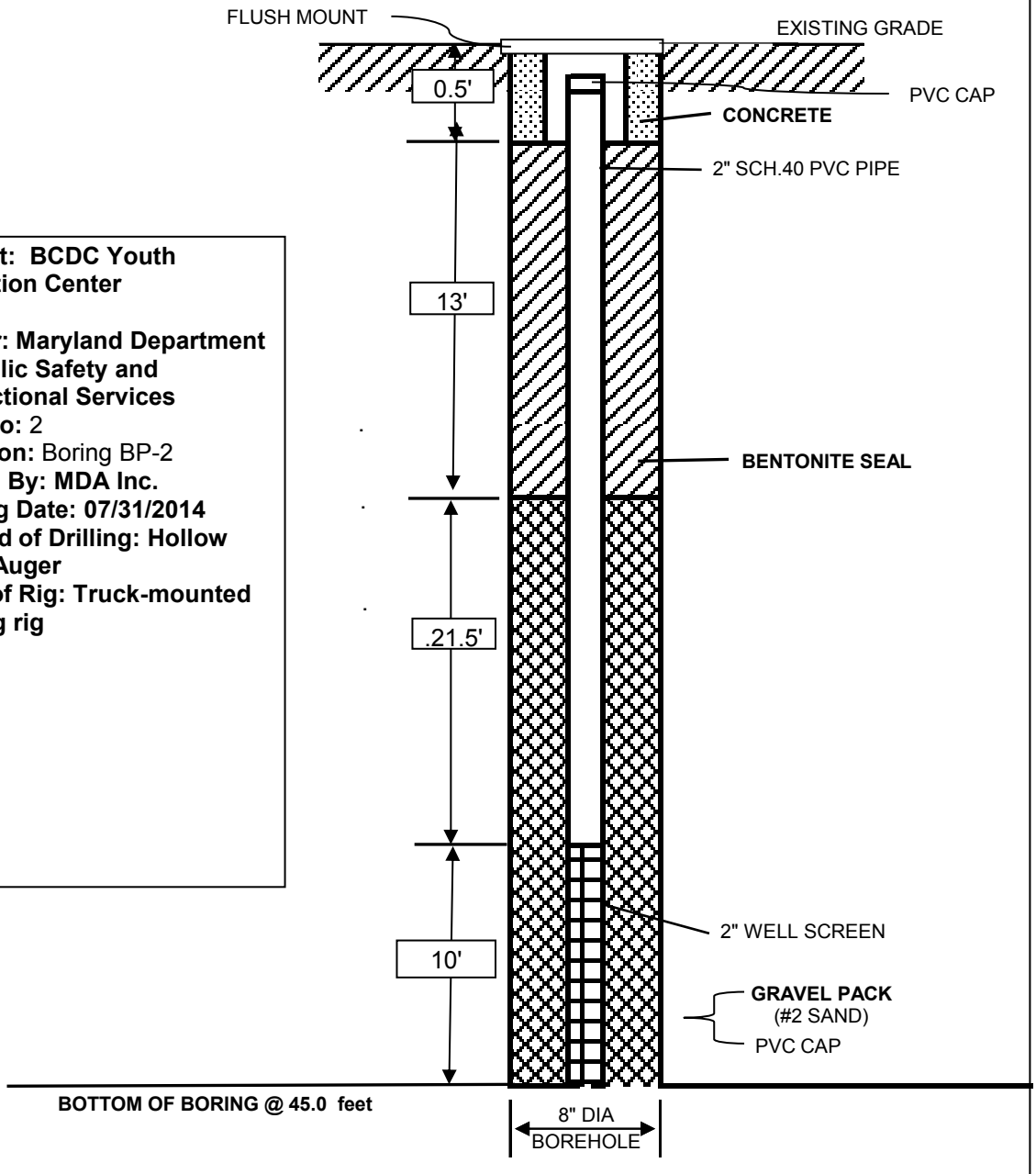
NOT TO SCALE

OBSERVATION WELL DETAIL

WELL # 2

Project: BCDC Youth Detention Center

Owner: Maryland Department of Public Safety and Correctional Services
Well No: 2
Location: Boring BP-2
Drilled By: MDA Inc.
Drilling Date: 07/31/2014
Method of Drilling: Hollow Stem Auger
Type of Rig: Truck-mounted drilling rig



MONITORING WELL DETAIL

NOT TO SCALE

APPENDIX D

SOIL BORING AND TEST HOLE LOGS

RECORD OF SUBSURFACE EXPLORATION

Project: BCDC Youth Detention Center
Location: Baltimore, Maryland
Job Number: 3532-01
Inspector: Duowen Ding
Boring Method: HSA
Hole Diameter: 8"
Water Level at Completion: N/A
Water Level After 24 hrs:

Boring Number: BP-1
Drilling Company: MDA Drilling Inc.
Driller: Duane Addison
Date Drilled: 08-01-14
Surface Elevation: 76.3' (est)
Hammer Weight/Drop: 140 lb/30 in
Northing: N/A
Easting: N/A

Elevation (ft)	Water/Caved Depth (ft)	Description	Depth (ft)	Sampler	Number	Blows/6"	Recovery (inches)	Remarks
76.3			0					3 inches of asphalt pavement.
		Brown, moist, very loose, poorly graded SAND, with gravel and brick fragment (Fill).		■	S-1	3 - 2 - 1	10	3 inches of gravel base.
		Brown, moist, very dense, silty SAND, with gravel, cinders, concrete and brick fragment (Fill).	5	■	S-2	10 - 8 - 50/2"	6	Auger refusal @ 5 feet, possible concrete.
		Bottom of Boring @ 5.0 ft						

RECORD OF SUBSURFACE EXPLORATION 3532-01 NEW YOUTH DETENTION CENTER.GPJ EBA ENGINEERING INC.GDT 8/25/14

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Baltimore, Maryland 21215

■ = Split Spoon

▽ Water Level At Completion
▼ Water Level After 24 hrs
⊥ Caved Depth At Completion
▩ Caved Depth After 24 hrs

RECORD OF SUBSURFACE EXPLORATION

Project: BCDC Youth Detention Center
Location: Baltimore, Maryland
Job Number: 3532-01
Inspector: Duowen Ding
Boring Method: HSA
Hole Diameter: 8"
Water Level at Completion: 25.0 '
Water Level After 24 hrs: 15.1 '

Boring Number: BP-1A
Drilling Company: MDA Drilling Inc.
Driller: Duane Addison
Date Drilled: 08-01-14
Surface Elevation: 76.3' (est)
Hammer Weight/Drop: 140 lb/30 in
Northing: 595450.433
Easting: 1423437.72

Elevation (ft)	Water/Caved Depth (ft)	Description	Depth (ft)	Sampler	Number	Blows/6"	Recovery (inches)	Remarks
76.3			0					
		See Boring BP-1 for soil description from 1 to 5 feet.						Offset 4 feet south from Boring BP-1. 3 inches of asphalt pavement. 3 inches of gravel base.
		Light brown, moist, very dense, poorly graded SAND, with gravel.	5	■	S-3	10 - 18 - 40	18	
		Light brown, moist, dense, poorly graded SAND, with gravel.	10	■	S-4	23 - 26 - 24	15	Collected bulk sample from 1 to 8 feet.
	▼	Brown, wet, medium dense, silty SAND, with gravel.	15	■	S-5	4 - 5 - 6	18	Observed wet spoon on S-5
		Reddish brown, moist, hard, fat CLAY.	20	■	S-6	9 - 18 - 21	18	
	▽	Green, moist, hard, CLAY.	25	■	S-7	10 - 14 - 18	18	
		Green, moist, very stiff, CLAY.	30	■	S-8	15 - 13 - 12	18	Installed monitoring well @ 38.5 feet.
		Green, moist, very dense, clayey SAND, trace rock fragments (Decomposed Rock).	35	■	S-9	5 - 50/5"	11	Hard augering 35 to 38.5 feet
					S-10	50/0"	0	Auger refusal @ 38.5 feet.
		Bottom of Boring @ 38.6 ft	40					
			45					

RECORD OF SUBSURFACE EXPLORATION 3532-01 NEW YOUTH DETENTION CENTER.GPJ EBA ENGINEERING INC.GDT 8/25/14

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Baltimore, Maryland 21215

■ = Split Spoon

▽ Water Level At Completion
▼ Water Level After 24 hrs
⊥ Caved Depth At Completion
▩ Caved Depth After 24 hrs

RECORD OF SUBSURFACE EXPLORATION

Project: BCDC Youth Detention Center
Location: Baltimore, Maryland
Job Number: 3532-01
Inspector: Duowen Ding
Boring Method: HSA
Hole Diameter: 8"
Water Level at Completion: 13.0 '
Water Level After 24 hrs: 15.7 '

Boring Number: BP-2
Drilling Company: MDA Drilling Inc.
Driller: Duane Addison
Date Drilled: 07-31-14
Surface Elevation: 76.5' (est)
Hammer Weight/Drop: 140 lb/30 in
Northing: 595450.433
Easting: 1423363.72

Elevation (ft)	Water/Caved Depth (ft)	Description	Depth (ft)	Sampler	Number	Blows/6"	Recovery (inches)	Remarks
76.5			0					
		Reddish brown, moist, dense, silty SAND, with gravel and crushed stone fragments (Fill).		■	S-1	11 - 14 - 16	16	3 inches of asphalt pavement.
		Reddish brown, moist, dense, silty SAND, with gravel and crushed stone fragments (Fill).	5	■	S-2	15 - 18 - 32	15	5 inches of gravel base.
		Light brown, moist, dense, poorly graded SAND, with gravel.		■	S-3	10 - 18 - 29	15	
		Light brown, moist, dense, poorly graded SAND, with gravel.	10	■	S-4	5 - 17 - 16	15	Collected bulk sample from 1 to 8 feet.
	▽	White/brown, moist, medium dense, silty SAND, trace gravel.	15	■	S-5	7 - 9 - 10	18	
	▼	Light brown, wet, stiff, CLAY.	20	■	S-6	6 - 7 - 8	18	
		Reddish brown, moist, stiff, CLAY.	25	■	S-7	2 - 5 - 6	18	
		Green, moist, hard, CLAY (Residual Soil).	30	■	S-8	15 - 28 - 27	18	
		Green, moist, hard, CLAY (Residual Soil).	35	■	S-9	6 - 15 - 38	18	
		Green, moist, hard, sandy CLAY, trace rock fragments (Decomposed Rock)	40	■	S-10	45 - 50/1"	7	Installed monitoring well @ 45 feet.
		Green, moist, hard, sandy CLAY, with rock fragments (Decomposed Rock) No sample.	45	■	S-11	50/1"	1	
					S-12	50/0"	0	Auger refusal @ 45 feet
		Bottom of Boring @ 45.0 ft						

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■ = Split Spoon

▽ Water Level At Completion
▼ Water Level After 24 hrs
Caved Depth At Completion
Caved Depth After 24 hrs

RECORD OF SUBSURFACE EXPLORATION

Project: BCDC Youth Detention Center
Location: Baltimore, Maryland
Job Number: 3532-01
Inspector: Duowen Ding
Boring Method: HSA
Hole Diameter: 8"
Water Level at Completion: Dry, caved @ 33.5 '
Water Level After 24 hrs: Backfilled at Completion

Boring Number: BP-3
Drilling Company: MDA Drilling Inc.
Driller: Duane Addison
Date Drilled: 07-30-14
Surface Elevation: 73.5' (est)
Hammer Weight/Drop: 140 lb/30 in
Northing: 595339.433
Easting: 1423363.72

Elevation (ft)	Water/Caved Depth (ft)	Description	Depth (ft)	Sampler	Number	Blows/6"	Recovery (inches)	Remarks
73.5			0					
73		Brown, moist, stiff, CLAY (Fill).			S-1	25 - 7 - 5	14	3 inches of asphalt pavement. 4 inches of gravel base.
72								
71								
70		Gray/brown, moist, medium dense, silty SAND with gravel and cinders (Fill).			S-2	5 - 7 - 9	6	
69								
68			5					
67		Red/brown, moist, stiff, CLAY.			S-3	6 - 7 - 8	3	Collected bulk sample from 1 to 8 feet.
66								
65								
64		Reddish brown, moist, stiff, CLAY.			S-4	6 - 7 - 6	10	
63			10					
62								
61								
60								
59		Brown, moist, stiff, CLAY.			S-5	3 - 3 - 7	18	
58			15					
57								
56								
55								
54		Light brown, moist, stiff, CLAY.			S-6	2 - 7 - 7	18	
53			20					
52								
51								
50								
49		Brown, moist, hard, CLAY.			S-7	11 - 14 - 18	18	
48			25					
47								
46								
45								
44		Brown, moist, hard, CLAY.			S-8	4 - 11 - 26	18	
43			30					
42								
41								
40	⊥							
39		Brown, moist, very stiff, CLAY.			S-9	8 - 12 - 17	18	
38			35					
37								
36								
35		Green, moist, dense, silty SAND (Residual Soil).			S-10	9 - 28 - 4	18	
34			40					
33								
32								
31								
30					S-11	50/0"	0	Auger refusal @ 43.6 feet
29		No sample.						
28			45					
27		Bottom of Boring @ 43.6 ft						
26								
25								
24								

RECORD OF SUBSURFACE EXPLORATION 3532-01 NEW YOUTH DETENTION CENTER.GPJ EBA ENGINEERING INC.GDT 8/25/14

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Baltimore, Maryland 21215

■ = Split Spoon

▽ Water Level At Completion
▼ Water Level After 24 hrs
⊥ Caved Depth At Completion
▨ Caved Depth After 24 hrs

RECORD OF SUBSURFACE EXPLORATION

Project: BCDC Youth Detention Center
Location: Baltimore, Maryland
Job Number: 3532-01
Inspector: Duowen Ding
Boring Method: HSA
Hole Diameter: 8"
Water Level at Completion: NA
Water Level After 24 hrs:

Boring Number: BP-3A
Drilling Company: MDA Drilling Inc.
Driller: Duane Addison
Date Drilled: 07-30-14
Surface Elevation: 73.5' (est)
Hammer Weight/Drop: 140 lb/30 in
Northing: N/A
Easting: N/A

Elevation (ft)	Water/Caved Depth (ft)	Description	Depth (ft)	Sampler	Number	Blows/6"	Recovery (inches)	Remarks
73.5			0					
		See Boring BP-3 for soil description from 1 to 13 feet.						Offset 3 feet east from Boring BP-3.
							22	Collected Shelby Tube sample from 13 to 15 feet.
		Bottom of Boring @ 15.0 ft	15					

RECORD OF SUBSURFACE EXPLORATION 3532-01 NEW YOUTH DETENTION CENTER.GPJ EBA ENGINEERING INC.GDT 8/25/14

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Baltimore, Maryland 21215

☒ = Pushed Tube

Water Level At Completion
Water Level After 24 hrs
Caved Depth At Completion
Caved Depth After 24 hrs

Accurate Infrastructure Data, Inc.
1100 Batavia Farm Rd., Suite 200
Baltimore, MD 21237
Phone: 410-686-5091
Fax: 410-686-5093

TEST HOLE SUMMARY

PROJECT: BCDC YOUTH DETENTION CENTER

CLIENT: EBA ENGINEERING, INC.

A/I/DATA PROJECT NO.: 14139

DATE: AUGUST 7, 2014

(ALL MEASUREMENTS IN DECIMAL FEET)

TH#	UTILITY REQUESTED	UTILITY FOUND	COVER	UTILITY ELEVATION	REMARKS
1	CONCRETE BUILDING FOOTER	CONCRETE BUILDING FOOTER & 6" CAST IRON UNKNOWN PIPE	TOP 9.18 BOT 10.14	TOP 64.07 BOT 63.11	DEPTH TO 6" UNKNOWN PIPE = 8.84

A|I|DATA WHAT'S UNDERGROUND

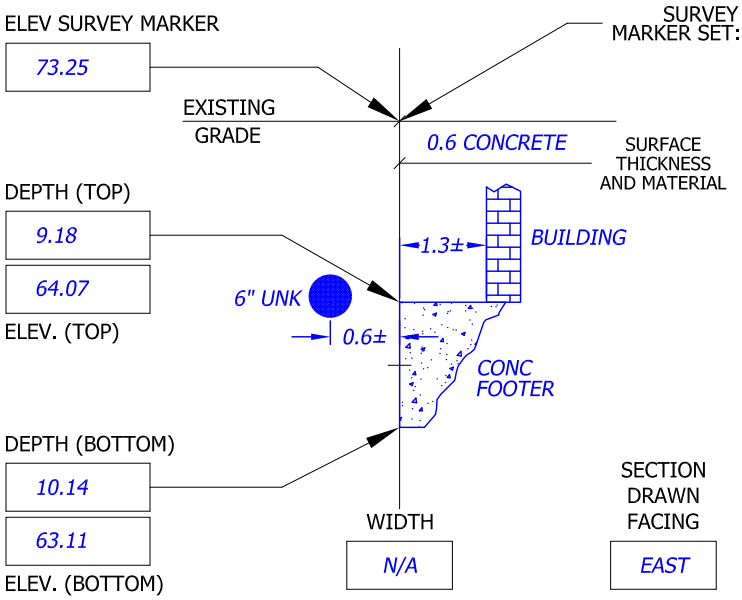
TEST HOLE DATA SHEET

JOB #: 14139 TEST HOLE # : 1

PROJECT NAME:	BCDC YOUTH DETENTION CENTER	EXCAVATION BY:	A/I/DATA DATE DUG: 08/04/2014
PROJECT LOCATION:	BALTIMORE, MARYLAND	FORM BY:	MRB ASSISTED BY: JEM CHECKED BY: JPM
CLIENT NAME:	EBA ENGINEERING, INC.	PAVING CONDITION:	GOOD
UTILITY REQUESTED:	CONCRETE BUILDING FOOTER	GENERAL SOIL CONDITIONS:	SOFT MOIST CLAY ROCKY
UTILITY FOUND:	CONCRETE BUILDING FOOTER	UTILITY CONDITION:	GOOD
		MARKER SURVEYED BY:	A/I/DATA

SECTION VIEW OF TEST HOLE

NOT TO SCALE



CONTROL POINTS PROVIDED BY: EBA ENGINEERING, INC.
ELEVATION= 73.41 FINISHED FLOOR ELEVATION ON TILE FLOOR

A/I/DATA MARKER: ELEVATION
73.25

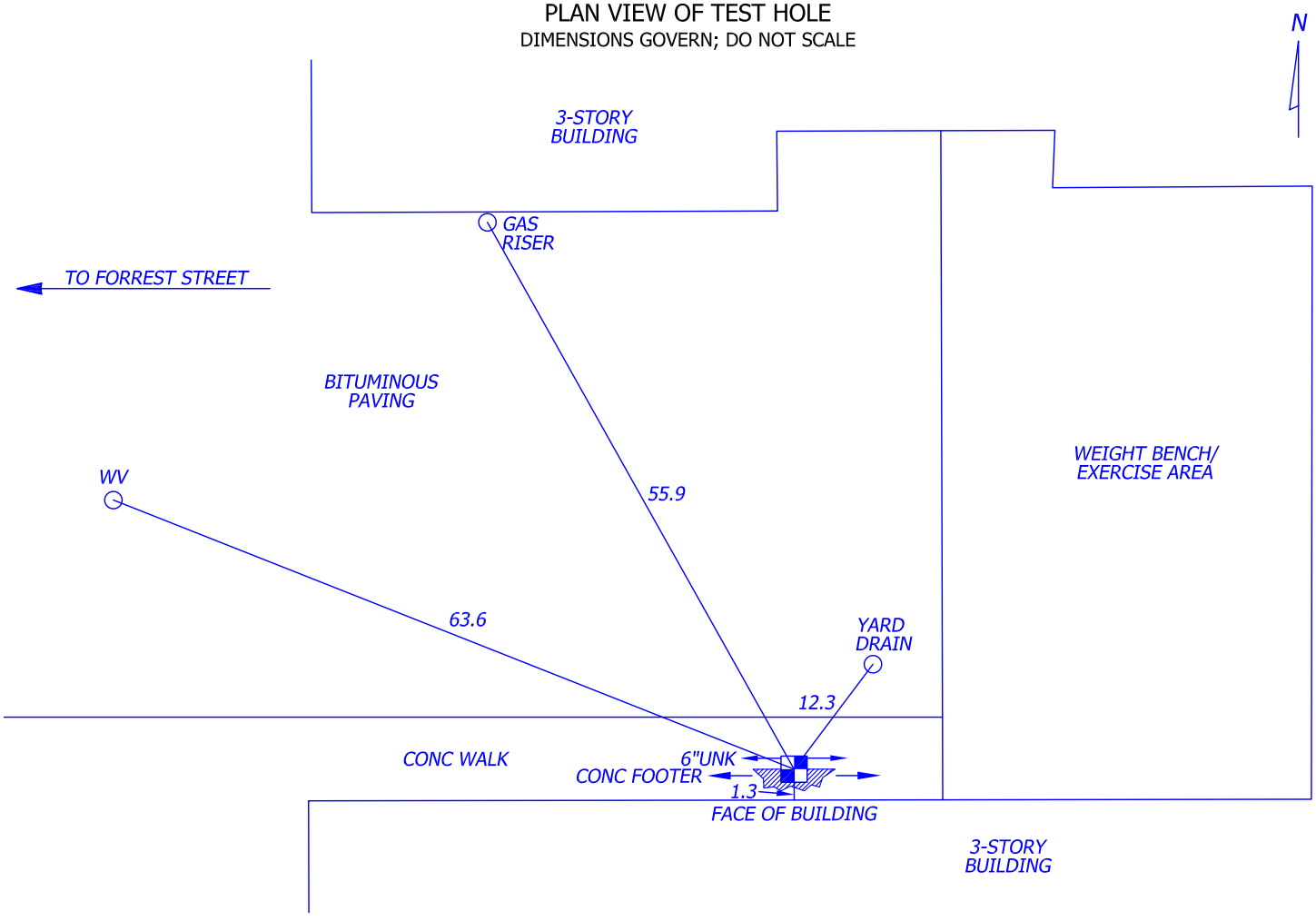
NOTES:
TEST HOLE ALSO EXPOSED A 6" (6.5"OD) CAST IRON UNKNOWN PIPE AT A DEPTH OF 8.84.

ALL MEASUREMENTS ARE SHOWN IN DECIMAL FEET EXCEPT WHERE NOTED

TEST HOLE DATA PRODUCED BY:
ACCURATE INFRASTRUCTURE DATA, INC.
1100 BATAVIA FARM ROAD, SUITE 200, BALTIMORE, MD 21237
PH: 410-686-5091 FAX: 410-686-5093

PLAN VIEW OF TEST HOLE

DIMENSIONS GOVERN; DO NOT SCALE



APPENDIX E

LABORATORY TEST RESULTS

BCDC Youth Detention Center
Baltimore, Maryland

SUMMARY OF LABORATORY SOIL TEST RESULTS
August, 2014

Boring No.	Sample No.	Depth (ft)	Moisture Content (%)	Atterberg Limits		Grain Size Analysis			Modfied Proctor (ASTM D 1557)		Unconfined Compressive Strength (psf)	Consolidation			Soil Classification	
				LL	PI	Gravel (%)	Sand (%)	Silt & Clay (%)	MDD (pcf)	OMC (%)		Cc	Cr	Pc (tsf)	USCS	AASHTO
BP-1A	Bulk	1.0-8.0	4.2	NV	NP	20.3	73.0	6.7	121.1	9.1					SP-SM	
	S-4	8.5-10.0	5.6													
	S-6	18.5-20.0	36.7			0.0	8.5	91.5							CH	A-7-6
	S-7	23.5-25.0	49.4													
	S-8	28.5-30.0	57.6													
	S-9	33.5-35.0	29.6			0.5	72.8	26.7							SC	A-2-7
BP-2	Bulk	1.0-8.0	4.0	NV	NP	30.4	58.7	10.9	136.0	6.1					SP-SM	A-1-b
	S-4	8.5-10.0	4.2													
	S-6	18.5-20.0	26.8													
	S-7	23.5-25.0	21.2			5.9	14.1	80.0							CH	A-7-6
	S-8	28.5-30.0	37.6													
	S-9	33.5-35.0	36.9													
BP-3	Bulk	1.0-8.0	18.7	47	30	0.9	35.7	63.4	125.9	10.6					CL	A-7-6
	S-3	6.0-7.5	17.3													
	S-4	8.5-10.0	19.0	39	23	1.6	38.7	59.7							CL	A-6
	S-5	13.5-15.0	31.4													
	S-6	18.5-20.0	21.0													
	S-7	23.5-25.0	42.4													
	S-8	28.5-30.0	36.3													
BP-3A	PT-1	13.5-15.0	31.8	55	28	0.0	9.1	90.9			1,364	0.27	0.05	2.3	CH	A-7-6

LL: Liquid Limit	USCS: Unified Soil Classification System	
PI: Plastiicty Index	AASHTO: American Association of State Highway and Transportation Officials	
Cc: Consolidation Index	MDD: Maximum Dry Density	
Cr: Rebound Index	OMC: Optimum Moisture Content	
Pc: Preconsolidation Pressure	NV: Non Viscous	NP: Non Plastic

Note: Oven dry liquid limit shown in parentheses, where available

EBA ENGINEERING

Laboratory Soil Corrosion Test Results

Project:	BCDC Youth Detention Center
Client:	PSA-Dewberry & Penza Bailey Architects
EBA Job No.:	3532-01

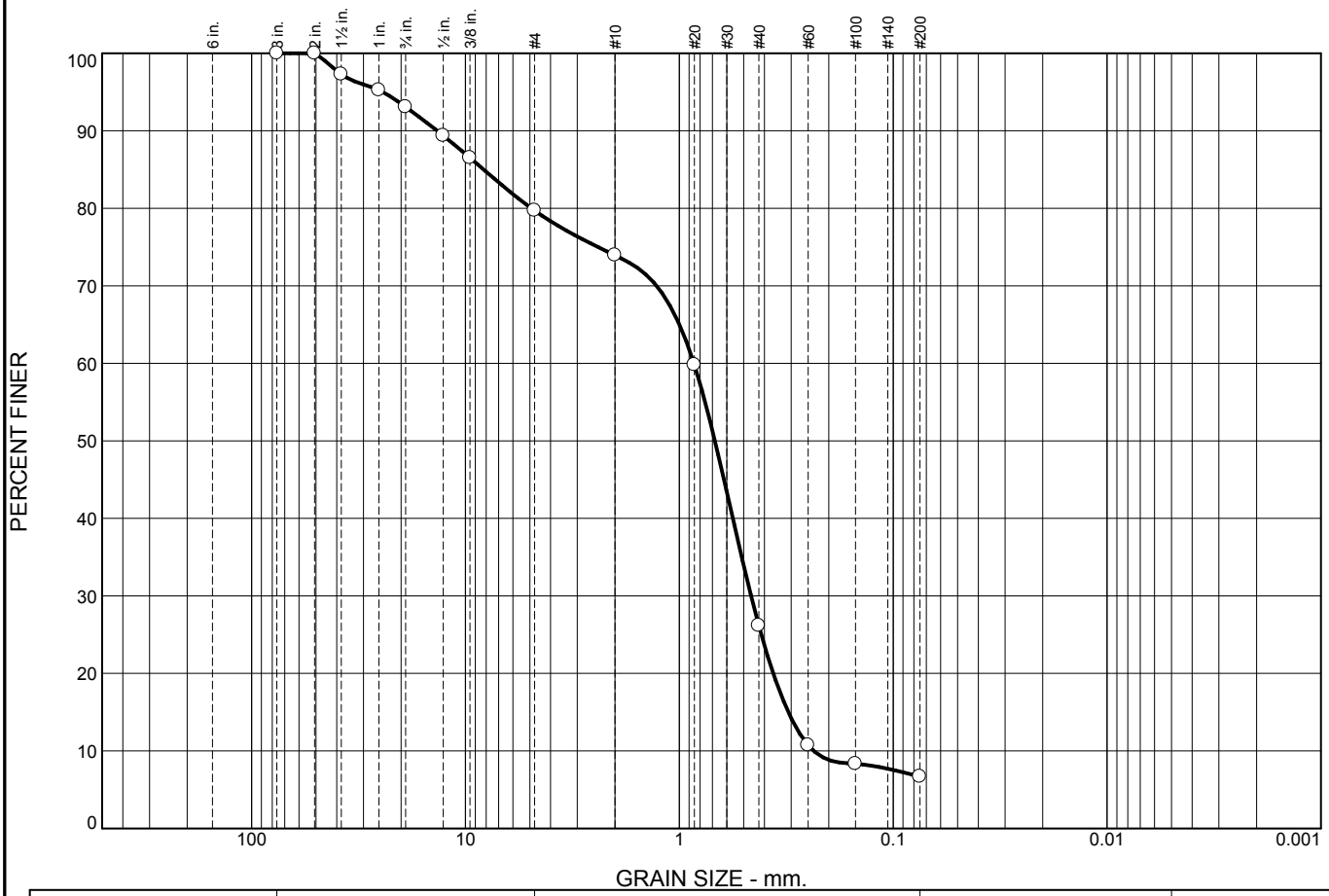
Dates Tested: 8/19/2014

Sample ID/Location	BP-1, S-2 @ 3.5'-5.0'	BP-1A, S-3 @ 6.0'-7.5'	BP-2, S-2 @ 3.5'-5.0'	BP-3, S-2 @ 3.5'-5.0'
Lab Sample Number	1	2	3	4
As Received Resistivity, ohm-cm	7,700	130,000	20,000	10,500
Minimum Resistivity (AASHTO T 288), ohm-cm	2,100	43,000	10,400	3,400
pH (AASHTO T 289)	8.27	8.32	8.06	8.48
Sample Temperature during pH Test, °C	24.2	24.3	24.3	24.5
Oxidation Reduction Potential -ORP in Saturated Condition (ASTM D1498), mV	395	366	352	338
Chloride Ion Concentration in 1:1 Soil/Water Mix, (AASHTO T291, Method B), ppm	12	6	47	27
Sulfate Ion Concentration in 1:3 Soil/Water Mix (AASHTO T290, Method B), ppm	5	<1	6	<1

Tested by: SK

Reviewed by NR

Particle Size Distribution Report



	% +3"	% Gravel	% Sand	% Silt	% Clay
○	0.0	20.3	73.0	6.7	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	NV	NP	8.2221	0.8546	0.6821	0.4619	0.3093	0.2352	1.06	3.63

Material Description	USCS	AASHTO
○ Light brown poorly graded sand with silt and gravel	SP-SM	A-1-b

Project No. 3532-01 **Client:** PSA-Dewberry + Penza-Bailey Architects

Project: BCDC Youth Detention Center

○ **Source of Sample:** BP-1A **Depth:** 1.0'-8.0' **Sample Number:** Bulk

Remarks:

○Moisture content = 4.2%

Date tested: 08/2014

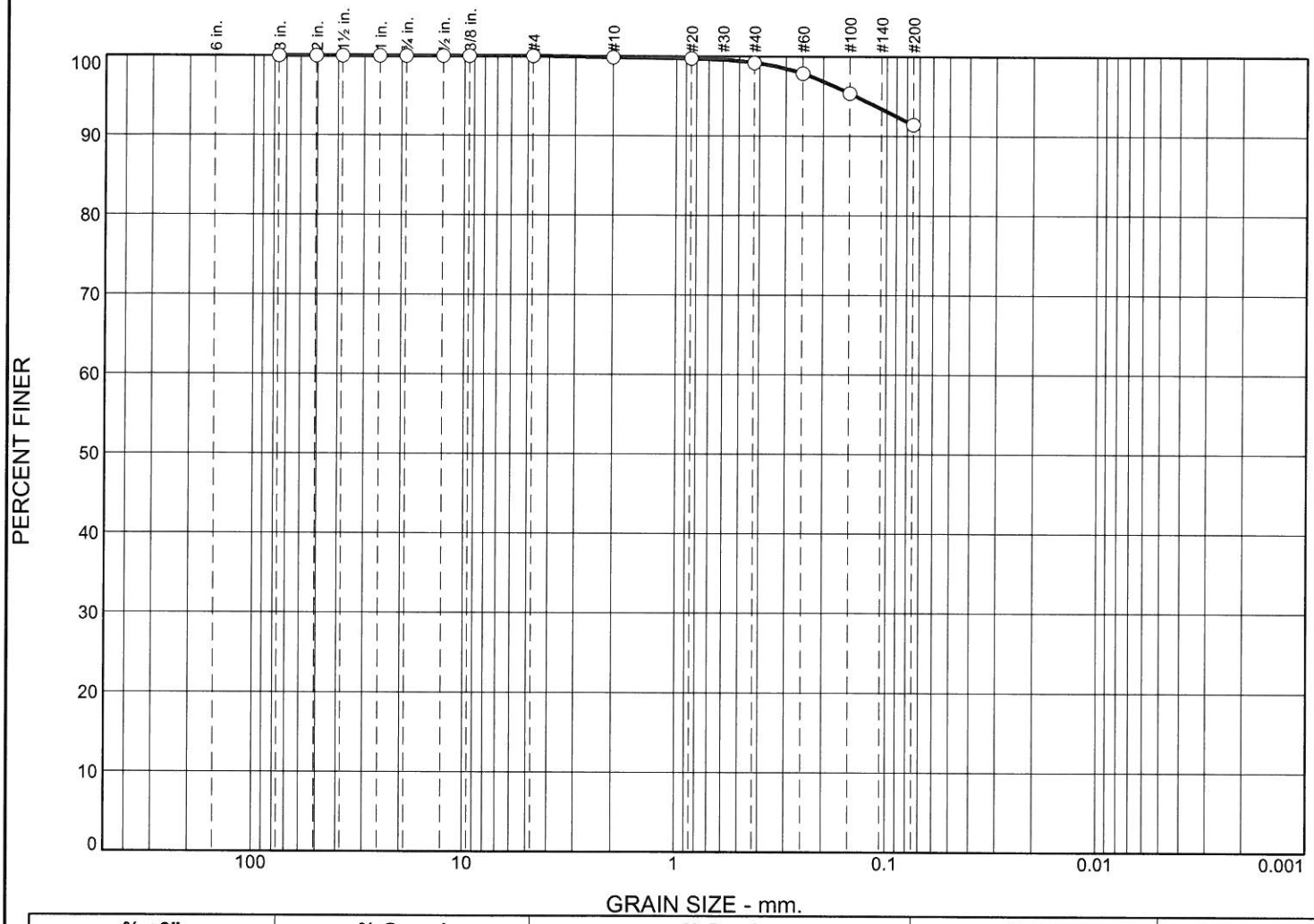
EBA Engineering, Inc.

Baltimore, MD

Figure

Tested By: RD & JB **Checked By:** SK

Particle Size Distribution Report



	% +3"	% Gravel	% Sand	% Silt	% Clay
○	0.0	0.0	8.5	91.5	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	99	29								

Material Description	USCS	AASHTO
○ Reddish brown fat clay	CH	A-7-6(74)

Project No. 3532-01 **Client:** PSA-Dewberry + Penza-Bailey Architects

Project: BCDC Youth Detention Center

○ **Source of Sample:** BP-1A **Depth:** 18.5'-20.0' **Sample Number:** S-6

Remarks:

○ Moisture content = 36.7%

Date tested: 08/2014

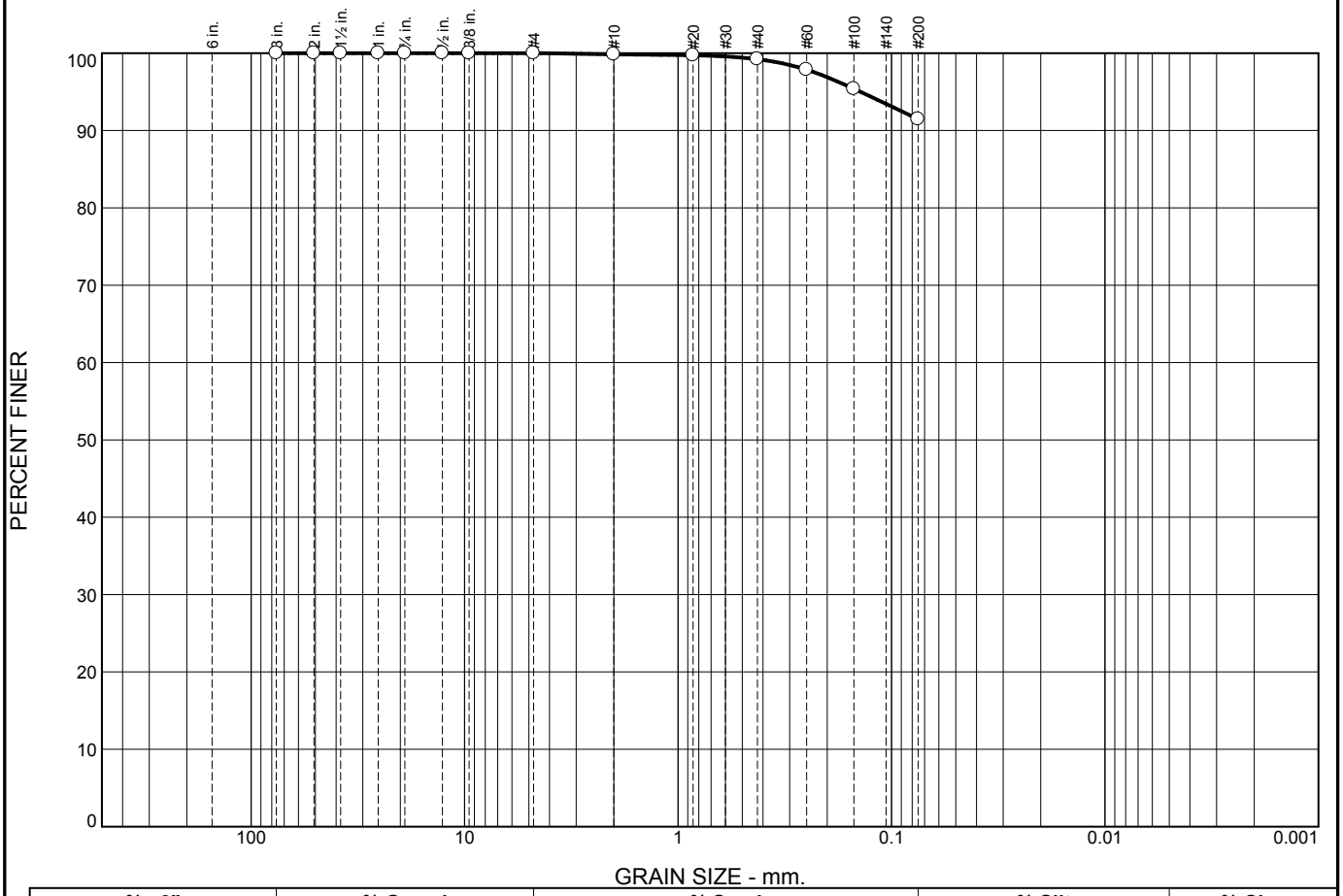
EBA Engineering, Inc.

Baltimore, MD

Figure

Tested By: RD **Checked By:** SK

Particle Size Distribution Report



	% +3"	% Gravel	% Sand	% Silt	% Clay
○	0.0	0.0	8.5	91.5	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	99	29								

Material Description	USCS	AASHTO
○ Reddish brown fat clay	CH	A-7-6(74)

Project No. 3532-01 **Client:** PSA-Dewberry + Penza-Bailey Architects

Project: BCDC Youth Detention Center

○ **Source of Sample:** BP-1A **Depth:** 18.5'-20.0' **Sample Number:** S-6

Remarks:

○Moisture content =

Date tested: 08/2014

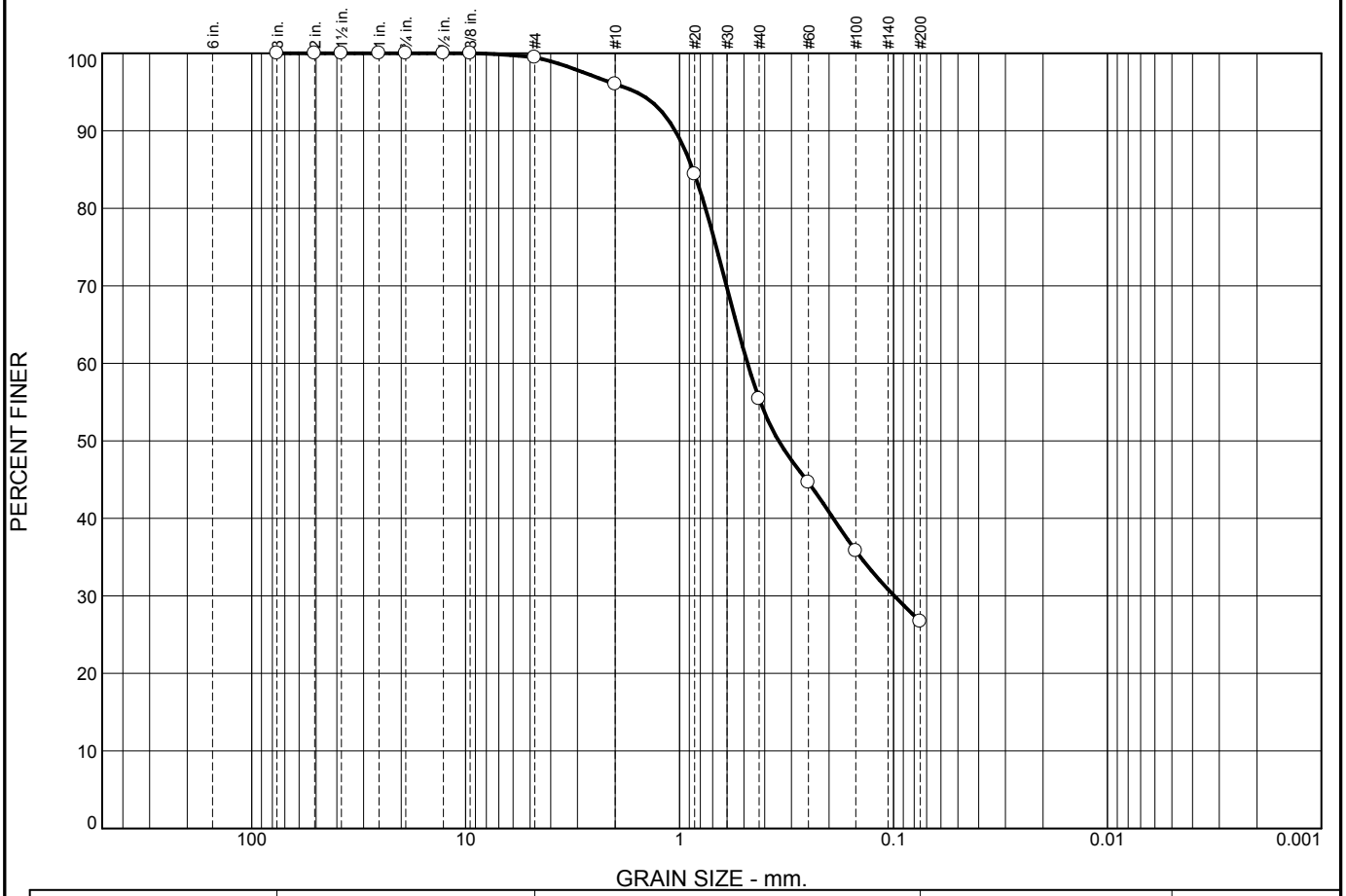
EBA Engineering, Inc.

Baltimore, MD

Figure

Tested By: RD **Checked By:** SK

Particle Size Distribution Report



	% +3"	% Gravel	% Sand	% Silt	% Clay
○	0.0	0.5	72.8	26.7	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	52	22	0.8658	0.4813	0.3444	0.0992				

Material Description	USCS	AASHTO
○ Green clayey sand	SC	A-2-7(2)

Project No. 3532-01 **Client:** PSA-Dewberry + Penza-Bailey Architects

Project: BCDC Youth Detention Center

○ **Source of Sample:** BP-1A **Depth:** 33.5' - 35.0' **Sample Number:** S-9

Remarks:

○Moisture content = 29.6%

Date tested: 08/2014

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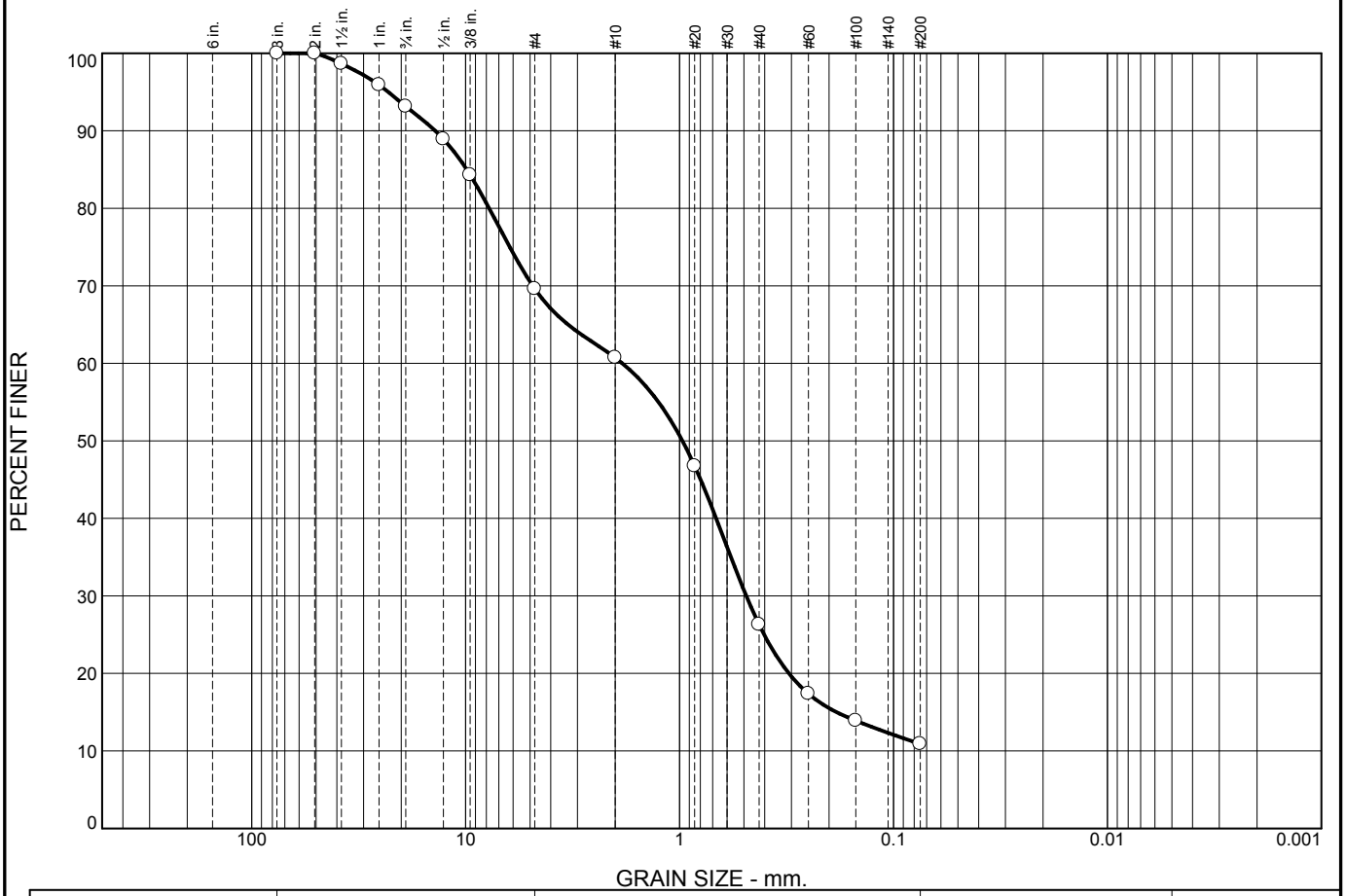
Baltimore, MD

Figure

Tested By: RD **Checked By:** SK

Particle Size Distribution Report



	% +3"	% Gravel	% Sand	% Silt	% Clay
○	0.0	30.4	58.7	10.9	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	NV	NP	9.8819	1.8514	0.9696	0.4877	0.1847			

Material Description	USCS	AASHTO
○ Reddish brown poorly graded sand with silt and gravel	SP-SM	A-1-b

Project No. 3532-01 **Client:** PSA-Dewberry + Penza-Bailey Architects

Project: BCDC Youth Detention Center

○ **Source of Sample:** BP-2 **Depth:** 1.0'-8.0' **Sample Number:** Bulk

Remarks:

○Moisture content = 4.0%

Date tested: 08/2014

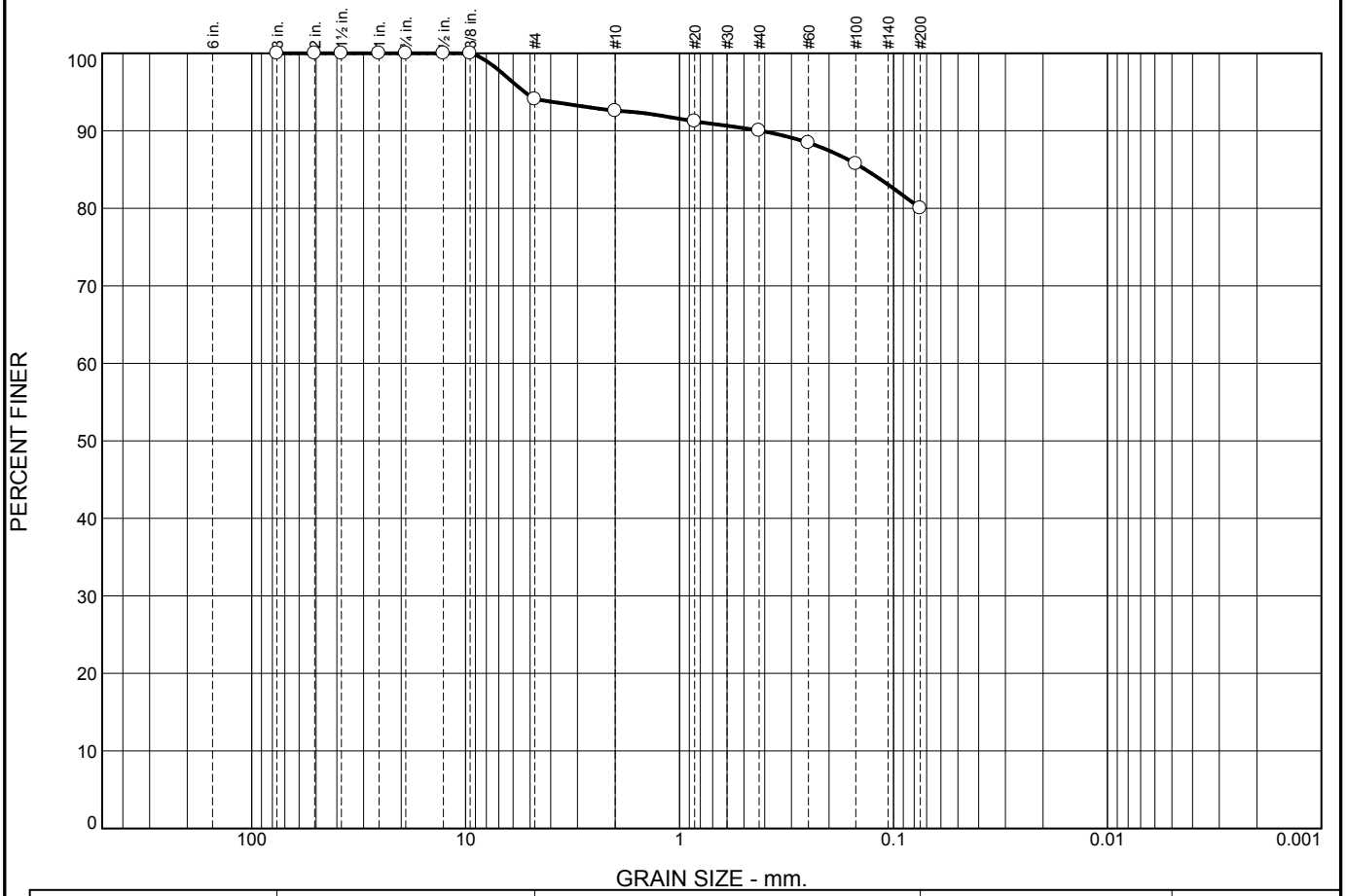
EBA Engineering, Inc.

Baltimore, MD

Figure

Tested By: RD & SC **Checked By:** SK

Particle Size Distribution Report



	% +3"	% Gravel	% Sand	% Silt	% Clay
○	0.0	5.9	14.1	80.0	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	57	18	0.1353							

Material Description	USCS	AASHTO
○ Reddish brown fat clay with sand	CH	A-7-6(32)

Project No. 3532-01 **Client:** PSA-Dewberry + Penza-Bailey Architects

Project: BCDC Youth Detention Center

○ **Source of Sample:** BP-2 **Depth:** 23.5'-25.0' **Sample Number:** S-7

Remarks:

○Moisture content = 21.2%

Date tested: 08/2014

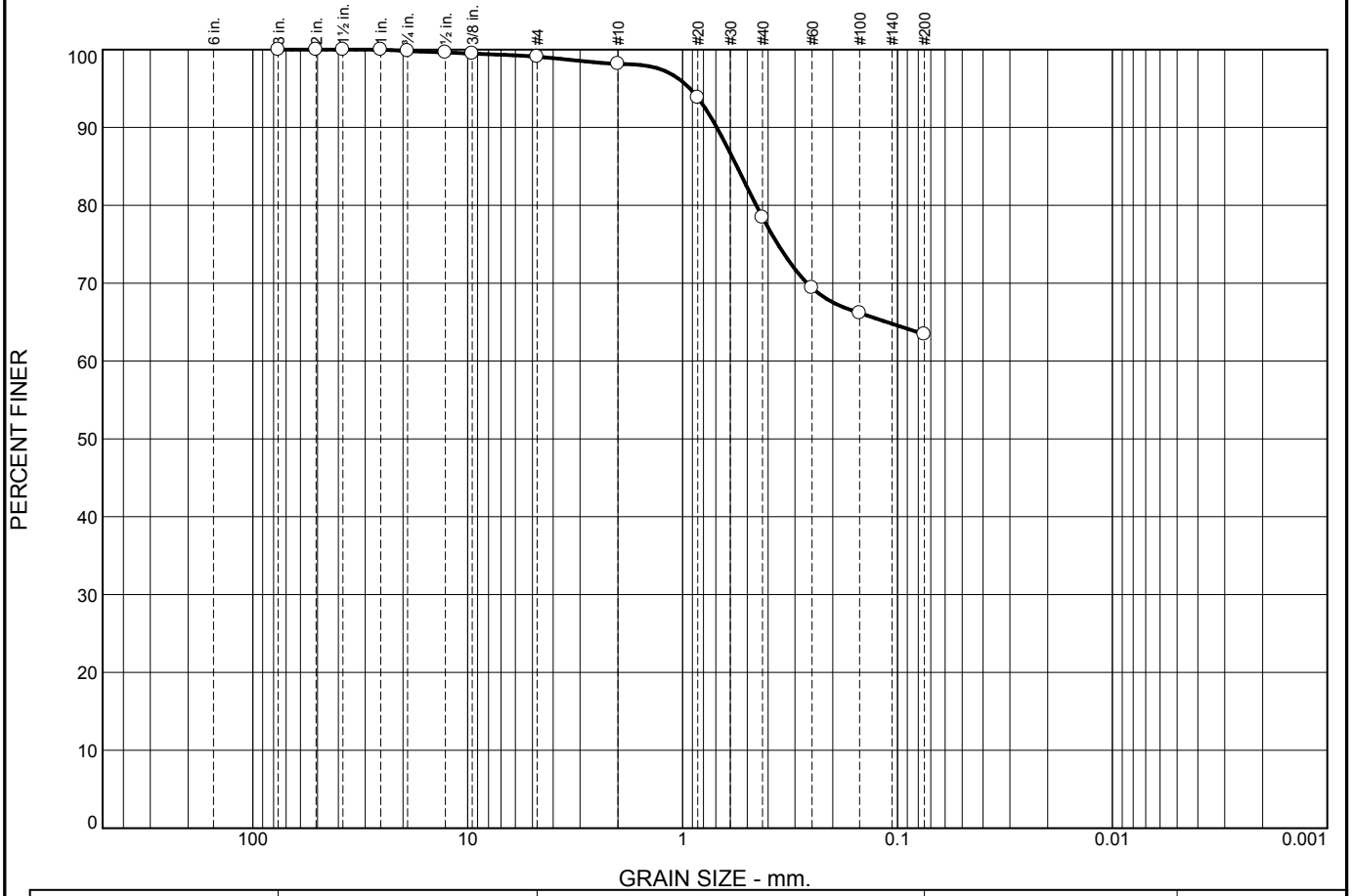
EBA Engineering, Inc.

Baltimore, MD

Figure

Tested By: RD **Checked By:** SK

Particle Size Distribution Report



	% +3"	% Gravel	% Sand	% Silt	% Clay
○	0.0	0.9	35.7	63.4	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	47	17	0.5588							

Material Description	USCS	AASHTO
○ Gray / brown sandy lean clay	CL	A-7-6(16)

Project No. 3532-01 **Client:** PSA-Dewberry + Penza-Bailey Architects

Project: BCDC Youth Detention Center

○ **Source of Sample:** BP-3 **Depth:** 1.0'-8.0' **Sample Number:** Bulk

EBA Engineering, Inc.

Baltimore, MD

Remarks:

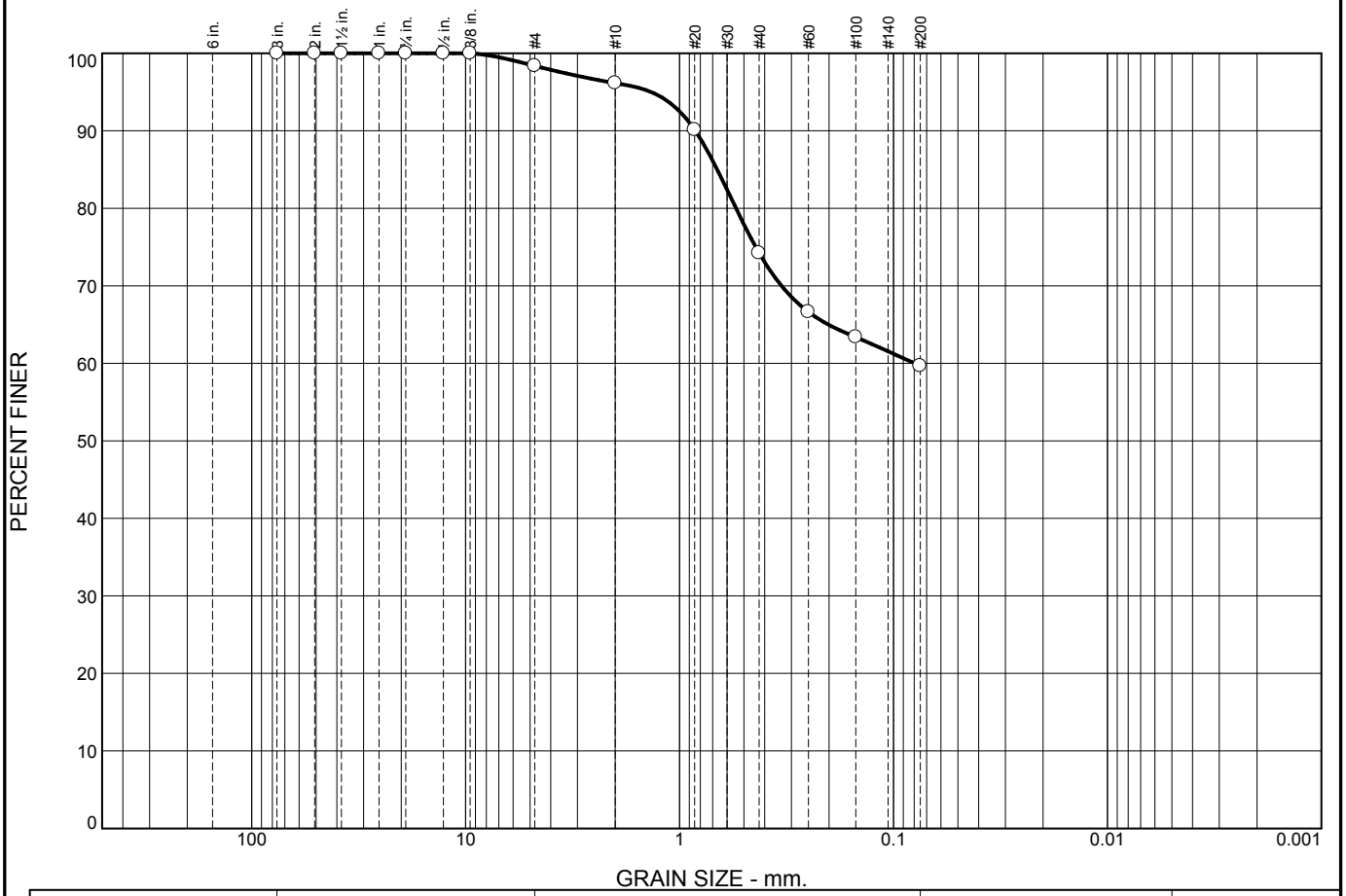
○Moisture content = 18.7%

Date tested: 08/2014

Figure

Tested By: RD **Checked By:** SK

Particle Size Distribution Report



	% +3"	% Gravel	% Sand	% Silt	% Clay
○	0.0	1.6	38.7	59.7	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	39	16	0.6670	0.0797						

Material Description	USCS	AASHTO
○ Reddish brown sandy lean clay	CL	A-6(11)

Project No. 3532-01 **Client:** PSA-Dewberry + Penza-Bailey Architects

Project: BCDC Youth Detention Center

○ **Source of Sample:** BP-3 **Depth:** 8.5'-10.0' **Sample Number:** S-4

Remarks:

○Moisture content = 19.0%

Date tested: 08/2014

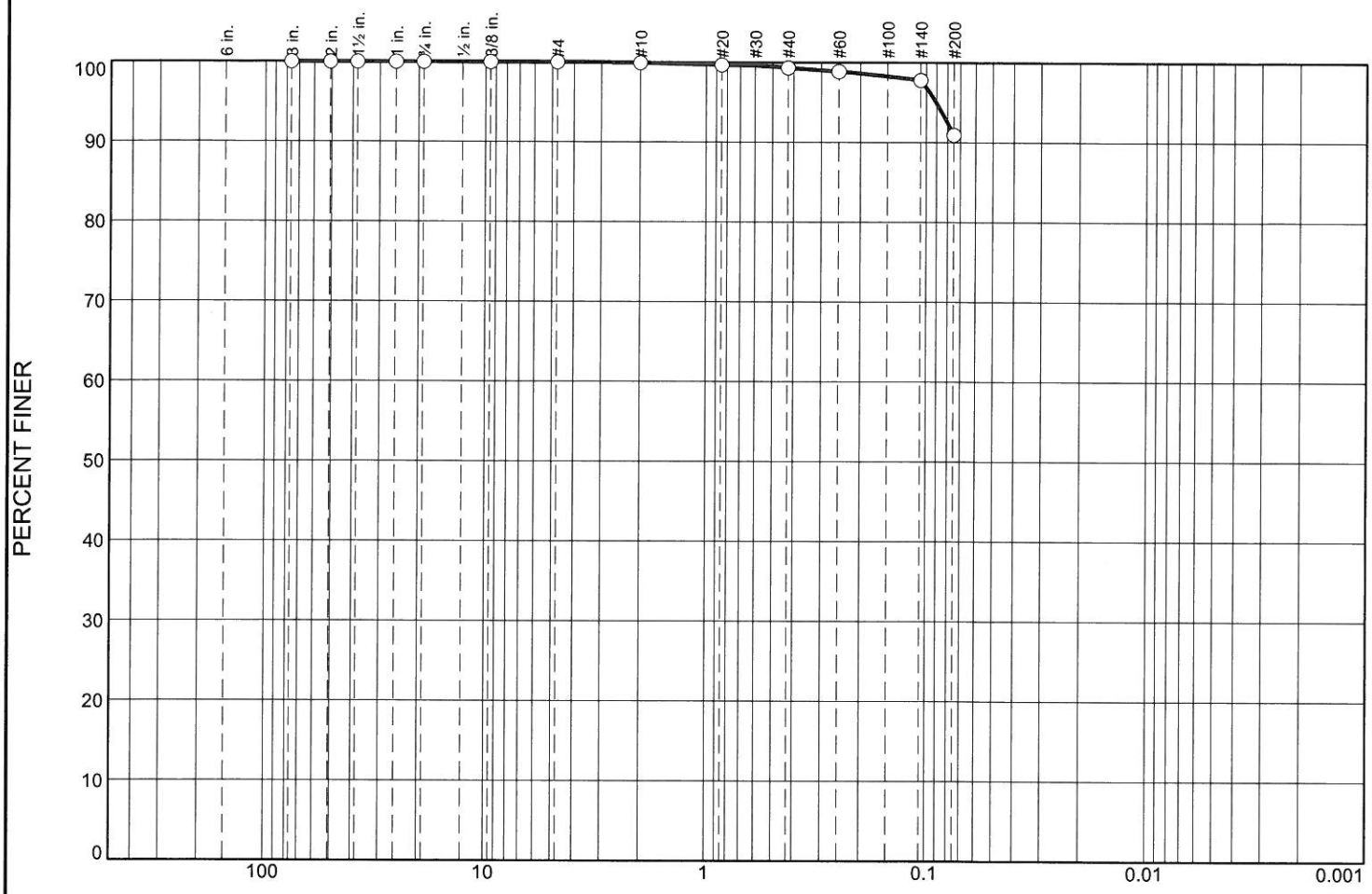
EBA Engineering, Inc.

Baltimore, MD

Figure

Tested By: RD **Checked By:** SK

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.1	0.6	8.4	90.9	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	55	28								

Material Description	USCS	AASHTO
○ Mottled red, brown and tan fat clay	CH	A-7-6(28)

Project No. 3532-01 **Client:** Dewberry/PBA

Project: New Youth Detention Center

○ **Location:** B-3 **Depth:** 13.0'-15.0' **Sample Number:** PT-1

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Baltimore, MD

Remarks:

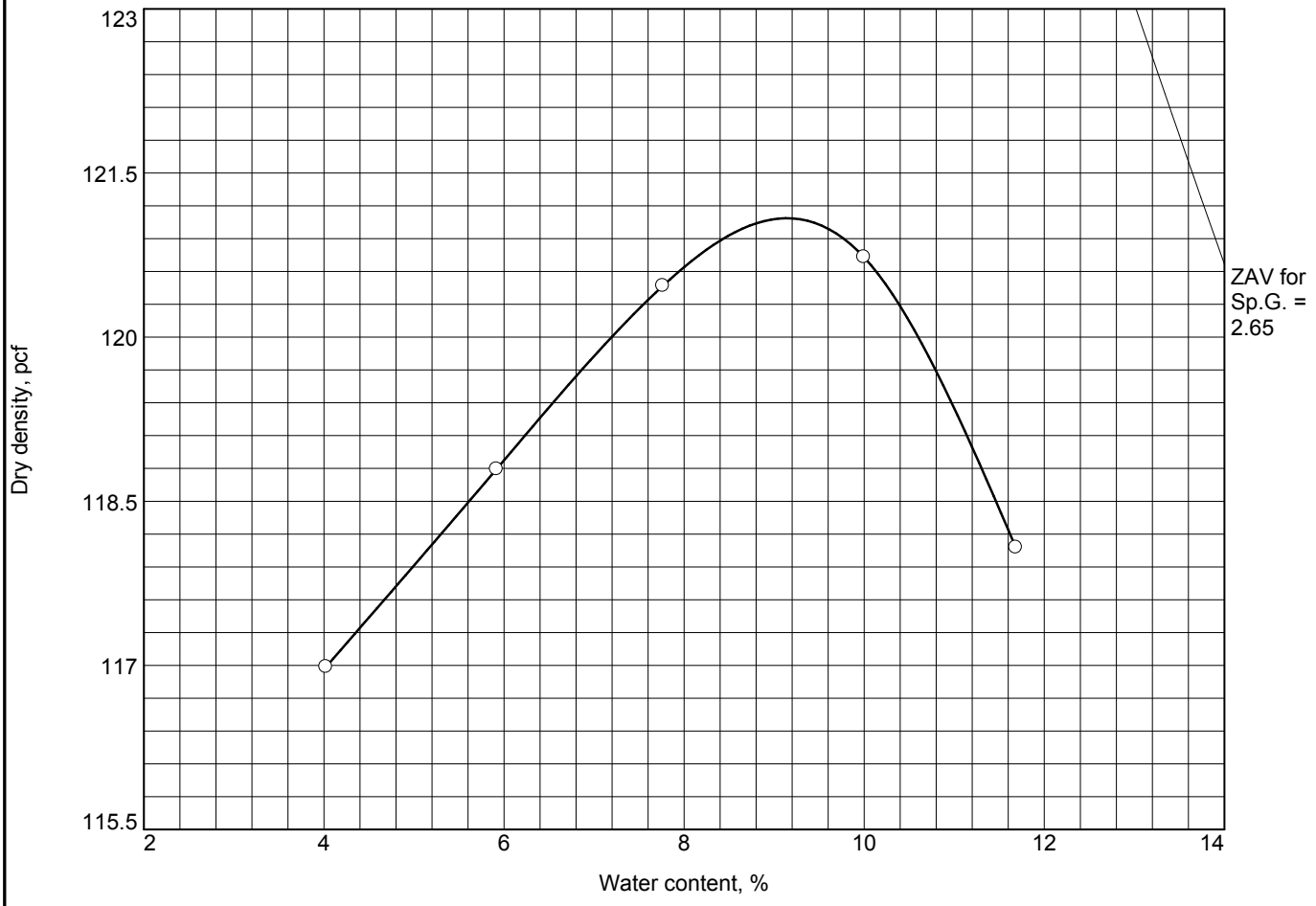
○ Moisture content = 31.8%

Date tested: 08/2014

Figure

Tested By: RD **Checked By:** SK

COMPACTION TEST REPORT



Test specification: ASTM D 1557-00 Method B Modified

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in.	% < No.200
	USCS	AASHTO						
1.0'-8.0'	SP-SM	A-1-b	4.2	2.650	NV	NP	13.5	6.7

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 121.1 pcf Optimum moisture = 9.1 %	Light brown poorly graded sand with silt and gravel

Project No. 3532-01 **Client:** PSA-Dewberry + Penza-Bailey Architects

Project: BCDC Youth Detention Center

○**Source of Sample:** BP-1A **Sample Number:** Bulk

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Baltimore, MD

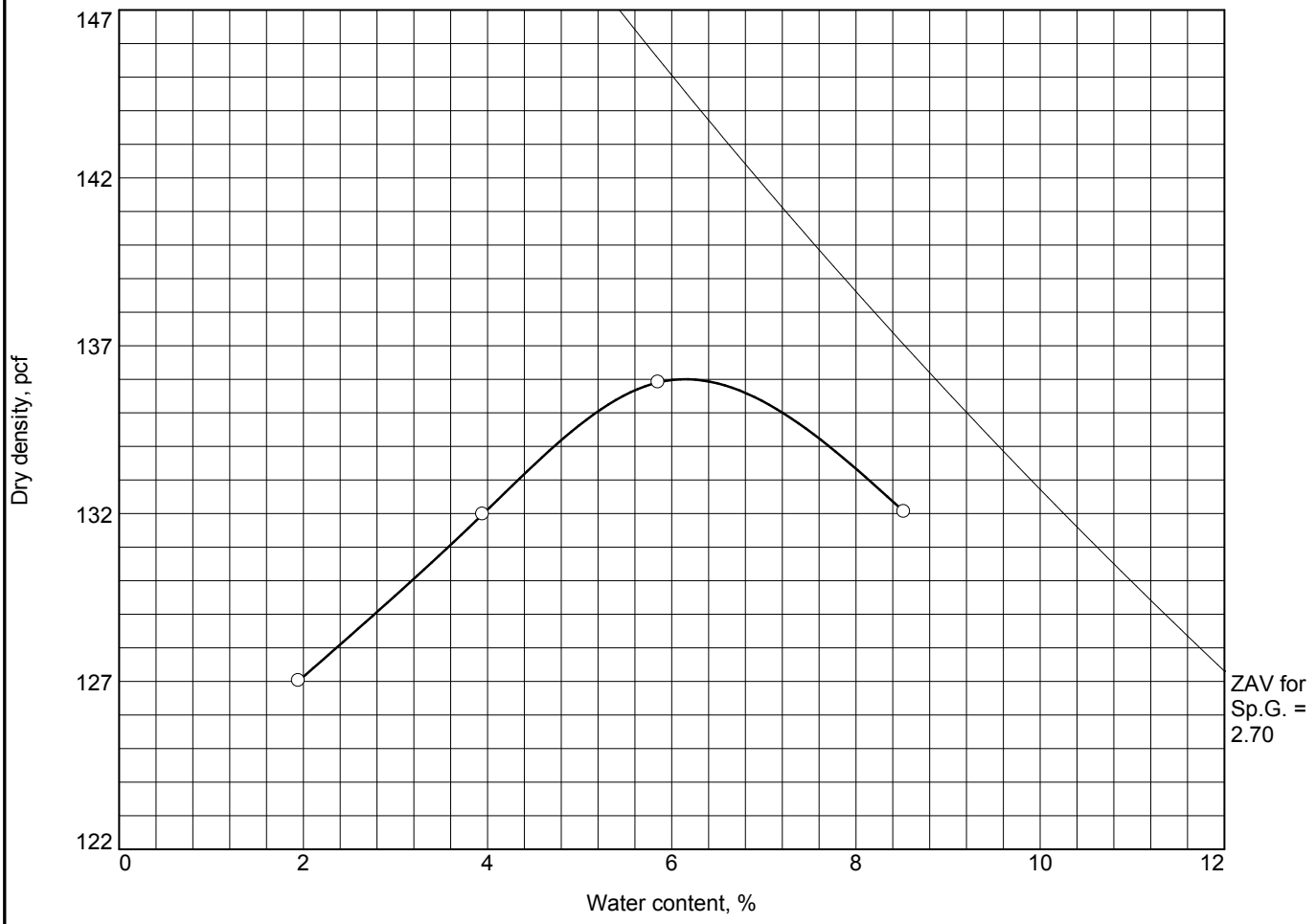
Remarks:

Specific gravity assumed
Date tested: 08/2014

Figure

Tested By: SB **Checked By:** SK

COMPACTION TEST REPORT



Test specification: ASTM D 1557-00 Method B Modified

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in.	% < No.200
	USCS	AASHTO						
1.0'-8.0'	SP-SM	A-1-b	4.0	2.700	NV	NP	15.7	10.9

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 136.0 pcf Optimum moisture = 6.1 %	Reddish brown poorly graded sand with silt and gravel

Project No. 3532-01 **Client:** PSA-Dewberry + Penza-Bailey Architects

Project: BCDC Youth Detention Center

○**Source of Sample:** BP-2 **Sample Number:** Bulk

EBA Engineering, Inc.

Baltimore, MD

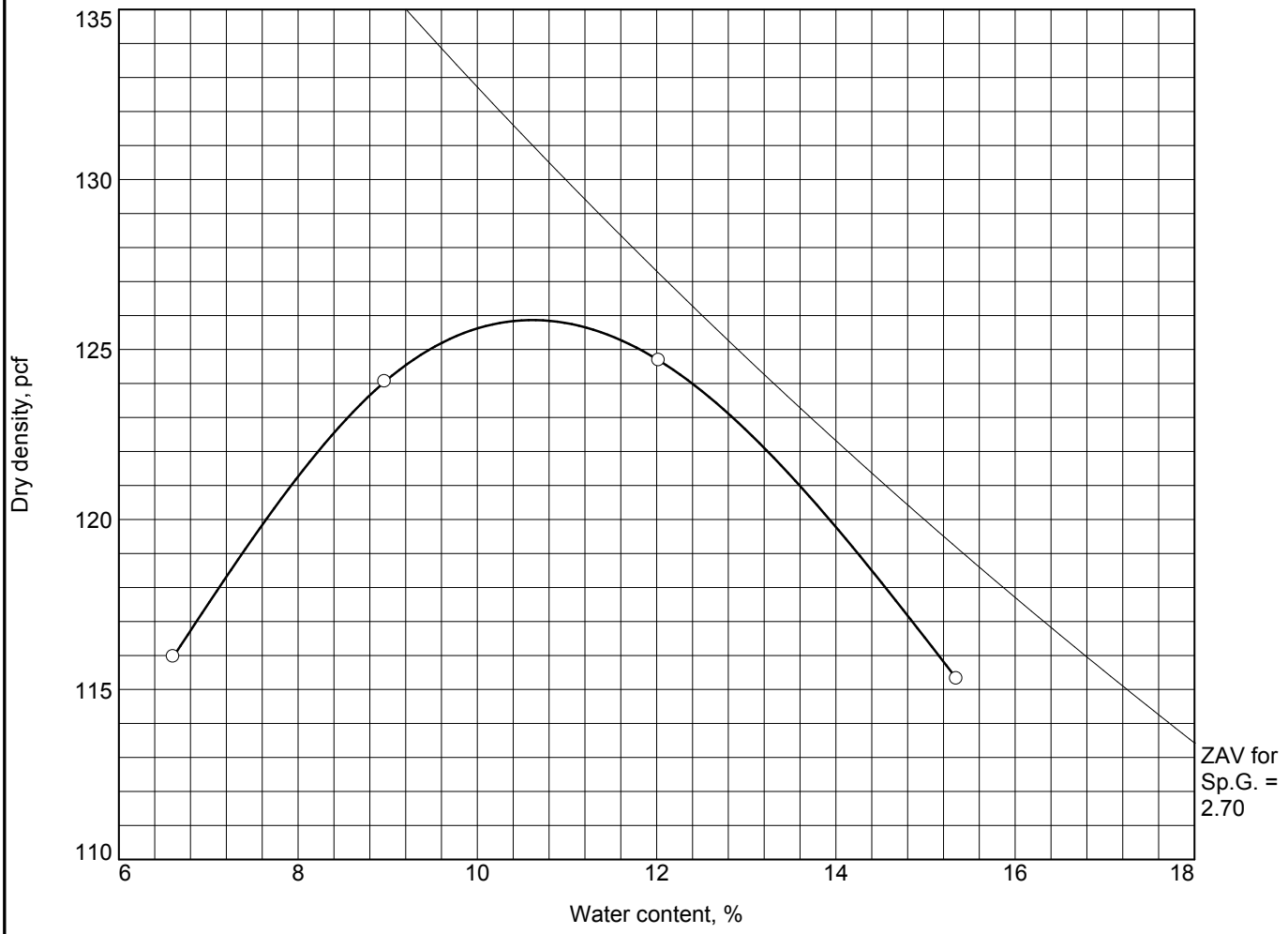
Remarks:

Specific gravity assumed
Date tested: 08/2014

Figure

Tested By: SC **Checked By:** SK

COMPACTION TEST REPORT



Test specification: ASTM D 1557-00 Method B Modified

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in.	% < No.200
	USCS	AASHTO						
1.0'-8.0'	CL	A-7-6(16)	18.7	2.700	47	30	0.5	63.4

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 125.9 pcf Optimum moisture = 10.6 %	Gray / brown sandy lean clay

Project No. 3532-01 **Client:** PSA-Dewberry + Penza-Bailey Architects

Project: BCDC Youth Detention Center

○**Source of Sample:** BP-3 **Sample Number:** Bulk

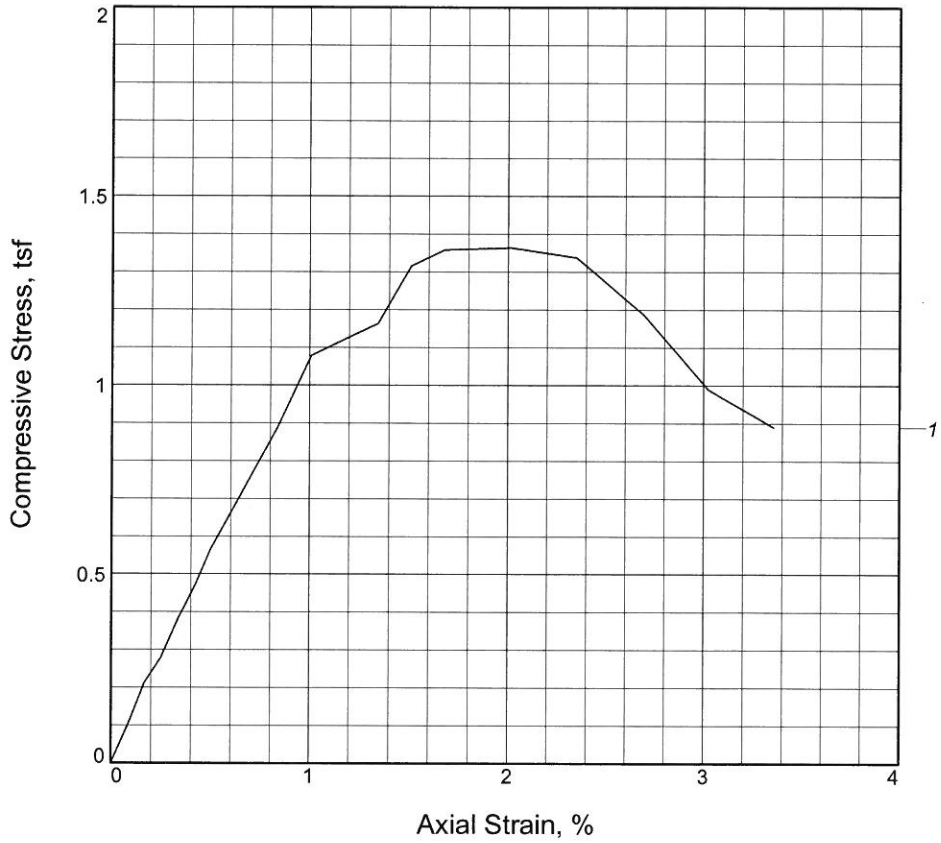
Remarks:

EBA Engineering, Inc.

Baltimore, MD

Figure

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, tsf	1.364			
Undrained shear strength, tsf	0.682			
Failure strain, %	2.0			
Strain rate, in./min.	0.05			
Water content, %	24.6			
Wet density, pcf	124.5			
Dry density, pcf	99.9			
Saturation, %	96.8			
Void ratio	0.6875			
Specimen diameter, in.	2.85			
Specimen height, in.	5.96			
Height/diameter ratio	2.09			

Description: Mottled red, brown and tan fat clay

LL = 55	**PL =** 28	**PI =** 27	**Assumed GS=** 2.700	**Type:** Undisturbed: Shelby Tube

Project No.: 3532-01
Date Sampled:
Remarks:
Date tested: 08/07/2014

Figure _____

Client: Dewberry/PBA

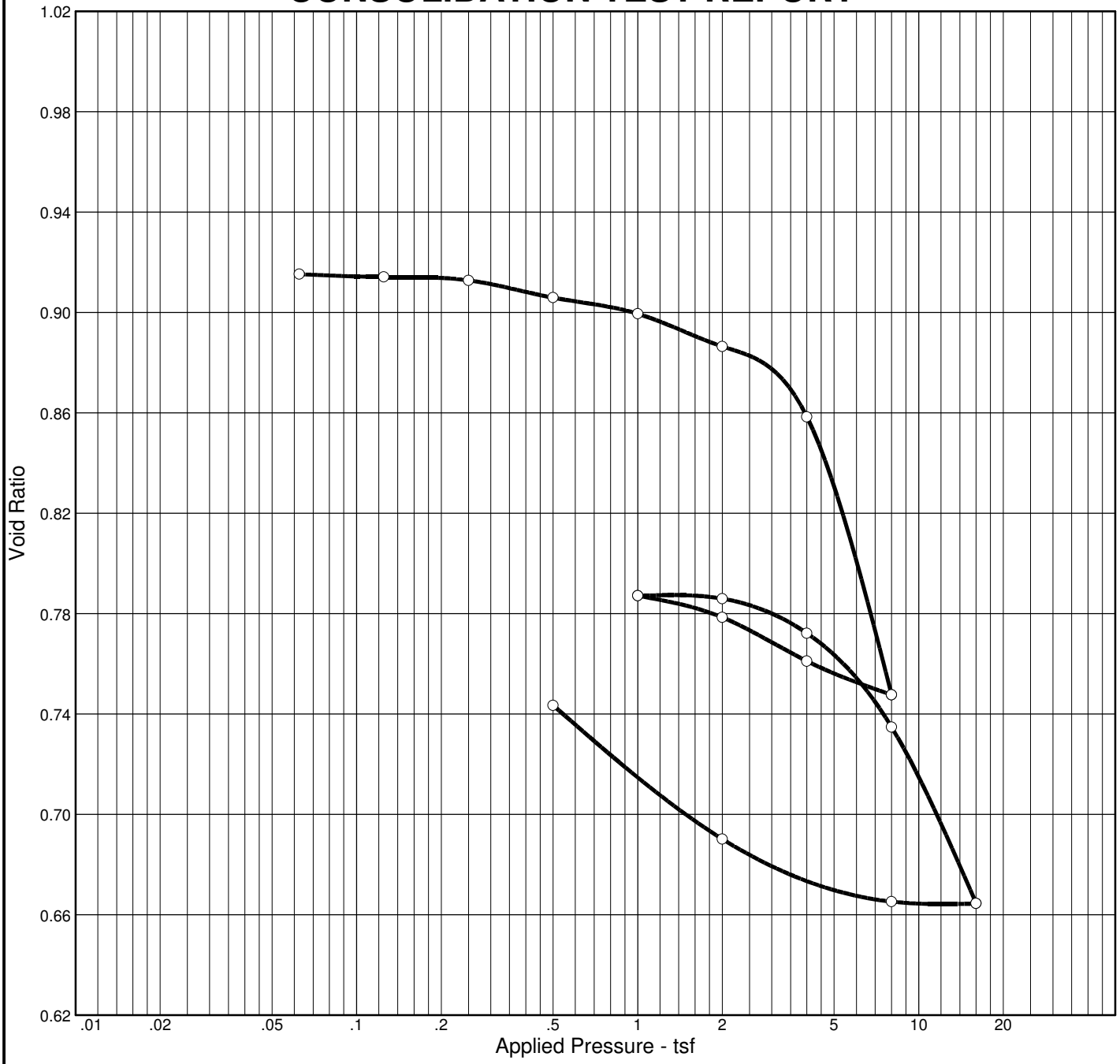
Project: New Youth Detention Center

Location: B-3
Sample Number: PT-1 **Depth:** 13.0'-15.0'

UNCONFINED COMPRESSION TEST
EBA Engineering, Inc.
Baltimore, MD

Tested By: SK **Checked By:** NR

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
93.6 %	32.0 %	87.3	55	27	2.680	0.86	2.31	0.27	0.05	0.916

MATERIAL DESCRIPTION	USCS	AASHTO
Mottled red, brown and tan fat clay	CH	A-7-6(28)

Project No. 3532-01 **Client:** Dewberry/PBA

Project: New Youth Detention Center

Location: B-3

EBA Engineering, Inc.

Baltimore, MD

Remarks:

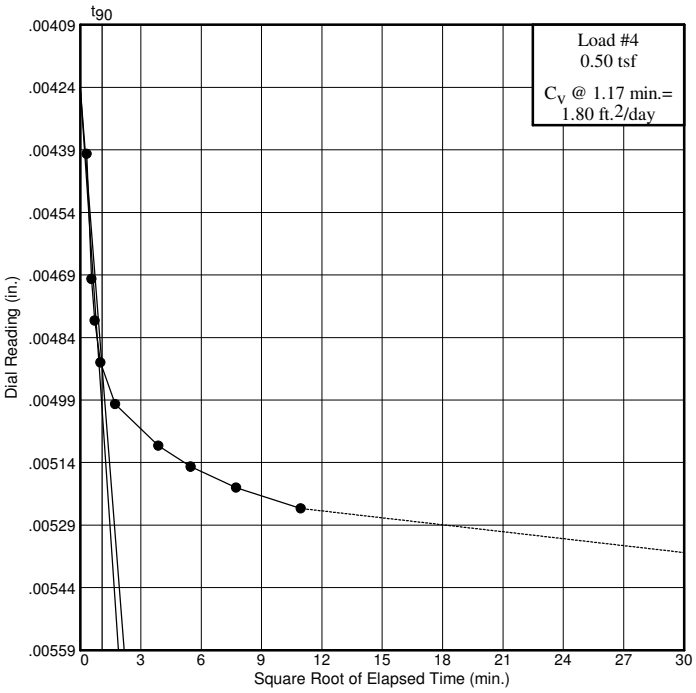
Specfic gravity assumed
Tested by: S.K
Checked by: N.R

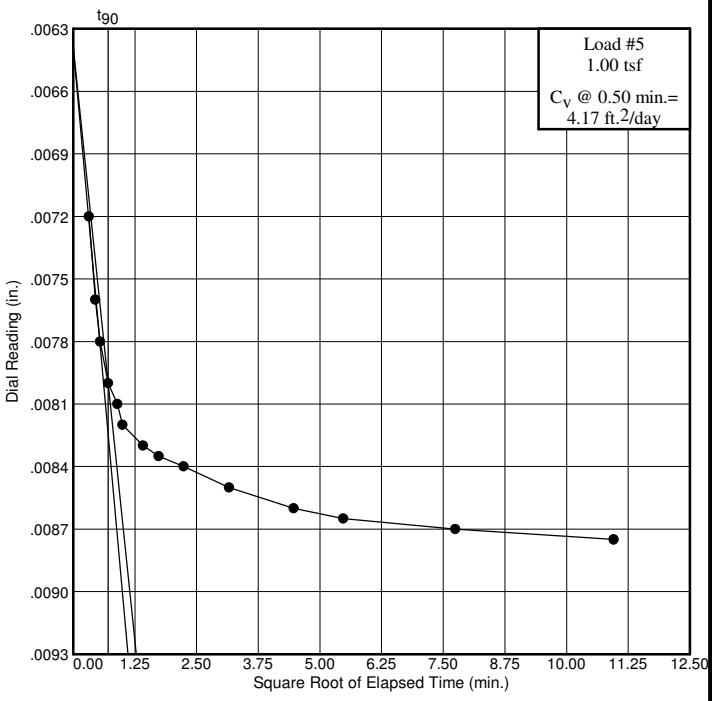
Figure

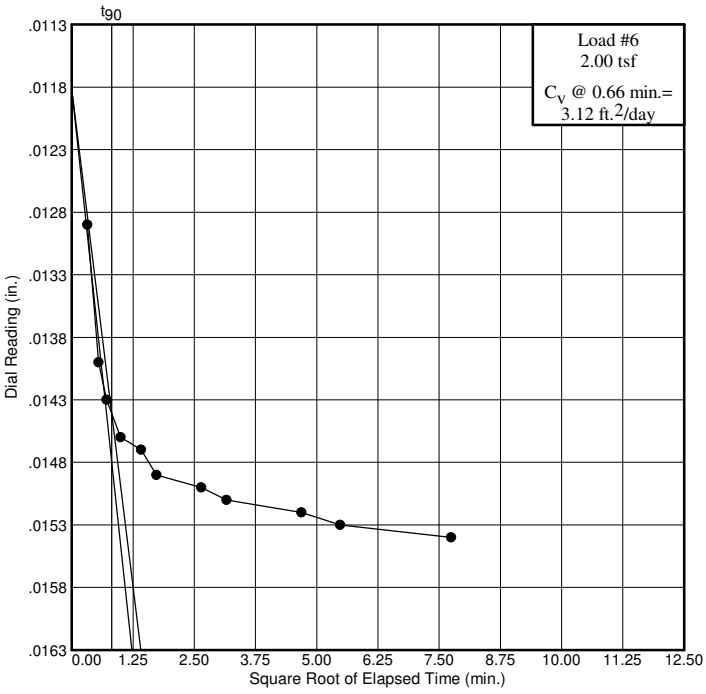
Dial Reading vs. Time

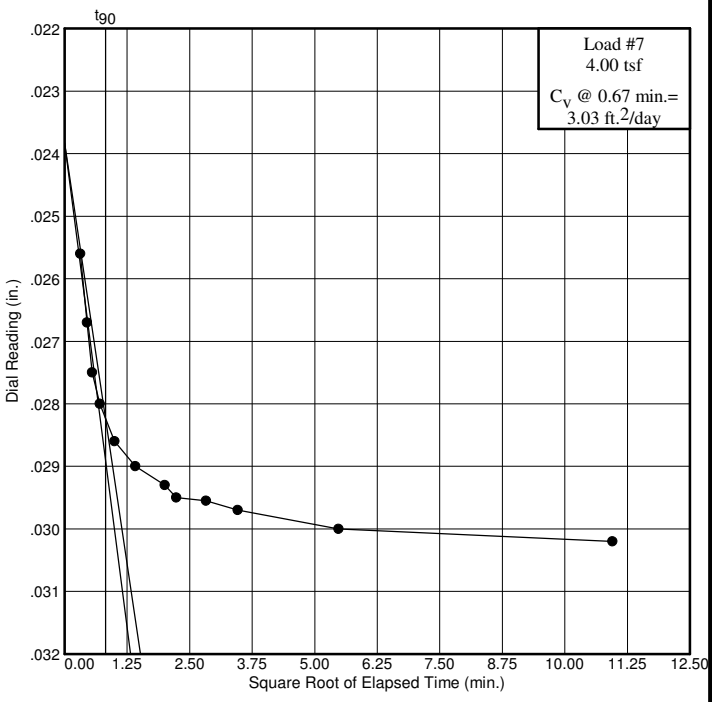
Project No.: 3532-01
Project: New Youth Detention Center

Location: B-3









EBA Engineering, Inc.

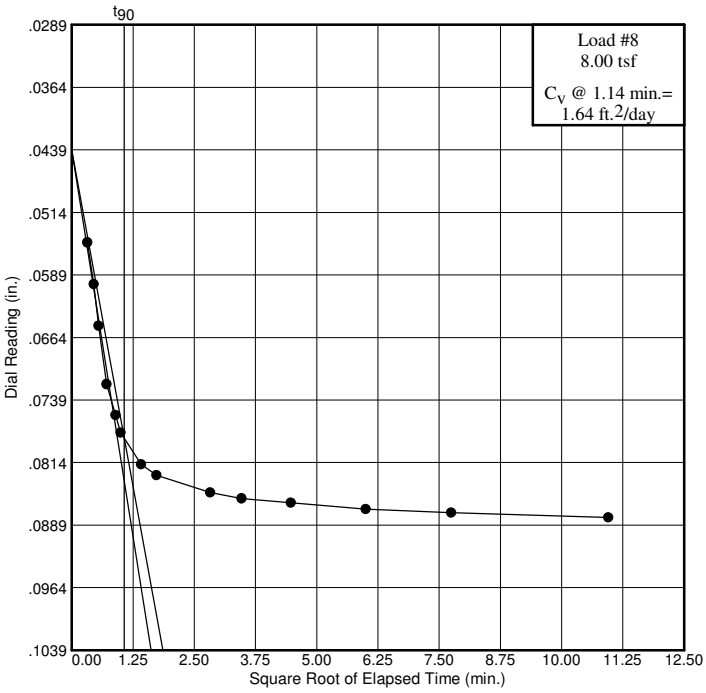
Baltimore, MD

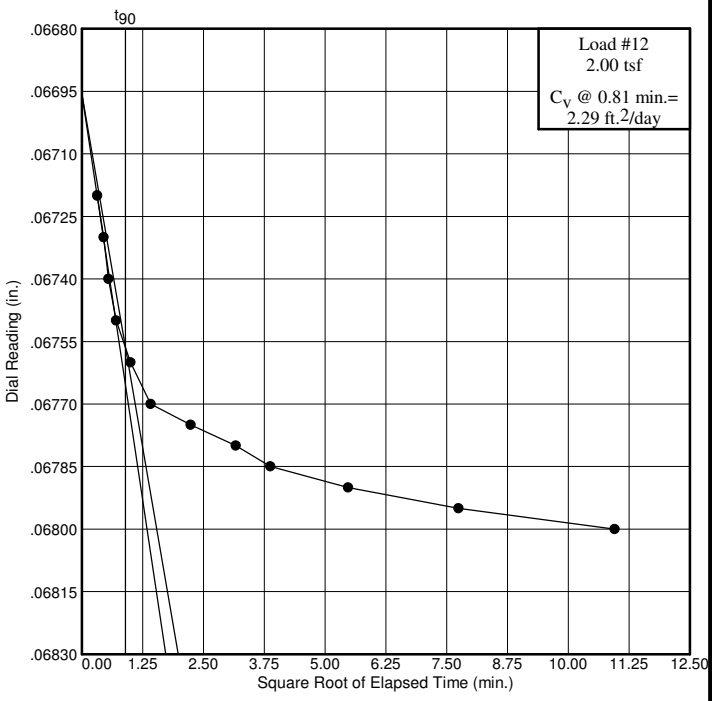
Figure

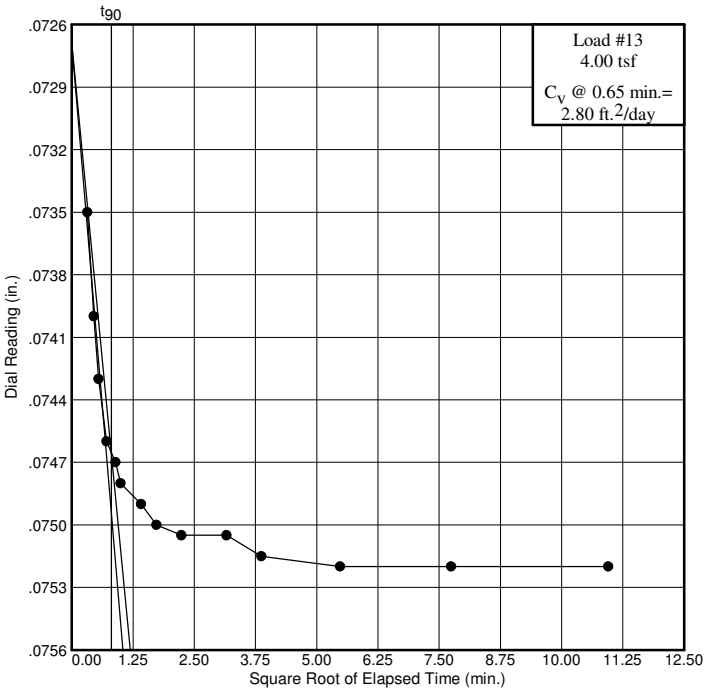
Dial Reading vs. Time

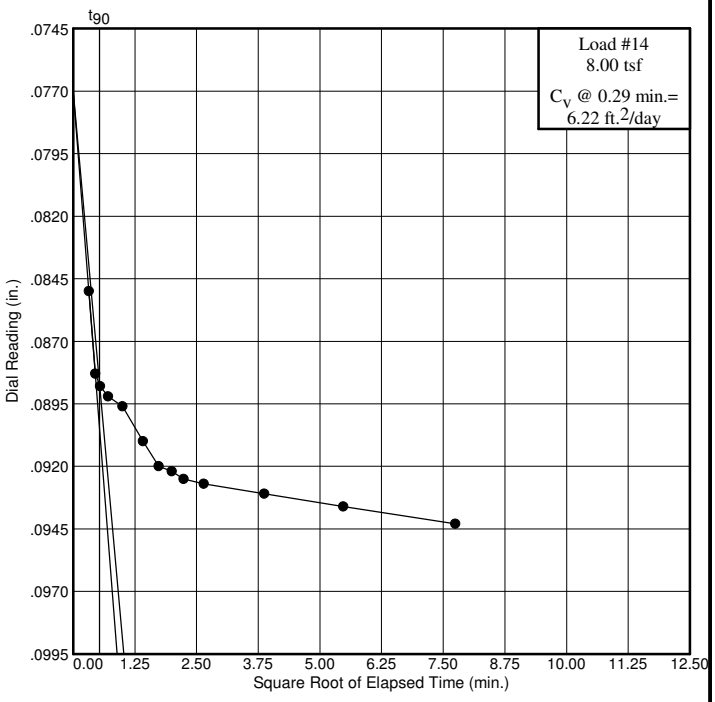
Project No.: 3532-01
Project: New Youth Detention Center

Location: B-3









EBA Engineering, Inc.

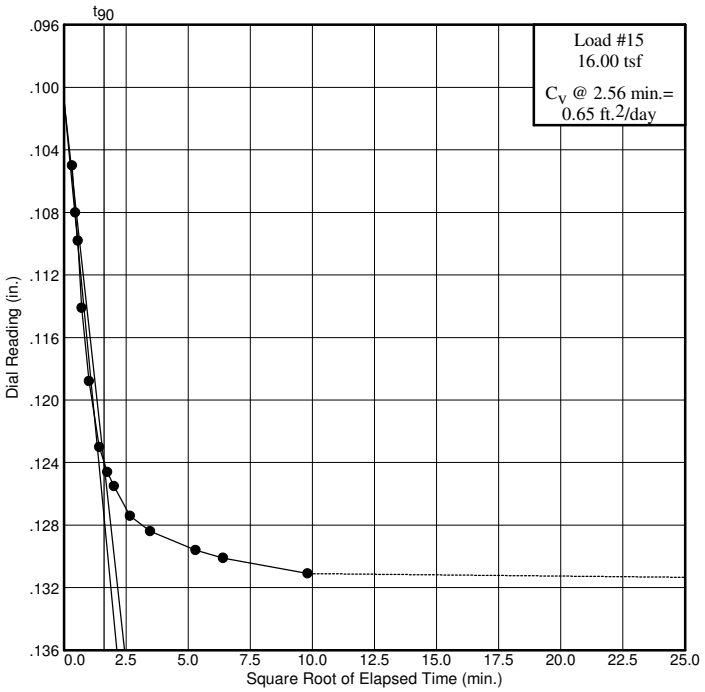
Baltimore, MD

Figure

Dial Reading vs. Time

Project No.: 3532-01
Project: New Youth Detention Center

Location: B-3



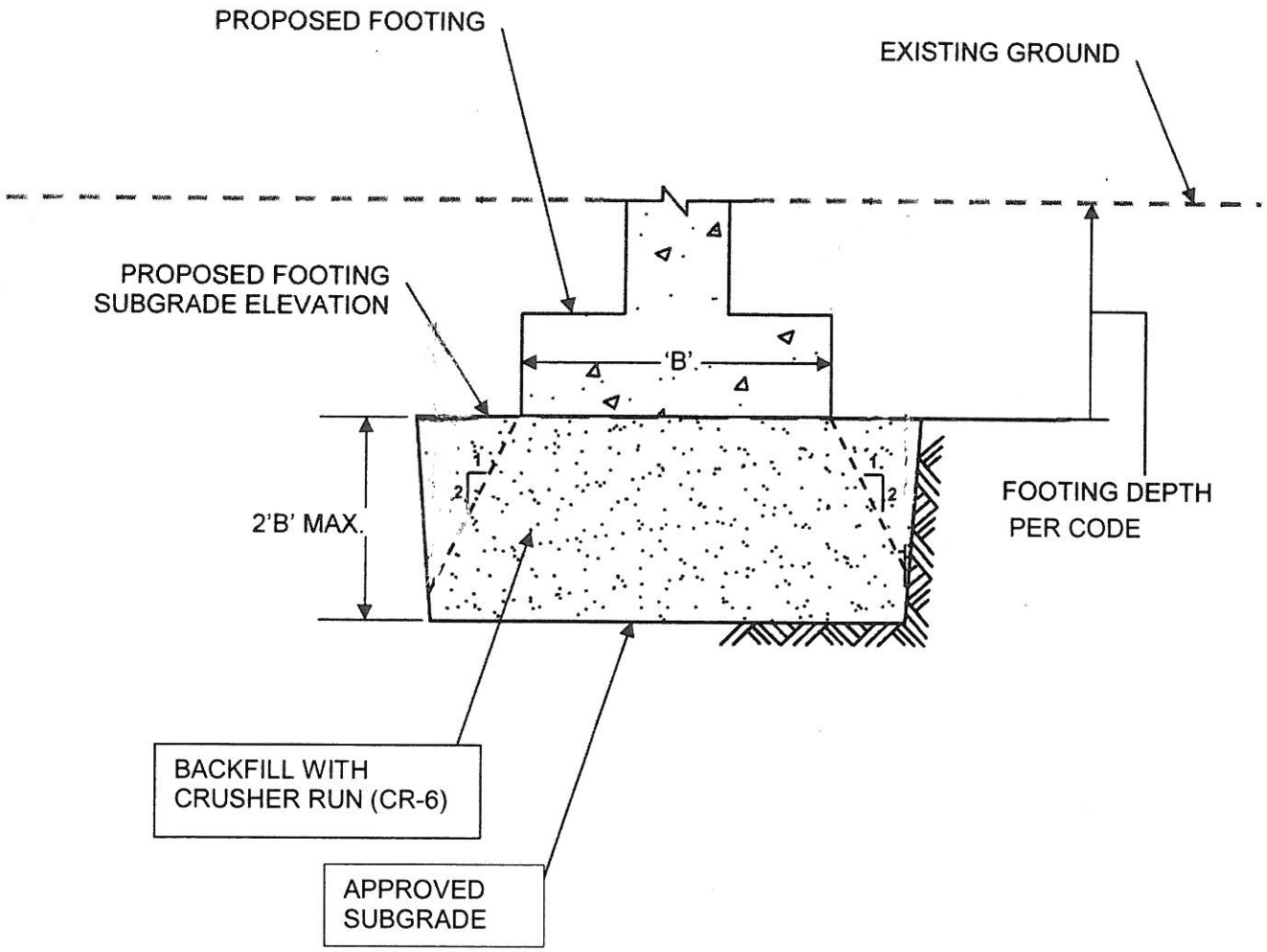
EBA Engineering, Inc.

Baltimore, MD

Figure

APPENDIX F

FOOTING SUBGRADE MODIFICATION DETAIL



EBA ENGINEERING **EBA ENGINEERING, INC.** *4813 Seton Drive* *Baltimore, Maryland 21215*	Project Name: **BCDC YOUTH DETENTION CENTER** **BALTIMORE, MD**	Figure: **Footing Subgrade Modification Detail** Date: 8/12/14 Job No.: 3562-01 Prepared by: NDR Not to Scale

SECTION 02 41 16 - STRUCTURE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Demolition and removal of the BPRU Dorm building and site improvements.
2. Removing below-grade construction.
3. Disconnecting, capping or sealing, and removing site utilities.

B. Related Requirements:

1. Section 011000 "Summary" for project information, access and use of the premises, and work restrictions.
2. Section 012100 “Specialty Allowances” for removal of Unknown Below-Grade Site Structures.
3. Section 012200 “Unit Prices” for Rock Excavation and replacement with satisfactory soil material
4. Section 012200 “Unit Prices” for Rock Excavation and replacement with satisfactory soil material.
5. Section 012200 “Unit Prices” for Removal of Unsuitable Material (Backfill with Structural Fill Material)
6. Section 012200 “Unit Prices” for Removal of Unsuitable Material (Backfill with Aggregate Fill Material):
7. Section 015000 Temporary Facilities And Controls
8. Section 013200 "Construction Progress Documentation" for preconstruction photographs taken before building demolition.
9. Section 017419 "Construction Waste Management and Disposal."
10. Section 02 20 00 – “Existing Building Drawings” for Owner provided drawings
11. Section 023000 ’Subsurface Investigation’ for geotechnical report and the depth of the caissons
12. Section 024119 "Selective Demolition" for partial demolition of buildings, structures, and site improvements.
13. Section 026400 Aboveground storage tank removal and closure activities
14. Section 026500 Underground storage tank and hydraulic lift removal and closure activities
15. Section 028200 Asbestos abatement
16. Section 028300 Impact to lead painted surfaces, removal and disposal
17. Section 028400 Polychlorinated biphenyl (pcb) equipment removal and disposal
18. Section 028700 Ozone-depleting compounds (odcs) equipment Removal and Disposal
19. Section 311000 "Site Clearing" for site clearing and removal of above- and below-grade site improvements not part of building demolition.

1.3 DEFINITIONS

A. Remove: Detach items from existing construction and dispose of them off-site.

B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse . Include fasteners or brackets needed for reattachment elsewhere.

1.4 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

1.5 PREINSTALLATION MEETINGS

A. Predemolition Conference: Conduct conference at Project site .

1. Inspect and discuss condition of construction to be demolished.
2. Review structural load limitations of existing structures.
3. Review and finalize building demolition schedule and verify availability of demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review and finalize protection requirements.
5. Review procedures for noise control and dust control.
6. Review procedures for protection of adjacent buildings.
7. Review items to be salvaged and returned to Owner.

1.6 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable LEED Credits

1. MRc2

B. LEED Requirements

1. MRc2: Construction Waste Management:

No less than the specified portion of all construction waste from the Project shall be diverted from disposal in a landfill and/or incineration in with the Project Requirements for Construction Waste Management and Disposal. Refer to Specification Sections 017419 Construction Waste Management and Disposal and 013510 Sustainable Design Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For refrigerant recovery technician.

B. Engineering Survey: Submit engineering survey of condition of building.

C. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection

, for dust control and , for noise control. Indicate proposed locations and construction of barriers.

1. Adjacent Buildings: Detail special measures proposed to protect adjacent buildings to remain including means of egress from those buildings.

D. Schedule of Building Demolition Activities: Indicate the following:

1. Detailed sequence of demolition work, with starting and ending dates for each activity.
2. Temporary interruption of utility services.
3. Shutoff and capping or re-routing of utility services.

E. Predemolition Photographs or Video: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by demolition operations. Comply with Section 013233 "Photographic Documentation." Submit before the Work begins.

F. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.8 QUALITY ASSURANCE

A. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.

1.9 FIELD CONDITIONS

A. Buildings to be demolished will be vacated and their use discontinued before start of the Work.

B. Buildings immediately adjacent to demolition area will be occupied. Conduct building demolition so operations of occupied buildings will not be disrupted.

1. Provide not less than 72 hours' notice of activities that will affect operations of adjacent occupied buildings.
2. Maintain access to existing walkways, exits, and other facilities used by occupants of adjacent buildings.

a. Do not close or obstruct walkways, exits, or other facilities used by occupants of adjacent buildings without written permission from authorities having jurisdiction.

C. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

D. Hazardous Materials: Present in buildings and structures to be demolished. A report on the presence of hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials are present.

1. Hazardous material remediation is specified elsewhere in the Contract Documents.
2. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.
3. Owner will provide material safety data sheets for materials that are known to be present in buildings and structures to be demolished because of building operations or processes performed there.

E. On-site storage or sale of removed items or materials is not permitted.

1.10 COORDINATION

A. Arrange demolition schedule so as not to interfere with [Owner's on-site operations] [or] [operations of adjacent occupied buildings].

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ASSE A10.6 and NFPA 241.

2.2 SOIL MATERIALS

A. Satisfactory Soils: Comply with requirements in Section 312000 "Earth Moving."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting demolition operations.

B. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.

C. Steel Tendons: Locate tensioned steel tendons and include recommendations for de-tensioning.

D. Verify that hazardous materials have been remediated before proceeding with building demolition operations.

E. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations. Comply with Section 013233 "Photographic Documentation.

3.2 PREPARATION

A. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction.

3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Utilities to be Disconnected: Locate, identify, disconnect, and seal or cap off utilities serving buildings and structures to be demolished.

1. .
2. Arrange to shut off utilities with utility companies.
3. When removal, relocation, or abandonment of utility services will affect adjacent occupied buildings, then provide temporary utilities that bypass buildings and structures to be demolished and that maintain continuity of service to other buildings and structures.
4. Cut off pipe or conduit a minimum of 24 inches (610 mm) below grade. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing according to requirements of authorities having jurisdiction.
5. Do not start demolition work until utility disconnecting and sealing have been completed and verified in writing.

3.4 PROTECTION

A. Existing Facilities: Protect adjacent walkways, loading docks, building entries, and other building facilities during demolition operations. Maintain exits from existing buildings.

B. Temporary Shoring: Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent unexpected movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of demolition.

C. Existing Utilities to Remain: Maintain utility services to remain and protect from damage during demolition operations.

1. Do not interrupt existing utilities serving adjacent occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction.
2. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and authorities having jurisdiction.

a. Provide at least 72 hours' notice to occupants of affected buildings if shutdown of service is required during changeover.

D. Temporary Protection: Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction and as indicated. Comply with requirements in Section 015000 "Temporary Facilities and Controls."

1. Protect adjacent buildings and facilities from damage due to demolition activities.
2. Protect existing site improvements, appurtenances, and landscaping to remain.
3. Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
4. Provide protection to ensure safe passage of people around building demolition area and to and from occupied portions of adjacent buildings and structures.
5. Protect walls, windows, roofs, and other adjacent exterior construction that are to remain and that are exposed to building demolition operations.
6. Erect and maintain dustproof partitions and temporary enclosures to limit dust, noise, and dirt migration to occupied portions of adjacent buildings.

E. Remove temporary barriers and protections where hazards no longer exist. Where open excavations or other hazardous conditions remain, leave temporary barriers and protections in place.

3.5 DEMOLITION, GENERAL

A. General: Demolish indicated buildings completely. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Do not use cutting torches until work area is cleared of flammable materials. Maintain portable fire-suppression devices during flame-cutting operations.
2. Maintain adequate ventilation when using cutting torches.
3. Locate building demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

B. Site Access and Temporary Controls: Conduct building demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed trafficways if required by authorities having jurisdiction.
2. Use water mist and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations. Do not use water when it may damage adjacent construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.

C. Explosives: Use of explosives is not permitted.

3.6 DEMOLITION BY MECHANICAL MEANS

A. Proceed with demolition of structural framing members systematically, from higher to lower level. Complete building demolition operations above each floor or tier before disturbing supporting members on the next lower level.

B. Remove debris from elevated portions of the building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

1. Remove structural framing members and lower to ground by method suitable to minimize ground impact and dust generation.

C. Below-Grade Construction: Demolish foundation walls and other below-grade construction.

1. Remove below-grade construction, including basements, foundation walls, and footings, as indicated on Drawings.

D. Existing Utilities: Demolish existing utilities and below-grade utility structures that are within 5 feet (1.5 m) outside footprint indicated for new construction. Abandon utilities outside this area.

3.7 REPAIRS

A. Promptly repair damage to adjacent buildings caused by demolition operations.

3.8 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site and recycle or dispose of them in accordance with Section 01 74 19 “Construction Waste Management and Disposal.”

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Do not burn demolished materials.

3.9 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by building demolition operations. Return adjacent areas to condition existing before building demolition operations began.

1. Clean roadways of debris caused by debris transport.

END OF SECTION 02 41 16

SECTION 02 41 19 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Demolition and removal of selected portions of the SUI building.

B. Related Requirements:

1. Section 011000 "Summary" for project information, access and use of the premises, and work restrictions.
2. Section 012100 “Specialty Allowances’ for Removal of Hazardous Roof Material
3. Section 012100 “Specialty Allowances” for Removal of Hazardous Material from Existing Fire Suppression System and Fire Alarm/Detection System in the OSTC Portion of SUI Building.
4. Section 012100 “Specialty Allowances’ for Repair of The Existing Concrete Masonry
5. Section 012200 “Unit Prices” for Filling/Patching of Existing Concrete Floor/Roof Slabs
6. Section 015000 Temporary Facilities And Controls
7. Section 013200 "Construction Progress Documentation" for preconstruction photographs taken before building demolition.
8. Section 017419 "Construction Waste Management and Disposal."
9. Section 02 20 00 – “Existing Building Drawings” for Owner provided drawings
10. Section 024116 "Structural Demolition" for demolition of buildings, structures, and site improvements.

1.3 DEFINITIONS

A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.

B. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

C. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

1.4 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

1.5 PREINSTALLATION MEETINGS

A. Predemolition Conference: Conduct conference at Project site.

1. Inspect and discuss condition of construction to be selectively demolished.
2. Review structural load limitations of existing structure.
3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
5. Review areas where existing construction is to remain and requires protection.

1.6 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable LEED Credits

1. MRc2

B. LEED Requirements

1. MRc2: Construction Waste Management:

No less than the specified portion of all construction waste from the Project shall be diverted from disposal in a landfill and/or incineration in with the Project Requirements for Construction Waste Management and Disposal. Refer to Specification Sections 017419 Construction Waste Management and Disposal and 013510 Sustainable Design Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For refrigerant recovery technician.

B. Engineering Survey: Submit engineering survey of condition of building.

C. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection , for dust control and , for noise control. Indicate proposed locations and construction of barriers.

D. Schedule of Selective Demolition Activities: Indicate the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity.
2. Interruption of utility services. Indicate how long utility services will be interrupted.
3. Coordination for shutoff, capping, and continuation of utility services.
4. Use of elevator and stairs.

5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.

E. Predemolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces, that might be misconstrued as damage caused by demolition operations. Comply with Section 013233 "Photographic Documentation." Submit before Work begins.

F. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

G. Warranties: Documentation indicating that existing warranties are still in effect after completion of selective demolition.

1.8 CLOSEOUT SUBMITTALS

A. Inventory: Submit a list of items that have been removed and salvaged.

1.9 QUALITY ASSURANCE

A. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

1.10 FIELD CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials: Present in buildings and structures to be selectively demolished. A report on the presence of hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials are present.

1. Hazardous material remediation is specified elsewhere in the Contract Documents.
2. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.
3. Owner will provide material safety data sheets for suspected hazardous materials that are known to be present in buildings and structures to be selectively demolished because of building operations or processes performed there.

E. Storage or sale of removed items or materials on-site is not permitted.

F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1. Maintain fire-protection facilities in service during selective demolition operations.

1.11 COORDINATION

A. Arrange selective demolition schedule so as not to interfere with Owner's operations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ASSE A10.6 and NFPA 241.

C. Sustainable Design Requirements for Building Reuse:

1. Maintain existing building structure (including structural floor and roof decking) and envelope (exterior skin and framing, excluding window assemblies and nonstructural roofing material) not indicated to be demolished; do not demolish such existing construction beyond indicated limits.
2. Maintain existing interior nonstructural elements (interior walls, doors, floor coverings, and ceiling systems) not indicated to be demolished; do not demolish such existing construction beyond indicated limits.
3. Maintain existing nonshell, nonstructural components (walls, flooring, and ceilings) not indicated to be demolished; do not demolish such existing construction beyond indicated limits.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

B. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.

C. Verify that hazardous materials have been remediated before proceeding with building demolition operations.

D. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs or video.

1. Comply with requirements specified in Section 013233 "Photographic Documentation."
2. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations.
3. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

3.2 PREPARATION

A. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction.

3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
2. Arrange to shut off utilities with utility companies.
3. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
4. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.

    a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
    b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
    c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
    d. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
    e. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

3.4 PROTECTION

A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.

2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
4. Cover and protect furniture, furnishings, and equipment that have not been removed.
5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 015000 "Temporary Facilities and Controls."

B. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of selective demolition.

C. Remove temporary barricades and protections where hazards no longer exist.

3.5 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
5. Maintain adequate ventilation when using cutting torches.
6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
9. Dispose of demolished items and materials promptly. Comply with requirements in Section 017419 "Construction Waste Management and Disposal."

B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

C. Work in Historic Areas: Selective demolition may be performed only in areas of Project that are not designated as historic. In historic spaces, areas, and rooms, or on historic surfaces, the terms "demolish" or "remove" shall mean historic "removal" or "dismantling" as specified in Section 024296 "Historic Removal and Dismantling."

D. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.6 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least 3/4 inch (19 mm) at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.

B. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, and then remove concrete between saw cuts.

C. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.

D. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.

E. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings." Do not use methods requiring solvent-based adhesive strippers.

F. Roofing: Remove no more existing roofing than what can be covered in one day by new roofing and so that building interior remains watertight and weathertight. See Section 075423 Thermoplastic Polyolefin (Tpo) Roofing for new roofing requirements.

1. Remove existing roof membrane, flashings, copings, and roof accessories.
2. Remove existing roofing system down to substrate.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having

jurisdiction. and recycle or dispose of them according to Section 017419 "Construction Waste Management and Disposal."

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
4. Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."

B. Burning: Do not burn demolished materials.

3.8 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

3.9 SELECTIVE DEMOLITION SCHEDULE

A. As indicated on drawings.

END OF SECTION 02 41 19

SECTION 02 64 00 - ABOVEGROUND STORAGE TANK REMOVAL AND DISPOSAL

PART 1 - GENERAL

1.1 SCOPE

A. Work Includes:

1. The work covered by this Section includes the furnishing of all materials and equipment and the performing of all labor, including obtaining any necessary permits, for the removal and disposal of the aboveground storage tank (AST) and related appurtenances. The location(s) and type(s) of the aboveground storage tank(s) known to be present at the worksite are presented in the specifications.

1.2 RELATED SECTIONS AND DOCUMENTS

A. Related Sections:

1. Section 00 73 19 – Health & Safety Requirements

B. Related Documents:

1. Drawings and general provisions of the Contract, including General Conditions, apply to this Section.

2. Limited Hazardous Materials Survey, Youth Detention Center Project, DPSCS #KT-000-110-C01, 926 Greenmount Avenue, Baltimore, Maryland 21202, dated December 24, 2014, EBA Engineering, Inc.

1.3 REFERENCES AND APPLICABLE STANDARDS AND GUIDELINES

A. The most recent edition of a relevant regulation, standard, or code shall be in effect. Where a conflict exists between the regulations, standards, codes, or these specifications, the more stringent requirements shall be utilized.

B. It shall be the duty and responsibility of the General Contractor and all of its Subcontractors to adhere to all regulations (Federal, State, and local) impacting this work including but not limited to:

1. Federal:

a. U.S. Department of Labor, Occupational Safety and Health Administration (OSHA)

1) 29 CFR 1910 – Occupational Safety and Health Standards (General Industry)

2) 29 CFR 1926 – Safety and Health Regulations for Construction

b. U.S. Environmental Protection Agency (EPA)

1) 40 CFR 280 – Technical Standards and Corrective Action Requirements for Owners and Operators of Underground Storage Tanks (UST)

c. U.S. Department of Transportation (DOT)

1) 49 CFR 130 – Oil Spill Prevention and Response Plans

2. State:

a. Code of Maryland Regulations (COMAR)

1) COMAR 26.10 – Oil Pollution and Tank Management

2) COMAR 09.12.20 – Occupational Safety and Health

3. Standard:

a. American Petroleum Institute (API)

1) API 653 – Tank Inspection, Repair, Alteration, and Reconstruction

4. Code:

a. National Fire Protection Association (NFPA)

1) NFPA 30 – Flammable and Combustible Liquids

2) NFPA 31 – Standard for the Installation of Oil-Burning Equipment

1.4 DEFINITIONS

A. Definitions applicable to this Section are included in COMAR 26.10.

1.5 SUBMITTALS

A. Prior to commencement of work, submit to the Engineer the items listed as follows for review. Work shall not start until these submittals are returned with the Engineer's written approval indicating that the submittal is returned for unrestricted use.

1. Work Plan - Describe work procedures to be used for this portion of this project. The Contractor shall develop, implement, maintain, and supervise as part of the work, a comprehensive plan for AST removal and related operations. The Work Plan shall include but not be limited to:

a. Company, contact name, phone number, and e-mail address of contractor removing AST.

b. Statement that work will be conducted in a manner compliant with the Contractor's Health and Safety Plan.

c. Personal Protective Equipment

d. Certification of the Maryland Department of the Environment (MDE) Underground Storage System Technician(s) that will be performing the work.

e. Company, contact name, phone number, and e-mail address of recycling facility.

f. Company, contact name, phone number, and e-mail address of waste disposal facility to accept petroleum impacted wastes.

g. Identification of wastes and means of disposal or recycling.

h. Plans for the disconnecting and removing of all AST appurtenances.

i. Plans for cleaning and removal of all liquids and sludge from the AST. Plans for purging the AST of all vapors.

j. Plans for preparation of the AST for removal and transport from the site.

k. Spill prevention plan.

l. Spill contingency plan.

m. Hazard Communication Program Plan.

n. Safety Data Sheets (SDSs) for affected petroleum products and for all chemicals to be used.

2. Liability insurance certificate with the statement of coverage that indicates pollution coverage is included. Occurrence type insurance is required. Minimum coverage shall be at least $1,000,000 per occurrence.

B. During work, the Contractor shall submit the following to the Engineer:

1. Copies of all waste manifests on the same day that the waste is picked up.

C. Upon completion of work, the Contractor shall submit the following to the Engineer:

1. Final waste disposal manifests signed by the waste disposal/recycling facility.

2. Certificate of Recycling for the AST.

3. Testing results (if any).

1.6 CONTRACTOR QUALIFICATIONS

A. The on-site tank remover(s) shall be certified through the Maryland Department of Environment as Underground Storage System Technicians.

1.7 SAFETY MONITORING REQUIREMENTS

A. Work conducted on-site will comply with 29 CFR 1910 and 1926, as well as the Contractor's Health and Safety Plan.

B. Atmospheric Monitoring: Combustible Gas Indicator, Oxygen Meter and other equipment as required for confined space entry procedures, if applicable.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.1 ESTIMATED QUANTITIES OF ABOVEGROUND STORAGE TANK(S)

A. Please refer to the Hazardous Materials Summary Table in the drawings.

3.2 METHODS OF COMPLIANCE

A. The Contractor shall adhere to the Aboveground Storage Tank Work Plan submitted.

3.3 PROJECT COMPLETION

A. The Contractor shall remove all equipment, supplies, and waste from the project site.

B. The project will be considered complete when all required submittals have been received and approved.

END OF SECTION 02 64 00

SECTION 02 65 00 UNDERGROUND STORAGE TANK AND HYDRAULIC LIFT REMOVAL AND DISPOSAL

PART 1 - GENERAL

1.1 SCOPE

A. Work Includes:

1. The work covered by this Section includes the furnishing of all materials and equipment and the performing of all labor, including obtaining any necessary permits, for the removal and disposal of underground storage tanks (USTs), an underground hydraulic lift, and related appurtenances. The location(s) and type(s) of the underground storage tank(s) and hydraulic lift known to be present at the worksite are presented in the specifications.

2. Quantities presented in this Section are estimates only. The Contractor shall field verify quantities prior to submitting a bid or accept the estimates as accurate.

1.2 RELATED DOCUMENTS

A. Related Sections:

1. Section 00 73 19 – Health & Safety Requirements

B. Related Documents:

1. Drawings and general provisions of Contract, including General Conditions, apply to this Section.

2. Limited Hazardous Materials Survey, Youth Detention Center Project, DPSCS #KT-000-110-C01, 926 Greenmount Avenue, Baltimore, Maryland 21202, dated December 24, 2014, EBA Engineering, Inc.

1.3 REFERENCES AND APPLICABLE STANDARDS AND GUIDELINES

A. The most recent edition of a relevant regulation, standard, or code shall be in effect. Where a conflict exists between the regulations, standards, codes, or these specifications, the more stringent requirements shall be utilized.

B. It shall be the duty and responsibility of the General Contractor and all of its Subcontractors to adhere to all regulations (Federal, State, and local) impacting this work including but not limited to:

1. Federal:

a. U.S. Department of Labor, Occupational Safety and Health Administration (OSHA)

1) 29 CFR 1910.12 – Construction Work

2) 29 CFR 1910.132 – General Requirements

3) 29 CFR 1910.134 – Respiratory Protection

4) 29 CFR 1910.147 – Control of Hazardous Energy (lockout/tagout)

5) 29 CFR 1910.1200 – Hazard Communication

6) 29 CFR 1926.59 – Hazard Communication

7) 29 CFR 1926.95-102 – Personal Protective Equipment (PPE)

8) 29 CFR 1926.652 – Requirements for Protective Systems

b. U.S. Environmental Protection Agency (EPA)

1) 40 CFR 117.3 – Determination of Reportable Quantities

2) 40 CFR 260 – Hazardous Waste Management System: General

3) 40 CFR 263 – Standards Applicable to Transporters of Hazardous Waste

4) 40 CFR 264 – Standards for Owners and Operators of Hazardous Waste Treatment Storage, and Disposal Facilities

5) 40 CFR 265 – Interim Status Standards for Owners and Operators of Hazardous Waste Treatment Storage, and Disposal Facilities

6) 40 CFR 280 – Technical Standards and Corrective Action Requirements for Owners and Operators of Underground Storage Tanks (UST)

7) CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act (Superfund)

8) TSCA – Toxic Substance Control Act

c. U. S. Department of Transportation (DOT)

1) 49 CFR 171-180 – General Awareness and Training Requirements for Handlers, Loaders, and Drivers

d. National Institute of Occupational Safety and Health (NIOSH)

1) NIOSH 80-106 – Criteria for a Recommended Standard: Working in Confined Spaces

2. State:

a. Code of Maryland Regulations (COMAR)

1) COMAR 09.12 – Division of Labor and Industry

2) COMAR 09.12.20 – Occupational Safety and Health

3) COMAR 26.10.10 – Out-of-Service UST Systems and Closure

4) COMAR 26.13 – Disposal of Controlled Hazardous Substances

3. Standards:

a. American Petroleum Institute (API)

1) API PUBL 1628 – Guide to the Assessment and Remediation of Underground Petroleum Releases

2) API PUBL 1663E – Underground Storage Tank Removal

3) API PUBL 2217A – Guidelines for Work in Inert Confined Spaces in the Petroleum Industry

4) API PUBL 2219 – Safe Operation of Vacuum Trucks in Petroleum Service

5) API RP 1604 – Closure of Underground Petroleum Storage Tanks

6) API RP 2003 – Protection Against Ignitions Arising out of Static, Lightning, and Stray Currents

7) API RP 2009 – Safe Welding, Cutting, and Other Hot Work Practices in the Petroleum and Petrochemical Industries

8) API STD 650 – Welded Steel Tanks for Oil Storage

9) API STD 653 – Tank Inspection, Repair, Alteration, and Reconstruction

10) API STD 2015 – Requirements for Safe Entry and Cleaning of Petroleum Storage Tanks

b. American National Standards Institute (ANSI)

1) ANSI Z117.1-2009 – Safety Requirements for Confined Spaces

1.4 DEFINITIONS

A. Terms defined by EPA Regulation 40 CFR 280 and by Code of Maryland Regulation 26.10 have the same meaning when used in this Section.

1.5 SUBMITTALS

A. Prior to commencement of work, submit to the Engineer the items listed as follows for review. Work shall not start until these submittals are returned with the Engineer's written approval indicating that the submittal is returned for unrestricted use.

1. Work Plan: Describe work procedures to be used for this portion of this project. The Contractor shall develop, implement, maintain, and supervise as part of the work, a comprehensive plan for tank(s) and hydraulic lift removal and related operations. The Work Plan shall include but not be limited to:

a. Company, contact name, phone number, and e-mail address of contractor removing UST(s) and hydraulic lift.

b. Statement that work will be conducted in a manner compliant with the Contractor's Health and Safety Plan.

c. Personal Protective Equipment

d. Certification of the Maryland Department of the Environment (MDE) Underground Storage System Technician(s) that will be performing the work.

e. Plan for exploratory excavation of one suspect UST.

f. Plan for characterizing UST(s) and hydraulic lift contents, including sampling and analyses, prior to removal. Means of disposal or recycling.

g. Plan for the disconnecting and removing of all UST(s) and hydraulic lift appurtenances.

h. Plan for cleaning and removal of all liquids and sludge from the UST(s) and hydraulic lift(s).

i. Plan for purging the UST(s) of all vapors.

j. Plan for preparation of the UST(s) and hydraulic lift for removal and transport from the site. Include cleaning of exterior UST surfaces.

k. Plan for temporary storage of excavated material onsite. Soils shall be placed on an impermeable geomembrane a minimum of 30 mil thick and covered with an impermeable geomembrane a minimum of 10 mil thick.

l. Plan for maintaining excavations in a dewatered condition.

m. Plan for backfilling.

n. Company, contact name, phone number, and e-mail address of recycling facility.

o. Company, contact name, phone number, and e-mail address of waste disposal facility to accept petroleum impacted wastes.

p. Spill prevention plan.

q. Spill contingency plan.

r. Hazard communication plan.

s. Confined space plan.

t. Safety Data Sheets (SDSs) for affected petroleum products and for all chemicals to be used.

u. Description of sampling procedures.

2. Liability insurance certificate with the statement of coverage that indicates pollution coverage is included. Occurrence type insurance is required. Minimum coverage shall be at least $1,000,000 per occurrence.

B. During work, the Contractor shall submit the following to the Engineer:

1. Copies of all waste manifests on the same day that the waste is picked up.

C. Upon completion of work, the Contractor shall submit the following to the Engineer:

1. Final waste disposal manifests signed by the waste disposal/recycling facility.

2. Certificate of recycling for the UST(s) and hydraulic lift.

3. Testing results (if any).

4. UST Closure Report submitted to the MDE which includes; statement of work, soil and groundwater sampling procedures and analytical results, conclusions and recommendations, site sketches, photographic documentation, disposal manifest(s), certificate(s) of recycling, and other MDE required forms (e.g., registration, MDE UST closure notification letter, and closure forms).

1.6 CONTRACTOR QUALIFICATIONS

A. The on-site tank remover(s) shall be certified through the Maryland Department of Environment as an Underground Storage System Technician(s).

B. The Contractor shall have a minimum of five (5) years of tank removal experience.

1.7 SAFETY AND ENVIRONMENTAL REQUIREMENTS

A. Work conducted on-site will comply with 29 CFR 1910 and 1926, as well as Contractor's Health & Safety Plan.

B. Environmental Monitoring – Photoionization Detector for field screening soils.

C. Atmospheric Monitoring – Combustible Gas Indicator, Oxygen Meter and other equipment as required for confined space entry procedures.

D. Use of explosives or burning will not be allowed.

1.8 PROJECT NOTIFICATION AND PERMITS

A. The Contractor shall notify the Owner seven (7) days prior to beginning removal activities.

B. The Contractor shall be responsible for notifying the MDE by completing the required 30-Day Written Notification Form and confirming by telephone 48 hours prior to beginning removal activities.

C. The Contractor shall obtain all necessary permits for this work prior to start of removal activities.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.1 ESTIMATED QUANTITIES OF UNDERGROUND STORAGE TANK(S) AND A HYDRAULIC LIFT

A. Please refer to the Hazardous Materials Summary Table in the drawings.

B. Work Includes:

1. Removal and disposal of one UST system. An operational underground fuel storage tank was identified.

2. Perform exploratory excavation of a suspect UST in the northwest corner of the subject property to include a 20' x 20' area to a depth of 15' below grade.

3. Removal and disposal of one hydraulic lift system. An underground two-point lift system was identified.

3.2 SPECIFIC EXCAVATION REQUIREMENTS

A. At all times the Contractor shall comply with 29 CFR 1926.652 Subpart P, Excavations.

B. The estimated location of utility installations, such as sewer, telephone, fuel, electric, water lines, or any other underground installations that reasonably may be expected to be encountered during excavation work, shall be determined prior to opening an excavation. When excavation operations approach the estimated location of underground installations, the exact location of the installations shall be determined by safe and acceptable means.

C. Where the stability of adjoining buildings, walls, or other structures is endangered by excavation operations, support systems such as shoring, bracing, or underpinning shall be provided to ensure the stability of such structures for the protection of employees.

D. Excavations shall be limited to the width and depth necessary for the removal of tank(s) and hydraulic lift.

E. Adequate protection shall be provided to protect employees from loose rock or soil that could pose a hazard by falling or rolling from an excavation face. Such protection shall consist of scaling to remove loose material; installation of protective barricades at intervals as necessary on the face to stop and contain falling material; or other means that provide equivalent protection.

F. Daily inspections of excavations, the adjacent areas, and protective systems shall be made by a competent person for evidence of a situation that could result in possible cave-ins, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions. An inspection shall be conducted by the competent person prior to the start of work and as needed throughout the shift. Inspections shall also be made after every rainstorm or other hazard increasing occurrence.

3.3 TANK CLOSURE REPORT

A. For each tank removed, a Tank Closure Report shall be prepared in a standard three ring binder and submitted to the MDE with two hard copies and two electronic copies to the Owner. Tank Closure Reports shall include the following information as a minimum:

1. A cover letter signed by a responsible company official certifying that all services involved have been performed in accordance with the terms and conditions of this specification.

2. A narrative report describing what was encountered at each site, including:

a. Condition of the tank;

b. Any visible evidence of leaks or stained soils;

c. Results of vapor monitoring readings;

d. Actions taken including quantities of materials treated or removed;

e. Reasons for selecting sample locations;

f. Sample locations;

g. Collection data such as time of collection and method of preservation;

h. Reasons for backfilling site, and,

i. Whether or not groundwater was encountered.

3. Copies of all analyses performed for disposal.

4. Copies of all waste analyses or waste profile sheets.

5. Copies of all certifications of final disposal signed by the responsible disposal facility official.

6. Information on who sampled, analyzed, transported, and accepted all wastes encountered and copies of manifests.

7. Copies of all analysis performed for verification that underlying soil is not contaminated, with copies of chain-of-custody for each sample. All analysis shall give the identification number of the sample used. Sample identification numbers shall correspond to those provided on the one-line drawings.

8. Scaled one-line drawings (for Administration approval) showing tank locations, size of tank, limits of excavation, limits of contamination, underground utilities encountered, sample locations, and sample identification numbers, date of abandonment, methods used for abandonment and name of controller in accordance with COMAR 26.10. Drawings shall locate the horizontal and vertical extent of the tank removal areas by dimensions from existing building features.

3.4 METHODS OF COMPLIANCE

A. The Contractor shall adhere to the Underground Storage Tank & Hydraulic Lift Work Plan submitted.

3.5 PROJECT COMPLETION

A. The Contractor shall remove all equipment, supplies, and waste from the project site.

B. The project will be considered complete when all required submittals have been received and approved.

END OF SECTION 02 65 00

SECTION 02 82 00 - ASBESTOS ABATEMENT

PART 1 - GENERAL

1.1 SCOPE

A. Work Includes:

1. The work covered by this Section includes the furnishing of all materials and equipment and the performing of all labor for the removal and disposal of asbestos-containing materials as reported in the Limited Hazardous Materials Survey, Youth Detention Center Project, DPSCS #KT-000-110-C01, 926 Greenmount Avenue, Baltimore, Maryland 21202, dated December 24, 2014. The location(s) and type(s) of asbestos-containing building material known, assumed, and presumed to be present at the worksite are presented in the specifications.

2. Quantities presented in this Section are estimates only. The Contractor shall field verify quantities prior to submitting a bid or accept the estimates as accurate.

3. Requirements of this Section are designed for the safe removal and disposal of Asbestos-Containing Materials (ACM) and/or Assumed Asbestos-Containing Materials. Regulatory standards and best industry practices may contain other requirements that must be followed.

4. The Contractor must adhere to the requirements of the Maryland Department of the Environment (MDE) and view MDE's determinations as final.

1.2 RELATED SECTIONS AND DOCUMENTS

A. Related Sections:

1. Section 00 73 19 – Health and Safety Requirements

2. Section 02 89 00 – Abatement Monitoring

B. Related Documents:

1. Drawings and general provisions of the Contract, including General Conditions, apply to this Section.

2. Limited Hazardous Materials Survey, Youth Detention Center Project, DPSCS #KT-000-110-C01, 926 Greenmount Avenue, Baltimore, Maryland 21202, dated December 24, 2014, EBA Engineering, Inc.

1.3 REFERENCES AND APPLICABLE STANDARDS AND GUIDELINES

A. The most recent edition of a relevant regulation, standard, or code shall be in effect. Where a conflict exists between the regulations, standards, codes, or these specifications, the more stringent requirements shall be utilized.

B. It shall be the duty and responsibility of the General Contractor and all of its Subcontractors to adhere to all regulations (Federal, State, and local) impacting this work including but not limited to:

1. Federal:

a. U.S. Department of Labor, Occupational Safety and Health Administration (OSHA)

1) 29 CFR 1910.134 – Respiratory Protection

2) 29 CFR 1910.1200 – Hazard Communication

3) 29 CFR 1926.1101 – Asbestos in Construction

4) 29 CFR 1926.95-102 – Personal Protective Equipment (PPE)

b. U.S. Environmental Protection Agency (EPA)

1) 40 CFR 61, Subpart M – National Emission Standards for Hazardous Air Pollutants (NESHAP), National Emission Standards for Asbestos

2) 40 CFR 763 – Asbestos Hazard Emergency Response Act (AHERA)

c. U.S. Department of Transportation (DOT)

1) 49 CFR 170-180 – Hazardous Waste Transportation

2. State:

a. Code of Maryland Regulations (COMAR)

1) COMAR 26.11.21 – Control of Asbestos

2) COMAR 26.11.23 – Asbestos Accreditation of Individuals

3) COMAR 26.13 – Disposal of Controlled Hazardous Substances

1.4 DEFINITIONS

A. Terms defined by OSHA Regulation 29 CFR 1926.1101 and by EPA Regulation 40 CFR 61, Subpart M have the same meaning when used in this Section.

1.5 SUBMITTALS

A. Prior to commencement of work, submit to the Engineer the items listed as follows for review. Work shall not start until these submittals are returned with the Engineer's written approval indicating that the submittal is returned for unrestricted use.

1. Qualifications

a. Project contact sheet for key personnel including names, cell phone numbers, and e-mail addresses for:

1) General Contractor.

2) Abatement Contractor.

b. Abatement Contractor

1) Asbestos Abatement License.

2) Liability insurance certificate with the statement that coverage includes asbestos. Occurrence type insurance is required. Minimum coverage shall be at least $3,000,000 per occurrence.

3) Certification signed by an officer of the abatement contracting firm that exposure measurements, medical surveillance, and worker training records are being kept in conformance with 29 CFR 1926.

4) Certification signed by an officer of the abatement contracting firm that the respiratory protection program is being kept in conformance with 29 CFR 1910.134.

5) Record(s) of any citation(s) issued by Federal, State, and local regulatory agencies relating to asbestos abatement activity by the Contractor within the past 5 years. Contractor must include projects, dates, and resolutions.

c. Abatement Supervisor(s) and Workers

1) Resume of abatement supervisor(s).

2) Training certification, medical approval certification, and fit test certification of supervisor(s) and all workers.

d. Waste Disposal

1) Company, contact name, phone number, e-mail address, and license of transporter to haul asbestos waste.

2) Company, contact name, phone number, e-mail address, and license or permit of landfill to accept asbestos waste.

3) If non-regulated ACM will be disposed of in a construction and

demolition (C&D) landfill, submit a letter from the landfill indicating that they will accept the waste.

2. Abatement Work Plan – The Abatement Work Plan shall be prepared by an AHERA Project Designer. The Work Plan shall include but not be limited to:

   a. Notification - Copy of notification submitted to EPA and MDE.

   b. Signs – Identify the number of 3-day signs required (as required by COMAR 26.11.21), identify the locations of 3-day signs, and schedule for posting 3-day signs.

   c. For each regulated area, describe the location, signs to be posted, means to control access, and means to capture debris from the work.

   d. Describe engineering controls.

   e. List all required personal protection equipment (PPE). For respirator, describe respirator and cartridge type.

   f. Describe work procedures including the method that will be used to remove each type of asbestos-containing material.

   g. Describe procedures for bagging and removal of wastes. Include how any waste will be moved from the roof to the ground, if applicable.

   h. Describe temporary storage facility for waste prior to removal from site. Include description of signs on storage facility.

3. Equipment and Supplies

   a. Safety Data Sheets (SDSs) for all chemicals to be used.

   b. Manufacturer's certification that HEPA vacuums, pressure differential ventilation units and other local exhaust ventilation systems to be used on the project conform to ANSI Z9.2-2006.

4. Emergency Plans

   a. An emergency plan that meets the requirements of 29 CFR 1926.35.

B. During abatement activities, the Contractor shall submit the following to the Engineer:

1. Copies of all waste shipment records on the same day that the waste is picked up.

2. The Contractor shall maintain on-site daily job progress reports detailing abatement activities including a review of the estimated percentage of completion, major problems or delays and taken or planned corrective action, injury reports, equipment breakdowns, etc. A compiled copy shall be submitted after work is completed.

3. The Contractor shall maintain on-site daily worksite entry logbooks with information on worker and visitor access. A compiled copy shall be submitted after the work is completed.

4. The Contractor shall maintain on-site air monitoring records that shall be made available to the Engineer upon request. A compiled copy shall be submitted after work is completed.

C. Upon completion of abatement activities, the Contractor shall submit the following to the Engineer:

1. Statement of completion of compliance with specifications.

2. Compiled set of daily job progress reports.

3. Compiled set of worksite entry logs.

4. Final waste disposal manifests signed by the waste disposal facility.

5. Air monitoring data/records and IH daily logs, including clearance sampling.

1.6 ASBESTOS HEALTH RISK

A. Where in the performance of the work, workers, supervisory personnel, subcontractors, or consultants may encounter, disturb, or otherwise function in the immediate vicinity of any identified ACM, take appropriate continuous measures as necessary to protect all building occupants from the risk of exposure to airborne asbestos. Such measures shall include the procedures and methods described herein, and compliance with regulations of applicable Federal, State, and local agencies.

1.7 WORKER TRAINING REQUIREMENTS

A. AHERA Supervisor Accreditation: All Supervisors are to be accredited by MDE as Abatement Supervisors as required by the EPA Model Accreditation Plan (MAP) asbestos abatement worker training (40 CFR Part 763, Subpart E, Appendix C).

B. AHERA Worker Accreditation: All workers are to be accredited by MDE as Abatement Workers as required by the EPA Model Accreditation Plan (MAP) asbestos abatement worker training (40 CFR Part 763, Subpart E, Appendix C).

C. Additional worker licenses, certifications, training, and documentation shall be in accordance with Contractor’s submittals in Section 1.5.

1.8 MEDICAL SURVEILLANCE REQUIREMENTS

A. All employees who will perform asbestos work and/or wear a respirator shall participate in a medical surveillance program meeting the requirements of 29 CFR 1926.1101 and 29 CFR 1910.134 as applicable.

1.9 STOP ACTION LEVELS

A. Inside Work Area

1. The Contractor shall stop work and re-evaluate engineering controls if any one sample in the work area or any personal sample exceeds a fiber concentration of 0.5 fibers per cubic centimeter (f/cc).

B. Outside Work Area

1. If any air sample taken outside of the work area exceeds 0.01 f/cc, the Contractor shall immediately and automatically stop all work except corrective action.

1.10 AUTHORITY TO STOP WORK

A. The Owner, Industrial Hygiene Contractor (third party), or the Engineer have the authority to issue a work stoppage at any time during the abatement work if the Owner, Industrial Hygiene Contractor, or Engineer deems that conditions are in violation of these specifications or any Federal, State, and local regulations.

B. Once a work stoppage has been issued, the Contractor shall take corrective steps including but not limited to the following:

1. Cease all asbestos removal activities, or any activities that disturb ACM.

2. Repair any fallen, ripped or otherwise failed work area isolation measures.

3. Maintain in operation work area isolation measures.

4. Maintain all worker protection.

5. Fog the air in the work area with a mist of amended water to reduce airborne fiber levels.

C. The Contractor shall not recommence work until conditions have been corrected and authorized in writing by the Engineer.

D. Delays, stand-by time, and expenses necessary for Contractor to take corrective action, resolve any violations of these specifications or applicable laws shall be at the Contractor's expense.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Provide in quantities necessary to accomplish work of this Section.

1. Amended Water

a. Provide water to which a surfactant has been added.

b. Use a mixture of surfactant and water which results in adequately wetting the ACM by use of one ounce of a surfactant consisting of 50% polyoxyethylene ester and 50% polyoxyethylene ether mixed with five gallons of water.

2. Encapsulants

a. Encapsulants (sealants) shall meet the latest requirements of the EPA.

3. Polyethylene Sheet

a. Polyethylene film designed for asbestos abatement with a minimum 6-mil thickness.

b. Polyethylene film shall be designated as fire resistant by the manufacturer.

4. Disposal Bags

a. Disposal bags shall include required OSHA, EPA, and DOT asbestos labels.

b. Disposal bags shall be a minimum of 6-mil thick, leak tight, and made of polyethylene.

5. Other Materials

a. Duct tape in 2” or 3” widths, with an adhesive which is formulated to aggressively stick to polyethylene sheeting.

b. Spray adhesive, which is specifically formulated to stick tenaciously to polyethylene sheeting.

2.2 PERSONAL PROTECTIVE EQUIPMENT

A. Provide disposable full-body coveralls and disposable head covers, and require that they be worn by all workers in the work area. For all workers in the work area, provide a sufficient number of disposable coveralls and head covers for all required changes.

B. Provide each worker with the additional protective clothing as required by the site specific Health and Safety Plan. This may include, but is not necessarily limited to:

1. Hardhats

2. Gloves

3. Steel-toed boots

4. Eye protection (i.e., face shield, safety glasses, and/or goggles)

5. Hearing protection

6. Cold weather gear

C. In addition, disposable full-body coveralls and disposable head covers shall be provided by the Contractor for the Engineer, Emergency Personnel, and other authorized representatives who may enter the job site.

2.3 RESPIRATORY PROTECTION

A. The Contractor shall provide at no cost to the employee respiratory protection against airborne concentrations of asbestos during this abatement project.

B. The Contractor's respiratory protection program shall be in place in accordance with the Contractor's submittal as detailed in Section 1.5 and in compliance with 29 CFR 1910.134.

C. Respirators are required to be used for all asbestos work.

PART 3 - EXECUTION

3.1 ASBESTOS-CONTAINING MATERIAL TYPE(S) AND ESTIMATED QUANTITIES

A. Please refer to the Hazardous Materials Summary Table in the drawings.

3.2 ENGINEERING AND WORK PRACTICE CONTROLS

A. The Contractor shall implement engineering and work practice controls to reduce and maintain employee exposure below the Permissible Exposure Limit (PEL of 0.1 f/cc) to the extent that such controls are feasible. Engineering and work practices shall be reviewed and approved by the Engineer. Respirators are required for all asbestos abatement even if engineering controls maintain exposures below the PEL.

B. All abatement work shall be done using wet methods. Water shall be sprayed on all materials to be removed during this procedure and shall continue to be sprayed on the material until placed in a waste container or roll-off.

C. A HEPA vacuum shall be used as an engineering control to pre-clean before abatement begins, during abatement activities, and as part of final cleanup activities.

D. Perform prompt cleanup of debris as it is generated during abatement activities and perform daily cleanup of work areas.

3.3 SIGNAGE AND WARNINGS

A. The Contractor shall display 3-Day Notice sign as required by MDE at all entrances into the building.

B. The Contractor may use signs required by other statutes, regulations or ordinances in addition to, or in combination with, signs required by this specification. The Contractor shall assure that no statement appears on or near any sign required by this specification, which contradicts or detracts from the meaning of the required sign.

C. Warning signs that demarcate the regulated area shall be provided and displayed by the Contractor. A regulated area is defined as an area where an employee's exposure may be above the PEL.

D. Warning signs shall also be required outside the work area at the proposed and secured waste storage.

E. Warning signs shall be posted at such a distance from such a location that an employee or other authorized personnel may read the signs and take necessary protective steps before entering the area marked by the signs.

F. Warning signs are required by 29 CFR 1926.1101.Z.(k).(7).(ii).[A] and shall bear the following information:

DANGER
ASBESTOS
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNGS
AUTHORIZED PERSONNEL ONLY

G. Warning signs are required by 29 CFR 1926.1101.Z.(k).(7).(ii).[B] and shall bear the following information where the use of respirators and protective clothing are required in the regulated area:

DANGER
ASBESTOS
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNGS
AUTHORIZED PERSONNEL ONLY
WEAR RESPIRATORY PROTECTION AND PROTECTIVE
CLOTHING IN THIS AREA

H. The Contractor shall ensure that all signs required in Section 3.3 are illuminated and cleaned as necessary so that the text is readily visible.

3.4 LABELING OF ASBESTOS-CONTAINING MATERIAL WASTE

A. The Contractor shall affix label(s) to all products and containers containing asbestos waste, including disposal bags, containers, and drums.

1. The label(s) shall be clearly visible printed in large, bold letters on a contrasting background. The label(s) are required by 29 CFR 1926.1101.Z.(k).(8).(iii) and shall bear the following information:

DANGER
CONTAINS ASBESTOS FIBERS
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNGS
DO NOT BREATHE DUST
AVOID CREATING DUST

3.5 SITE PREPARATION

A. Site preparation prior to abatement consists of the following steps:

1. Posting signs on all entrances into the building 3 days prior to abatement.

2. Posting warning signs at entrances and exits to work areas and secured waste storage areas.

3. Removing or protecting all furnishings.

4. Set up containment necessary to protect surfaces and contain dust and debris.

5. Pre-clean all surfaces in the work areas.

6. Provide a wash area for the crew at the site. All members of the abatement crew must wash after removing and properly disposing of their protective clothing.

3.6 ABATING OF ASBESTOS-CONTAINING MATERIAL

A. Removal of ACM shall be performed according to the Contractor's Abatement Work Plan and applicable regulations.

3.7 DAILY CLEANUP

A. All asbestos waste must be bagged at the end of each day and any asbestos debris on the floor must be vacuumed at the end of each day.

B. All supplies and equipment must be maintained in a neat and orderly condition.

C. Under no circumstances shall active abatement be proceeding while the daily cleanup is in progress.

3.8 FINAL CLEARANCE PROCEDURES

A. All waste must be bagged and all bags removed from the work area.

B. All dust and debris must be removed from all surfaces.

C. The Industrial Hygienist Contractor (third party) shall perform a final visual inspection.

D. Perform any additional cleaning required by the Industrial Hygienist Contractor.

E. Encapsulate area.

F. The Industrial Hygienist Contractor shall perform final clearance air sampling.

3.9 STORAGE OF ACM WASTE

A. The Contractor shall make provisions for the safe storage of waste on-site prior to disposal. For security reasons, waste storage areas must be treated as regulated areas and access shall be restricted.

3.10 DISPOSAL OF ASBESTOS-CONTAINING MATERIAL WASTE

A. Execution

1. All waste shall be maintained in an adequately wet condition and sealed in leak tight containers.

2. Prior to removing waste from the work area, each bag of waste shall be sealed and placed entirely within a second bag, which shall also be sealed in a manner to prevent leakage.

3. All waste is to be hauled by a waste hauler with all required licenses from all Federal, State, and local authorities.

4. Load all ACM waste material in disposal bags, leak-tight drums, or other containers as described in Contractor's submittal.

5. Post "Danger Asbestos” signs on vehicle while loading.

6. Protect interior of truck or dumpster with a double layer of 6-mil poly sheeting.

7. Carefully load containerized waste in fully enclosed dumpsters, trucks or other appropriate vehicles for transport. Exercise care before and during transport, to ensure that no unauthorized persons have access to the material.

8. Ensure asbestos waste storage and disposal complies with all applicable aspects of Federal, State, and local asbestos regulations, including time periods for removing waste from project site and temporary storage.

9. Complete a waste disposal record at the time of shipment. Contractor's competent person shall sign the "Generator's Certification" unless directed otherwise. Submit copy of pickup receipt to Engineer on the same day that waste is shipped.

B. Disposal

1. All asbestos waste shall be disposed of at an approved landfill. Specifically, regulated ACM waste shall be disposed at a licensed asbestos landfill. ACM that

is not regulated may be disposed at a Construction and Demolition (C&D) landfill that has agreed to accept the material.

2. Sealed plastic bags shall be carefully unloaded from the truck. If bags are broken or damaged, return to work site for re-bagging within a containment area; the entire truck and contents must be cleaned using damp cleaning methods and mopping or with a HEPA vacuum.

3. After completion of delivery, truck must be cleaned using damp cleaning methods and mopping or with a HEPA vacuum.

4. The Contractor shall retain receipts from landfill for material disposed.

5. The Contractor shall, no later than 45 days after shipment of each load, submit copy(s) of waste manifest, chain of custody or cradle to grave form, and landfill receipt to the Engineer.

3.11 PROJECT COMPLETION

A. The Abatement Contractor shall remove all equipment, supplies, and waste from the project site.

B. The project will be considered complete when all required submittals have been received and approved.

END OF SECTION 02 82 00

SECTION 02 83 00 - IMPACT TO LEAD PAINTED SURFACES, REMOVAL AND DISPOSAL

PART 1 - GENERAL

1.1 SCOPE

A. Work Includes:

1. The work covered by this Section includes the furnishing of all materials and equipment and the performing of all labor for lead-safe work practices and the proper disposal of waste materials containing lead paint as reported in the Limited Hazardous Materials Survey, Youth Detention Center Project, DPSCS #KT-000-110-C01, 926 Greenmount Avenue, Baltimore, Maryland 21202, dated December 24, 2014.

2. The Contractor and Subcontractors shall comply with OSHA's Lead in Construction Standard, 29 CFR 1926.62.

3. Components with surface coatings not otherwise reported in the Limited Hazardous Materials Survey, Youth Detention Center Project, DPSCS #KT-000-110-C01, 926 Greenmount Avenue, Baltimore, Maryland 21202, dated December 24, 2014 shall be presumed to contain lead in paint.

1.2 RELATED SECTIONS AND DOCUMENTS

A. Related Sections:

1. Section 00 73 19 – Health and Safety Requirements

2. Section 02 89 00 – Abatement Monitoring

B. Related Documents:

1. Drawings and general provisions of the Contract, including General Conditions, apply to this Section.

2. Limited Hazardous Materials Survey, Youth Detention Center Project, DPSCS #KT-000-110-C01, 926 Greenmount Avenue, Baltimore, Maryland 21202, dated December 24, 2014, EBA Engineering, Inc.

1.3 REFERENCES AND APPLICABLE STANDARDS AND GUIDELINES

A. The most recent edition of a relevant regulation, standard, or code shall be in effect. Where a conflict exists between the regulations, standards, codes, or these specifications, the more stringent requirements shall be utilized.

B. It shall be the duty and responsibility of the General Contractor and all of its Subcontractors to adhere to all regulations (Federal, State, and local) impacting this work including but not limited to:

1. Federal:

a. U.S. Department of Labor, Occupational Safety and Health Administration (OSHA)

1) 29 CFR 1910.134 – Respiratory Protection

2) 29 CFR 1910.1200 – Hazard Communication

3) 29 CFR 1926.62 – Lead

4) 29 CFR 1926.95-102 – Personal Protective Equipment (PPE)

b. U.S. Environmental Protection Agency (EPA)

1) 40 CFR 117.3 – Determination of Reportable Quantities

2) 40 CFR 260 – Hazardous Waste Management System: General

3) 40 CFR 268 – Land Disposal Restrictions: General

4) 40 CFR 302 – Reportable Quantities, and Notification

5) EPA Guidance Document SW-846 Test Methods for Evaluating Solid Waste, Physical/Chemical Methods

c. U.S. Department of Transportation (DOT)

1) 49 CFR 171-180 – General Awareness and Training Requirements for Handlers, Loaders, and Drivers

2. State:

a. Code of Maryland Regulations (COMAR)

1) COMAR 26.13 – Disposal of Controlled Hazardous Substances

2) COMAR 26.16 – Lead

1.4 DEFINITIONS

A. Terms defined by OSHA Regulation 29 CFR 1926.62 and COMAR Regulation 26.16 have the same meaning when used in this Section.

1.5 SUBMITTALS

A. Prior to commencement of work, submit to the Engineer the items listed as follows for review. Work shall not start until these submittals are returned with the Engineer's written approval indicating that the submittal is returned for unrestricted use.

1. Lead Compliance Program meeting the requirements of 29 CFR 1926.62 (e) for the Contractor and each Subcontractor who will disturb lead in paint. Elements include but are not limited to:

a. A description of each activity in which lead is emitted.

b. A description of the means to be used to achieve compliance, and where engineering controls are required engineering plans and studies used to determine the methods selected for controlling exposure to lead.

c. Information on the technology considered to comply with the permissible exposure limit (PEL).

d. Air monitoring data that document the source of lead emissions.

e. A detailed schedule for implementing the program.

f. A work practice program which includes items required under paragraphs (g), (h), and (i) of 29 CFR 1926.62.

g. An administrative control schedule required by paragraph (e)(4) of 29 CFR 1926.62, if applicable.

h. A description of arrangements made among contractors on multi-contractor sites to inform affected employees of potential lead exposures.

2. Lead Waste Management Plan. This plan must identify each waste stream impacted by lead in paint and state how each such waste stream will be handled for waste disposal. Examples of potential waste streams include but are not limited to disposable PPE, plastic drop cloths, paint stripping waste, dust and paint chips from paint, and construction and demolition debris coated with lead-based paint. For each waste stream, the plan shall indicate:

a. Training certificate for contractor personnel who will handle or ship hazardous waste as required by 49 CFR 172 Subpart H, the hazardous waste shipping regulation of the Department of Transportation.

b. Packaging and labeling of waste.

c. A copy of the shipping manifest that will accompany hazardous waste. State the generator's ID number that will be used, the proper shipping name of the waste, and indicate how the Owner's signature will be obtained for the manifest.

d. Means of secure on-site storage of waste while it is accumulated.

e. Testing protocol. The Plan must indicate how the contractor will determine if the waste is hazardous for lead and if the paint contains PCBs which are known to have been an additive for some lead-based paint. The Plan must indicate who will collect samples, how samples will be collected, the laboratory that will analyze the samples, the analytical method, and the standard to which results will be compared.

f. Hazardous waste shipping company, their contact information, and their hazardous waste shipping identification number.

g. Transfer facility (if any), their contact information, and their Resource Conservation and Recovery Act (RCRA) identification number.

h. Final disposal site, their contact information, and their RCRA identification number.

i. All metal waste coated with lead-based paint shall be recycled at an appropriately certified and permitted facility.

3. Record(s) of any citation(s) issued by Federal, State, and local regulatory agencies relating to LBP abatement activity by the Contractor within the past 5 years. Contractor must include projects, dates, and resolutions.

4. Liability insurance certificate with the statement of coverage that indicates pollution coverage is included. Occurrence type insurance is required. Minimum coverage shall be at least $1,000,000 per occurrence.

1.6 LEAD HEALTH RISK

A. Where in the performance of the work, workers, supervisory personnel, subcontractors, or consultants may encounter, disturb, or otherwise function in the immediate vicinity of any identified lead in paint, take appropriate continuous measures as necessary to protect all building occupants from the risk of exposure to lead. Such measures shall include the procedures and methods described herein, and compliance with regulations of applicable Federal, State, and local agencies.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.1 METHODS OF COMPLIANCE

A. The Contractor shall adhere to the Lead Compliance Program and Lead Waste Management Plan submitted.

3.2 PROJECT COMPLETION

A. The Abatement Contractor shall remove all equipment, supplies, and waste from the project site.

B. The project will be considered complete when all required submittals have been received and approved.

END OF SECTION 02 83 00

SECTION 02 84 00 - POLYCHLORINATED BIPHENYL (PCB) EQUIPMENT REMOVAL AND DISPOSAL

PART 1 - GENERAL

1.1 SCOPE

A. Work Includes:

1. The work covered by this Section includes the furnishing of all materials and equipment and the performing of all labor for the removal and disposal of Polychlorinated Biphenyl (PCB) equipment as reported in the Limited Hazardous Materials Survey, Youth Detention Center Project, DPSCS #KT-000-110-C01, 926 Greenmount Avenue, Baltimore, Maryland 21202, dated December 24, 2014. The location(s) and type(s) of PCB equipment known to be present at the worksite are presented in the specifications.

2. Quantities presented in this Section are estimates only. The Contractor shall field verify quantities prior to submitting a bid or accept the estimates as accurate.

1.2 RELATED SECTIONS AND DOCUMENTS

A. Related Sections:

1. Section 00 73 19 – Health and Safety Requirements

2. Section 02 76 00 – Abatement Monitoring

B. Related Documents:

1. Drawings and general provisions of the Contract, including General Conditions, apply to this Section.

2. Limited Hazardous Materials Survey, Youth Detention Center Project, DPSCS #KT-000-110-C01, 926 Greenmount Avenue, Baltimore, Maryland 21202, dated December 24, 2014, EBA Engineering, Inc.

1.3 REFERENCES AND APPLICABLE STANDARDS AND GUIDELINES

A. The most recent edition of a relevant regulation, standard, or code shall be in effect. Where a conflict exists between the regulations, standards, codes, or these specifications, the more stringent requirements shall be utilized.

B. It shall be the duty and responsibility of the General Contractor and all of its Subcontractors to adhere to all regulations (Federal, State, and local) impacting this work including but not limited to:

1. Federal:

    a. U.S. Department of Labor, Occupational Safety and Health Administration (OSHA)

        1) 29 CFR 1910.12 – Construction Work

        2) 29 CFR 1910.132 – General Requirements

        3) 29 CFR 1910.147 – Control of Hazardous Energy (lockout/tagout)

        4) 29 CFR 1910.1200 – Hazard Communication

        5) 29 CFR 1926.59 – Hazard Communication

        6) 29 CFR 1926.95-102 – Personal Protective Equipment (PPE)

    b. U.S. Environmental Protection Agency (EPA)

        1) 40 CFR 260 – Hazardous Waste Management System: General

        2) 40 CFR 261 – Identification and Listing of Hazardous Waste

        3) 40 CFR 263 – Standards Applicable to Transporters of Hazardous Waste

        4) 40 CFR 271 – Requirements For Authorization of State Hazardous Waste Programs

        5) 40 CFR 761 – Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions

    c. U. S. Department of Transportation (DOT)

        1) 49 CFR 171-180 – General Awareness and Training Requirements for Handlers, Loaders, and Drivers

2. State:

    a. Code of Maryland Regulations (COMAR)

        1) COMAR 09.12 – Division of Labor and Industry

        2) COMAR 26.13 – Disposal of Controlled Hazardous Substances

1.4 DEFINITIONS

A. Terms defined by EPA Regulation 40 CFR 761 have the same meaning when used in this Section.

1.5 SUBMITTALS

A. Prior to commencement of work, submit to the Engineer the items listed as follows for review. Work shall not start until these submittals are returned with the Engineer's written approval indicating that the submittal is returned for unrestricted use.

1. Work Plan – Describe work procedures to be used for this portion of this project. The Work Plan shall include but not be limited to:

a. EPA Identification Number of waste hauler, if required.

b. Name and address of waste disposal facility where hazardous waste materials are to be disposed including:

1) Contact person, cell phone number, and e-mail address.

2) Copy of state license and permit.

3) Disposal facility permits.

c. Copy of forms required by state and local agencies.

d. Sample of disposal label to be used.

e. Documentation estimating the quantity of waste to be generated over the duration of the project and the Contractor's plan to store that waste.

f. Contractor statement indicating final disposition of equipment will be recycling.

g. Describe spill response procedures.

2. Liability insurance certificate with the statement of coverage that indicates pollution coverage is included. Occurrence type insurance is required. Minimum coverage shall be at least $1,000,000 per occurrence.

B. During work, the Contractor shall submit the following to the Engineer:

1. Copies of all waste manifests on the same day that the waste is picked up.

C. Upon completion of work, the Contractor shall submit the following to the Engineer:

1. Final waste disposal manifests signed by the waste disposal/recycling facility.

2. Transporter certification of notification to EPA of their PCB waste and stored chemical activities and EPA Identification Numbers if required.

3. Certificate of Decontamination, if required.

4. Certificate of Disposal and/or Recycling.

5. Testing results (if any).

1.6 PCB HEALTH RISKS

A. Where in the performance of the work, workers, supervisory personnel, subcontractors, or consultants may encounter, disturb, or otherwise function in the immediate vicinity of any identified PCBs, take appropriate continuous measures as necessary to protect all building occupants from the risk of exposure to PCBs. Such measures shall include the procedures and methods described herein, and compliance with regulations of applicable Federal, State, and local agencies.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Provide in quantities necessary to accomplish work of this Section.

1. Disposal Bags: 6-mil thick leak tight polyethylene bags.

2. Small Quantity Storage Containers: Five (5) gallon or less capacity for small quantity waste segregation, manufactured with structurally durable materials compatible with the hazardous waste type(s) used.

3. DOT Hazardous Waste Disposal Drums: In accordance with 49 CFR 173, 178, and 179.

4. DOT Hazardous Waste Labels: In accordance with 49 CFR.

2.2 PERSONAL PROTECTIVE EQUIPMENT

A. Person(s) conducting the removal of equipment known to contain or presumed to contain PCBs are required to be aware of the possible health hazards present and wear appropriate personal protective equipment (PPE) that includes but is not limited to:

1. Chemical resistant eye goggles.

2. Disposable fully-body coveralls.

3. Rubber boots.

4. Neoprene gloves (Note: gloves made of natural rubber latex and polyethylene materials are not acceptable).

PART 3 - EXECUTION

3.1 PCB EQUIPMENT TYPE(S) AND ESTIMATED QUANTITIES

A. Please refer to the Hazardous Materials Summary Table in the drawings.

3.2 PROCEDURES FOR REMOVAL OF PCB EQUIPMENT

A. Light Ballast

1. Power, if applicable, to the PCB equipment shall be discontinued before any work is started. Follow 29 CFR 1910.147, Control of Hazardous Energy (lockout/tagout) after electrical power is disabled.

2. After terminating the power, the ballast shall be removed from service as follows:

a. All wires connecting the ballast to the fixture shall be disconnected.

b. After the connecting wires have been disconnected, the bolts or screws that hold the ballast in position are to be loosened.

c. While loosening the bolts or screws, the person removing the ballast is to maintain a firm grip on the ballast in order to prevent the ballast from falling and creating a spill situation.

d. When the bolts or screws have been removed and the ballast has been dislodged from the light fixture, it must be placed into a storage/disposal container/drum immediately.

e. Proceed to the next light fixture, and repeat the removal procedure.

3.3 STORAGE AND TRANSPORTATION OF PCB EQUIPMENT

A. Storage and disposal of PCB equipment shall be conducted in accordance with all applicable requirements listed in 40 CFR 761 Subpart D (Storage and Disposal), specifically Section 761.65 (Storage for disposal); 40 CFR 260, 261, et al. (Hazardous Waste Management, including but not limited to General, Identification, Listing, Standards, etc.); 40 CFR 271 (Requirements For Authorization of State Hazardous Waste Programs); and DOT regulations 49 CFR Subchapter C Part 171, 173, 178, and 179 (Hazardous Materials Regulations).

B. Before shipment of the waste materials, an EPA Uniform Hazardous Waste Manifest must be filled out as required by the EPA 40 CFR 260, 261, et al. This manifest will contain information regarding the type and quantity of waste, the Generator/Owner, the Transporter, and the ultimate destination of the waste. Copies of this manifest are available from landfills and other hazardous material disposal sites.

1. The Transporter of the materials must be a licensed hazardous waste carrier capable of handling this specific material.

2. Each party involved in any part of the generation, transportation, and disposal of the waste material must be given and keep available a copy of the shipping manifest. Copies are to be kept at least three years after receipt of disposal certificate.

3.4 DISPOSAL OF PCB EQUIPMENT

A. The PCB equipment referenced in this specification must be disposed in accordance with 40 CFR 761.

3.5 LABELING OF WASTE CONTAINERS

A. Label waste containers with the following:

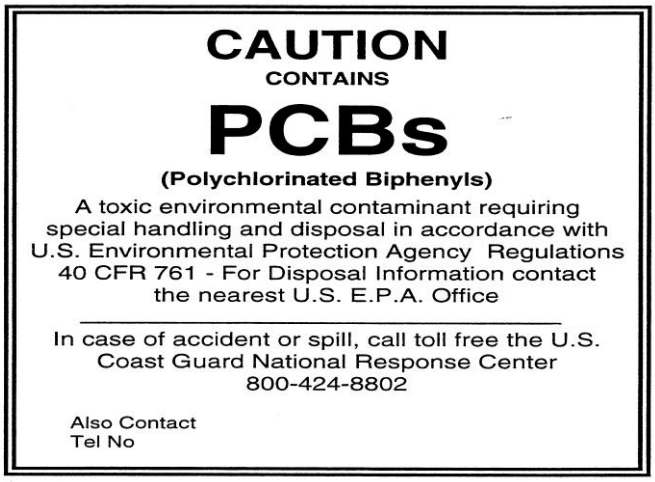
1. Date the item was placed in storage and the name of the cognizant activity/building.

2. A Non-RCRA Hazardous Waste Label with the Shipper's name, address, and contents should be affixed to container prior to shipment.

3. Marking Formats

a. Two formats shall be used for marking. These marks are known in the environmental regulations as the large PCB mark (ML) and the small PCB mark (Ms). A description of each mark is as follows:

1) Large PCB Mark: The ML mark consists of letters and striping on a white or yellow background and shall be sufficiently durable to equal or exceed the life (including storage for disposal) of the PCB article, PCB equipment, or PCB container. The mark is square and must measure at least 6 inches on each side. If the PCB article or PCB equipment is too small to accommodate this size, the mark may be reduced in size to a minimum of 2 inches on each side.

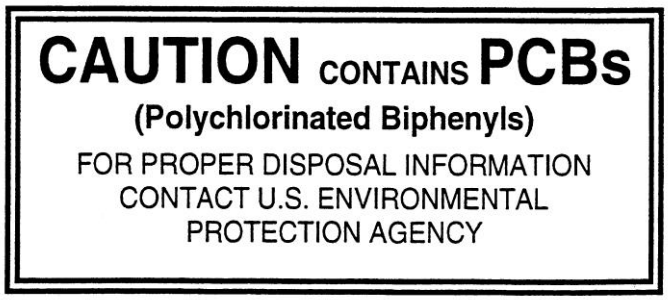


2) Small PCB Mark: The Ms mark consists of letters and striping on a white or yellow background, and shall be sufficiently durable to equal or exceed the life (including storage for disposal) of the PCB article, PCB equipment, or PCB container. The mark is rectangular and measures 1 inch by 2 inches. If the PCB article or PCB equipment is too small to accommodate this size, the mark may be reduced in size to a minimum of 0.4 inch by 0.8 inch.

b. All PCB transformers (transformers containing 500 ppm or greater PCBs) must be marked. Marking of PCB-contaminated transformers (transformers containing between 50 and less than 500 ppm PCBs) is not required.

c. All marks must be placed in a position on the exterior of the transformer so that the marks can be easily read by persons inspecting.

d. If the PCB transformer is too small to accommodate the smallest allowable of the ML mark, then the Ms mark may be used.



3.6 IDENTIFICATION NUMBER

A. Federal regulations 40 CFR 761 and 40 CFR 263 require that Generators, Transporters, Commercial Stores, and Disposers of PCBs and hazardous waste possess EPA Identification Numbers. The Contractor shall verify whether the Owner has an EPA Identification Number for the work to be performed as part of this specification. The Contractor shall also insure that the Owner has an EPA Identification Number for waste before shipment. If not, the Contractor shall assist the Owner in obtaining an EPA Identification Number from MDE prior to commencement of removal work.

3.7 TRANSPORTER CERTIFICATION

A. Comply with disposal and transportation requirements outlined in 40 CFR 761 and 40 CFR 263. Before transporting the waste, the Transporter shall sign and date the manifest acknowledging acceptance of the waste from the Owner and/or Owner's representative. Return a Transporter and Generator signed copy of the manifest to the Owner and/or Owner's representative before leaving the job site. Ensure that the manifest accompanies the waste at all times.

3.8 RECORD KEEPING

A. All record keeping shall be done in accordance with all applicable requirements listed in 40 CFR 761.180, General Records and Monitoring and 40 CFR 761 Subpart J, Records and Reports.

B. All paperwork associated with the removal, transportation, and disposal of the PCB equipment is required to be kept by the generator/owner for a period of no less than three (3) years after the removal and include the following:

1. Generator/Owner Information.

2. Equipment Information (Make, Model, ID number, & total number of each type).

3. Waste Transportation Company Information.

4. Copy of the Uniform Hazardous Waste Manifest.

5. Waste Disposal Site/Facility Information.

6. Reports of Analysis (if applicable).

7. Additional information as required by 40 CFR 761, Subpart J Records and Reports, Section 761.180 General Records and monitoring.

3.9 PROJECT COMPLETION

A. The Abatement Contractor shall remove all equipment, supplies, and waste from the project site.

B. The project will be considered complete when all required submittals have been received and approved.

END OF SECTION 02 84 00

SECTION 028700 - OZONE-DEPLETING COMPOUNDS (ODCS) EQUIPMENT REMOVAL AND DISPOSAL

PART 1 - GENERAL

1.1 SCOPE

A. Work Includes:

1. The work covered by this Section includes the furnishing of all materials and equipment and the performing of all labor for the removal and disposal of equipment containing Ozone-Depleting Compounds (ODCs) as reported in the Limited Hazardous Materials Survey, Youth Detention Center Project, DPSCS #KT-000-110-C01, 926 Greenmount Avenue, Baltimore, Maryland 21202, dated December 24, 2014. The location(s) and type(s) of equipment containing ODCs known to be present at the worksite are presented in the specifications.

2. Quantities presented in this Section are estimates only. The Contractor shall field verify quantities prior to submitting a bid or accept the estimates as accurate.

1.2 RELATED SECTIONS AND DOCUMENTS

A. Related Section:

1. Section 00 73 19 – Health and Safety Requirements

B. Related Documents:

1. Drawings and general provisions of the Contract, including General Conditions, apply to this Section.

2. Limited Hazardous Materials Survey, Youth Detention Center Project, DPSCS #KT-000-110-C01, 926 Greenmount Avenue, Baltimore, Maryland 21202, dated December 24, 2014, EBA Engineering, Inc.

1.3 REFERENCES AND APPLICABLE STANDARDS AND GUIDELINES

A. The most recent edition of a relevant regulation, standard, or code shall be in effect. Where a conflict exists between the regulations, standards, codes, or these specifications, the more stringent requirements shall be utilized.

B. It shall be the duty and responsibility of the General Contractor and all of its Subcontractors to adhere to all regulations (Federal, State, and local) impacting this work including but not limited to:

1. Federal:

   a. U.S. Department of Labor, Occupational Safety and Health Administration (OSHA)

      1) 29 CFR 1910.12 – Construction Work

      2) 29 CFR 1910.132 – General Requirements

      3) 29 CFR 1910.147 – Control of Hazardous Energy (lockout/tagout)

      4) 29 CFR 1910.1200 – Hazard Communication

      5) 29 CFR 1926.59 – Hazard Communication

      6) 29 CFR 1926.95-102 – Personal Protective Equipment (PPE)

   b. U.S. Environmental Protection Agency (EPA)

      1) 40 CFR 82 – Protection of Stratospheric Ozone

1.4 DEFINITIONS

A. Ozone-Depleting Compounds mean a group of chemicals that include chlorofluorocarbons-CFC, hydrochlorofluorocarbons-HCFC, and other halogenated chemicals such as halons that are found to contribute stratospheric ozone layer depletion.

B. Appliance means any device, which contains and uses a Class I (CFC) or Class II (HCFC) substance as a refrigerant and which is used for household or commercial purposes, including any air conditioner, refrigerator, chiller, or freezer.

C. Opening an appliance means any service, maintenance, repair, or disposal of an appliance that would release refrigerant from the appliance to the atmosphere unless the refrigerant was recovered previously from the appliance. Connecting and disconnecting hoses and gauges to and from the appliance to measure pressures within the appliance and to add refrigerant to or recover refrigerant from the appliance shall not be considered "opening."

D. Technician means any person who performs maintenance, service, or repair that could reasonably be expected to release Class I (CFC) or Class II (HCFC) substances from appliances, except for motor vehicle air conditioners (MVACs), into the atmosphere. Technician also means any person performing disposal of appliances, except for small appliances, MVACs, and MVAC-like appliances that could be reasonably expected to release Class I or Class II refrigerants from appliances into the atmosphere.

E. Reclaim means to reprocess refrigerant to all of the specifications in Appendix A of 40 CFR Part 82, Subpart F (based on Air-Conditioning, Heating, and Refrigeration Institute (AHRI) Standard 700-1993, Specification for Fluorocarbons and Other Refrigerants) that are applicable to that refrigerant and to verify that the refrigerant meets these specifications using the analytical methodology prescribed in Section 5 of Appendix A of 40 CFR Part 82, Subpart F. Reclamation requires specialized machinery. The

technician will recover the refrigerant and then send it either to a general reclaimer or back to the refrigerant manufacturer.

1.5 SUBMITTALS

A. Prior to commencement of work, submit to the Engineer the items listed as follows for review. Work shall not start until these submittals are returned with the Engineer's written approval indicating that the submittal is returned for unrestricted use.

1. Work Plan – Describe work procedures to be used for this portion of this project. The Work Plan shall include the method that will be used to remove Ozone-Depleting Compounds from each type of appliance. Also, include the name and address of the facility where the equipment will be recycled.

2. Certifications – Provide copies of Technician Certifications.

3. Liability insurance certificate with the statement of coverage that indicates pollution coverage is included. Occurrence type insurance is required. Minimum coverage shall be at least $1,000,000 per occurrence.

B. Upon completion of work, the Contractor shall submit the following to the Engineer:

1. Documentation of all equipment from which ODCs were reclaimed onsite.

2. Documentation of all equipment from which ODCs were reclaimed offsite.

1.6 PROHIBITION ON VENTING

A. Under EPA Regulation 40 Part 82, individuals are prohibited from knowingly venting Ozone-Depleting Compounds into the atmosphere while maintaining, servicing, repairing, or disposing of appliances.

1.7 SERVICE PRACTICE REQUIREMENTS

A. Evacuation Requirements

1. Air-conditioning and refrigeration equipment must be evacuated to EPA-required vacuum level prior to opening. If the technician's recovery or recycling equipment was manufactured on or after November 15, 1993, then an EPA-approved equipment testing organization must certify the equipment. Refrigerant recovery and recycling equipment manufactured before November 15, 1993, may be grandfathered if it meets the standard detailed in 40 CFR 82.158.

B. Reclamation Requirement

1. EPA has established that refrigerant recovered and/or recycled can be returned to the same system or other systems owned by the same person without restriction. If refrigerant changes ownership, however, that refrigerant must be reclaimed.

C. Equipment Certification

1. EPA has established a certification program for refrigerant recovery and recycling equipment. EPA requires that persons servicing or disposing of air-conditioning and refrigeration equipment certify to the EPA Region I Office that they have acquired (built, bought, or leased) recovery or recycling equipment and that they are complying with the applicable requirements of this rule. Owners do not have to send in a new form each time they add recycling or recovery equipment to their inventory. Certification of refrigerant recovery and recycling equipment manufactured on or after November 15, 1993 can be identified by a label reading "This equipment has been certified by AHRI and Underwriters Laboratories, Inc. (UL) to meet EPA's minimum requirements for recycling and/ or recovery equipment intended for use." Lists of certified equipment might be obtained by contacting AHRI at 703-524-8800 and UL at 708-272-8800 ext. 42371.

D. Technician Certification

1. EPA has established a technician certification program for technicians who perform maintenance, service, repair, or disposal that could be reasonably expected to release refrigerants into the atmosphere. All technicians must be certified through the EPA-approved training program.

1.8 DISPOSAL OF EQUIPMENT CONTAINING OZONE-DEPLETING COMPOUNDS

A. All major equipment containing Ozone-Depleting Compounds (e.g., chillers) must have their Ozone-Depleting Compounds recovered prior to dismantling. Small units that will enter the waste stream intact, such as freezers and window air conditioners, shall have their refrigerant recovered prior to the final disposal of the equipment.

B. If refrigerants are recycled or reclaimed, they are not considered hazardous under federal law. In addition, used oils contaminated with CFCs are not hazardous on the condition that:

1. They are not mixed with other waste.

2. They are subject to CFC recycling or reclamation.

3. They are not mixed with used oils from other sources.

4. Used oils that contain CFCs after the CFC reclamation procedure, however, are subject to specific limits for used oil fuels if these oils are destined for burning.

C. After refrigerants have been recovered, evacuated equipment shall be recycled.

1.9 RECORD KEEPING

A. All records must be kept at least 3 years.

B. Contractors disposing of small appliances must maintain a copy of signed statements from the appliance supplier (e.g., the original owner or disposal contractor) if the supplier indicates that he has removed the refrigerant from the appliance.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.1 EQUIPMENT TYPE(S) CONTAINING OZONE-DEPLETING COMPOUNDS AND ESTIMATED QUANTITIES

A. Please refer to the Hazardous Materials Summary Table in the drawings.

3.2 METHODS OF COMPLIANCE

A. The Contractor shall adhere to the Ozone-Depleting Compounds Work Plan submitted.

3.3 PROJECT COMPLETION

A. The Abatement Contractor shall remove all equipment, supplies, and waste from the project site.

B. The project will be considered complete when all required submittals have been received and approved.

END OF SECTION 02 87 00

SECTION 02 88 00 - UNIVERSAL WASTE REMOVAL AND DISPOSAL

PART 1 - GENERAL

1.1 SCOPE

A. Work Includes:

1. The work covered by this Section includes the furnishing of all materials and equipment and the performing of all labor for the removal and disposal of Universal Wastes (UWs) as reported in the Limited Hazardous Materials Survey, Youth Detention Center Project, DPSCS #KT-000-110-C01, 926 Greenmount Avenue, Baltimore, Maryland 21202, dated December 24, 2014. The location(s) and type(s) of UW known to be present at the worksite are presented in the specifications.

2. Quantities presented in this Section are estimates only. The Contractor shall field verify quantities prior to submitting a bid or accept the estimates as accurate.

1.2 RELATED SECTIONS AND DOCUMENTS

A. Related Sections:

1. Section 00 73 19 – Health and Safety Requirements

2. Section 02 89 00 – Abatement Monitoring

B. Related Documents:

1. Drawings and general provisions of the Contract, including General Conditions, apply to this Section.

2. Limited Hazardous Materials Survey, Youth Detention Center Project, DPSCS #KT-000-110-C01, 926 Greenmount Avenue, Baltimore, Maryland 21202, dated December 24, 2014, EBA Engineering, Inc.

1.3 REFERENCES AND APPLICABLE STANDARDS AND GUIDELINES

A. The most recent edition of a relevant regulation, standard, or code shall be in effect. Where a conflict exists between the regulations, standards, codes, or these specifications, the more stringent requirements shall be utilized.

B. It shall be the duty and responsibility of the General Contractor and all of its Subcontractors to adhere to all regulations (Federal, State, and local) impacting this work including but not limited to:

1. Federal:

    a. U.S. Department of Labor, Occupational Safety and Health Administration (OSHA)

        1) 29 CFR 1910.12 – Construction Work

        2) 29 CFR 1910.132 – General Requirements

        3) 29 CFR 1910.134 – Respiratory Protection

        4) 29 CFR 1910.147 – Control of Hazardous Energy (lockout/tagout)

        5) 29 CFR 1910.1200 – Hazard Communication

        6) 29 CFR 1926.59 – Hazard Communication

        7) 29 CFR 1926.95-102 – Personal Protective Equipment (PPE)

    b. U.S. Environmental Protection Agency (EPA)

        1) 40 CFR 260 – Hazardous Waste Management System: General

        2) 40 CFR 268 – Land Disposal Restrictions: General

        3) 40 CFR 273 – Universal Waste Regulations

    c. U.S. Department of Transportation (DOT)

        1) 49 CFR 171-180 – General Awareness and Training Requirements for Handlers, Loaders, and Drivers

2. State:

    a. Code of Maryland Regulations (COMAR)

        1) COMAR 26.13 – Disposal of Controlled Hazardous Substances

1.4 DEFINITIONS

A. Terms defined by EPA Regulation 40 CFR 273 and by Code of Maryland Regulation 26.13 have the same meaning when used in this Section.

1.5 SUBMITTALS

A. Prior to commencement of work, submit to the Engineer the items listed as follows for review. Work shall not start until these submittals are returned with the Engineer's written approval indicating that the submittal is returned for unrestricted use.

1. Work Plan – Describe work procedures to be used for this portion of this project. The Work Plan shall include but not be limited to:

a. Project contact sheet for key personnel including names, cell phone numbers, and e-mail addresses for:

1) General Contractor.

2) Abatement Contractor.

b. Describe work practices for removal of each type of universal waste.

c. List all required personal protective equipment (PPE).

d. Describe lockout/tagout procedures.

e. Describe temporary waste storage procedures. Include labeling of containers and where the containers will be stored.

f. Describe transportation and disposal procedures. Include the following:

1) A sample of the disposal label that will be used.

2) The name and address of the waste disposal facility where waste materials are to be recycled/disposed.

3) Documentation estimating the quantity of waste (drums, containers, etc.) to be generated over the duration of the project.

4) Contractor statement indicating final disposition of universal wastes will be recycling.

g. Describe spill response procedures.

2. Liability insurance certificate with the statement of coverage that indicates pollution coverage is included. Occurrence type insurance is required. Minimum coverage shall be at least $1,000,000 per occurrence.

B. During work, the Contractor shall submit the following to the Engineer:

1. Copies of all waste manifests on the same day that waste is picked up.

C. Upon completion of work, the Contractor shall submit the following to the Engineer:

1. Final waste disposal manifests signed by the waste disposal/recycling facility.

1.6 UNIVERSAL WASTE HEALTH RISKS

A. Where in the performance of the work, workers, supervisory personnel, subcontractors, or consultants may encounter, disturb, or otherwise function in the immediate vicinity of any identified UW, take appropriate continuous measures as necessary to protect all building occupants from the risk of exposure to UW. Such measures shall include the procedures and methods described herein, and compliance with regulations of applicable Federal, State, and local agencies.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Provide in quantities necessary to accomplish work in this Section.

1. Disposal Bags: 6-mil thick leak tight polyethylene bags

2. Small Quantity Storage Containers: Five (5) gallon or less capacity for small quantity waste segregation, manufactured with structurally durable materials compatible with the hazardous waste type(s) used

3. DOT Waste Disposal Drums

4. Small Mercury Spill Cleanup Kit: Items needed for a small mercury cleanup kit include the following (Note: Small Mercury Spill Cleanup Kits are available for purchase):

a. 1 box of ziplock-type bags;

b. Trash bags (2 to 6 mil thick);

c. Neoprene gloves (Note: gloves made of natural rubber latex and polyethylene materials are not acceptable.);

d. Paper towels;

e. Cardboard or squeegee;

f. Eyedropper;

g. Duct tape, or shaving cream and small paint brush;

h. Flashlight; and

i. Powdered sulfur or zinc.

5. Acid Waste Cleanup Kit

2.2 PERSONAL PROTECTIVE EQUIPMENT

A. Person(s) conducting the removal of universal wastes are required to be aware of the possible health hazards present and wear appropriate personal protective equipment (PPE) that includes but is not limited to:

1. Chemical resistant eye goggles

2. Disposable coveralls

3. Rubber boots

4. Neoprene gloves (Note: gloves made of natural rubber latex and polyethylene materials are not acceptable)

PART 3 - EXECUTION

3.1 UNIVERSAL WASTE TYPE(S) AND ESTIMATED QUANTITIES

A. Please refer to the Hazardous Materials Summary Table in the drawings.

3.2 METHODS OF COMPLIANCE

A. The Contractor shall adhere to the Universal Waste Work Plan submitted.

3.3 PROJECT COMPLETION

A. The Abatement Contractor shall remove all equipment, supplies, and waste from the project site.

B. The project will be considered complete when all required submittals have been received and approved.

END OF SECTION 02 88 00

SECTION 02 89 00 - ABATEMENT MONITORING

PART 1 - GENERAL

1.1 SCOPE

A. The General Contractor shall retain an independent Industrial Hygiene Contractor to perform the work of this Section.

B. Work Includes:

1. Monitoring asbestos abatement and verifying that all asbestos has been removed prior to demolition.

2. Monitoring lead-safe work practices and impact of work to lead coatings.

3. Monitoring universal waste abatement and verifying that all universal waste has been removed prior to demolition.

4. Monitoring PCB abatement and verifying that all PCBs have been removed prior to demolition.

5. Monitoring dust emissions during demolition.

1.2 RELATED SECTIONS AND DOCUMENTS

A. Related Sections:

1. Section 00 73 19 – Health and Safety Requirements

2. Section 02 82 00 – Asbestos Abatement

3. Section 02 83 00 – Impact to Lead Painted Surfaces, Removal and Disposal

4. Section 02 88 00 – Universal Waste Removal and Disposal

5. Section 028400 – Polychlorinated Biphenyl (PCB) Equipment Removal and Disposal

B. Related Documents:

1. Drawings and general provisions of the Contract, including General Conditions, apply to this Section.

2. Limited Hazardous Materials Survey, Youth Detention Center Project, DPSCS #KT-000-110-C01, 926 Greenmount Avenue, Baltimore, Maryland 21202, dated December 24, 2014, EBA Engineering, Inc.

1.3 REFERENCES AND APPLICABLE STANDARDS AND GUIDELINES

A. The most recent edition of a relevant regulation, standard, or code shall be in effect. Where a conflict exists between the regulations, standards, codes, or these specifications, the more stringent requirements shall be utilized.

B. It shall be the duty and responsibility of the General Contractor and all of its Subcontractors to adhere to all regulations (Federal, State, and local) impacting this work including but not limited to:

1. Federal:

a. U.S. Department of Labor, Occupational Safety and Health Administration (OSHA)

1) 29 CFR 1910.12 – Construction Work

2) 29 CFR 1910.132 – General Requirements

3) 29 CFR 1910.134 – Respiratory Protection

4) 29 CFR 1910.147 – Control of Hazardous Energy (lockout/tagout)

5) 29 CFR 1910.1001 – Asbestos General Industry Standard

6) 29 CFR 1926.33 – Access to Employee Exposure and Medical Records

7) 29 CFR 1926.59 – Hazard Communication

8) 29 CFR 1926.62 – Lead

9) 29 CFR 1926.95-102 – Personal Protective Equipment (PPE)

10) 29 CFR 1926.103 – Respiratory Protection

11) 29 CFR 1926.1101 – Asbestos in Construction

b. U.S. Environmental Protection Agency (EPA)

1) 40 CFR 61, Subpart M – National Emission Standards for Hazardous Air Pollutants (NESHAP), National Emission Standards for Asbestos

2) 40 CFR 117.3 – Determination of Reportable Quantities

3) 40 CFR 763 – Asbestos Hazard Emergency Response Act (AHERA)

4) 40 CFR 260 – Hazardous Waste Management System: General

5) 40 CFR 268 – Land Disposal Restrictions: General

6) 40 CFR 271 – Requirements For Authorization of State Hazardous Waste Programs

7) 40 CFR 273 – Universal Waste Regulations

8) 40 CFR 302 – Designation, Reportable Quantities, and Notification

9) EPA Guidance Document SW-846 Test Methods for Evaluating Solid Waste, Physical/Chemical Methods

c. U.S. Department of Transportation (DOT)

1) 49 CFR 170-180 – Hazardous Waste Transportation

2) 49 CFR 171-180 – General Awareness and Training Requirements for Handlers, Loaders, and Drivers

d. National Institute of Occupational Safety and Health (NIOSH)

1) NIOSH Manual of Analytical Methods (NMAM)

2. State:

a. Code of Maryland Regulations (COMAR)

1) COMAR 09.12 – Division of Labor and Industry

2) COMAR 26.11.21 – Control of Asbestos

3) COMAR 26.11.23 – Asbestos Accreditation of Individuals

4) COMAR 26.13 – Disposal of Controlled Hazardous Substances

5) COMAR 26.16 – Lead

1.4 INDUSTRIAL HYGIENE CONTRACTOR REQUIREMENTS

A. The Industrial Hygiene Contractor shall demonstrate prior experience with performing similar monitoring projects. Requirements for prior experience are as follows:

1. Industrial Hygiene Contractor must have a minimum of three years of experience monitoring abatement projects.

2. Industrial Hygiene Contractor must have monitored abatement projects for asbestos, lead, universal waste, and PCBs.

3. Industrial Hygiene Contractor must have monitored abatement on two or more projects of similar size and scope during the past three years.

4. Industrial Hygiene Contractor must provide three project references including at least two of similar size and scope.

B. The Industrial Hygiene Contractor shall have a written Quality Assurance / Quality Control Program (QA/QC Program) with standard operating procedures for the work of this Section. The QA/QC Program shall detail procedures for performing all quality

control required by the methods selected for sampling and analysis and a means to verify that the quality control procedures are being executed.

C. The Industrial Hygiene Contractor shall have a Certified Industrial Hygienist responsible for quality control on this project. In addition the Certified Industrial Hygienist will be responsible for approving any plans and revised work procedures developed to address exceedances of control and action levels, respectively.

D. The Industrial Hygiene Contractor shall have an On-site Industrial Hygienist during all abatement activities. The On-site Industrial Hygienist shall have a minimum of 2 years of experience performing similar monitoring.

E. The On-site Industrial Hygienist shall be accredited in Maryland as an asbestos supervisor and an asbestos inspector and shall have training in asbestos monitoring in a course that is equivalent to NIOSH 582.

F. The On-site Industrial Hygienist shall be accredited in Maryland as a Lead Paint Inspector Technician or Risk Assessor.

G. The on-site Industrial Hygienist shall adhere to the General Contractor's Health and Safety Plan.

1.5 DEFINITIONS

A. Industrial Hygiene Contractor – Third party industrial hygiene consulting firm retained by the General Contractor to perform the duties described in this Section.

B. Certified Industrial Hygienist – A person certified by the American Board of Industrial Hygiene in the comprehensive practice of industrial hygiene.

C. On-Site Industrial Hygienist – The representative of the Industrial Hygiene Contractor who is present on site daily and has the primary responsibility for executing the work of this Section.

D. Control Level – The level of airborne contaminant that results in a Stop Work order being required.

E. Action Level – The level of airborne contaminant that results in a requirement that abatement contractor develop a plan of action to reduce the level of contaminant.

1.6 SUBMITTALS

A. Prior to commencement of work, submit to the Engineer the items listed as follows for review. Work shall not start until these submittals are returned with the Engineer's written approval indicating that the submittal is returned for unrestricted use.

1. A list including the names, cell phone numbers, and e-mail addresses for the Certified Industrial Hygienist and On-Site Industrial Hygienist. For each individual submit resumes, certificates of training, MDE accreditations, medical approval to wear a respirator, and fit test for a respirator.

2. A statement of qualification providing evidence that Industrial Hygiene Contractor has the experience required by Paragraph 1.4A of this Section. The statement shall include a point of contact, phone number, and e-mail address for each project referenced.

3. The Industrial Hygiene Contractor's written quality control program with a statement signed and sealed by the Certified Industrial Hygienist that the QA/QC Program has been reviewed and includes procedures for performing all quality control required by the methods selected for sampling and analysis and a means to verify that the quality control procedures are being executed.

B. During abatement activities, the Industrial Hygiene Contractor shall:

1. Immediately notify the General Contractor and Owner's Representative by telephone with a follow up e-mail if any of the following conditions occur:

a. Breach of containment.

b. Applicable control level is exceeded for contaminants in air.

c. Accident resulting in personal injury requiring medical attention.

d. Property damages of over $500.00.

C. Project Closeout Submittal shall include:

1. Copies of daily logs.

2. Containment inspection check list.

3. Final clearance check list for days when a final clearance inspection is performed.

4. Air sampling log for all samples collected.

5. Analytical report for all samples analyzed on-site and all certificates of analysis for samples analyzed at a contract laboratory.

6. Spreadsheet recording information on waste shipments including date, type and quantity of material shipped, and waste manifest number.

7. Incident investigation reports.

8. A statement issued by the Industrial Hygiene Contractor that all hazardous materials included in the specification have been removed, that wall penetrations and pipe chases have been inspected using destructive techniques and all asbestos in these locations has been removed, and the Industrial Hygiene Contractor is not aware of any hazardous materials remaining in the work area(s) with the exception of lead-based paint that will be left in place during abatement.

1.7 CONTROL LEVELS AND ACTION LEVELS

A. Inside Work Area:

1. The Control Level shall be 50% of the Maximum Use Concentration as defined by OSHA in 29 CFR 1910.134. If airborne concentrations for any one sample exceed this Control Level, work shall be stopped and a plan developed to address the exceedance. The plan must be approved by the Certified Industrial Hygienist. Do not recommence work until authorized in writing by the Certified Industrial Hygienist and the Owner's Representative.

2. The Action Level for any sample taken shall be 25% of the Maximum Use Concentration as defined by OSHA in 29 CFR 1910.134. If airborne concentrations for any one sample exceed the Action Level, the abatement contractor shall revise work procedures to lower airborne contaminant levels. If the Time Weighted Average (TWA) contaminant level for any work shift or 8-hour period exceeds the Action Level, contractor shall stop all work except corrective action. Do not recommence work until authorized, in writing, by the Certified Industrial Hygienist and the Owner's Representative.

B. Outside Work Area:

1. The Control Level shall be 50% of the Permissible Exposure Limit for the applicable contaminant. If airborne concentrations for any one sample exceed this Control Level, work shall be stopped and a plan developed to address the exceedance. The plan must be approved by the Certified Industrial Hygienist. Do not recommence work until authorized in writing by the Certified Industrial Hygienist and the Owner's Representative. If the high reading was the result of a failure of Work Area isolation measures, initiate the following actions:

   a. Immediately stop all abatement work.

   b. Contact project Certified Industrial Hygienist for direction.

   c. Notify Owner's Representative.

   d. Evaluate possible sources of contamination.

   e. Repair damaged containment.

   f. As directed by project Certified Industrial Hygienist, decontaminate surfaces outside of the containment that may have been contaminated.

   g. Collect outside sample.

   h. If outside sample passes, re-start abatement. If outside sample fails, repeat steps d. through g.

2. The Action Level shall be 25% of the Permissible Exposure Limit. If airborne concentrations for any one sample exceed the Action Level, the abatement contractor shall revise work procedures to lower airborne contaminant levels. If the Time Weighted Average (TWA) contaminant level for any work shift or 8 hour period exceeds the Action Level, contractor shall stop all work except corrective

action. Do not recommence work until authorized, in writing, by the Certified Industrial Hygienist and the Owner's Representative.

C. Fence Line:

1. The Control Level shall be 10% of the Permissible Exposure Limit for the applicable contaminant. If airborne concentrations for any one sample exceed this Control Level, work shall be stopped and a plan developed to address the exceedance. The plan must be approved by the Certified Industrial Hygienist. Do not recommence work until authorized in writing by the Certified Industrial Hygienist and the Owner's Representative. If the high reading was the result of a failure of Work Area isolation measures, initiate the following actions:

   a. Immediately stop all demolition work and abatement work.

   b. Contact project Certified Industrial Hygienist for direction.

   c. Notify Owner's Representative.

   d. Project Certified Industrial Hygienist to identify potential causes and prepare a plan for how to eliminate this condition.

   e. Execute Certified Industrial Hygienist prepared plan.

2. The Action Level shall be 5% of the Permissible Exposure Limit. If airborne concentrations for any one sample exceed the Action Level, the abatement contractor shall revise work procedures to lower airborne contaminant levels. If the Time Weighted Average (TWA) contaminant level for any work shift or 8 hour period exceeds the Action Level, contractor shall stop all work except corrective action. Do not recommence work until authorized, in writing, by the Certified Industrial Hygienist and the Owner's Representative.

1.8 AUTHORITY TO STOP WORK

A. The Owner, Industrial Hygiene Contractor, or the Engineer have the authority to issue a work stoppage at any time during the abatement work if the Owner, Industrial Hygiene Contractor, or Engineer deems that conditions are in violation of these specifications or any Federal, State, or local regulations.

B. Delays, stand-by time, and expenses necessary for the General Contractor to take corrective action, resolve any violations of these specifications or applicable laws shall be at the General Contractor's expense.

PART 2 - PRODUCTS

2.1 SAMPLING

A. Flow Measurement Devices shall have had the flow rate checked within the past 3 months and at least every 3 months during the project against a primary standard that is traceable to a standard at the National Institute of Standards and Technology (NIST).

B. Pumps shall be capable of maintaining the required flow rate +/- 10% for the duration of the sampling period.

C. Asbestos Cassettes

1. PCM cassettes shall be 28 mm cassettes with 0.8 micron MCEF filters.

2. TEM cassettes shall be 28 mm cassettes with 0.45 micron MCEF filters.

D. Lead cassettes shall be 37 mm cassettes with 0.8 micron MCEF filters.

E. Other parameters shall use sampling systems specified by the method.

F. A watch or cell phone to determine start and stop times of each sample.

2.2 DIRECT READING METERS

A. Direct reading meters shall have been calibrated as recommended by the manufacturer.

B. Daily Check:

1. A daily bump check for all meters used to measure gas concentrations shall be performed at the start and end of the day for all gases monitored.

2. An XRF shall have the calibration verified with check samples every 4 hours.

3. Other meters shall be field checked, if recommended by the manufacturer.

2.3 PCM ANALYSIS ON SITE

A. Microscope shall be equipped with a phase contrast diaphragm, a Walton-Becket graticule, and a telescope ocular.

B. An HSE/NPL slide shall be available for regular checking of the resolution of the scope.

C. An acetone vaporizer shall be used to dissolve filter membrane.

D. Blind quality control slides shall be included for analysis each day.

2.4 PERSONAL PROTECTIVE EQUIPMENT

A. Respirator and cartridge combination as required by abatement contractor’s respiratory protection plan.

B. Steel-toed boots.

C. Hard-hat.

D. Safety glasses.

E. Tyvek Suits/Gloves.

F. Other PPE required by the General Contractor.

PART 3 - EXECUTION

3.1 HAZARDOUS MATERIALS INSPECTIONS

A. The Industrial Hygiene Contractor shall be familiar with the hazardous materials identified within the Limited Hazardous Materials Survey, any addendum letters, and the Project Plans & Specifications.

B. The Industrial Hygiene Contractor shall be responsible for verifying that all materials identified in the Project Plans & Specifications are abated.

C. The Industrial Hygiene Contractor shall be responsible for identifying suspect hazardous materials not reported in the Project Plans & Specifications. Areas of particular importance are through wall penetrations, pipe chases behind walls, and unsampled exterior and roofing materials. Inclusion of 10 bulk samples for asbestos shall be required. A spreadsheet shall be developed that reports all suspect hazardous materials identified, results of sampling, and removal date.

D. At the conclusion of the abatement, the Industrial Hygiene Contractor shall issue a statement that all hazardous materials included in the Specifications have been removed, that wall penetrations and pipe chases have been inspected using destructive techniques and all asbestos in these locations has been removed, and that Industrial Hygiene Contractor is not aware of any hazardous materials remaining in the work area(s) with the exception of lead-based paint that will be left in place during demolition.

3.2 WORK PRACTICE INSPECTIONS

A. Asbestos:

The On-Site Industrial Hygienist shall be on-site during all asbestos abatement activities and perform the following duties:

1. Review Work Plan submitted by General Contractor and accepted by the Owner’s Representative.

2. Report any observations of failure of the asbestos abatement contractor to comply with the accepted Work Plan or any Federal or State regulations to the abatement contractor supervisor. If they are not immediately corrected, report the observation to the General Contractor and to the Owner’s Representative with a recommendation that a stop work order be issued.

3. Issue a stop work order whenever asbestos concentrations in air exceed a Control Limit or whenever there is an immediate threat to the health or safety of a worker, the public, or the environment.

4. Verify that each asbestos worker and asbestos supervisor has a valid asbestos photo identification card with them each day that asbestos abatement is performed. Maintain a checklist of workers present each day with a mark indicating that their card was verified that day.

5. Complete a pre-abatement checklist for each containment indicating that all required elements are appropriately installed.

6. Complete a daily checklist for each containment indicating that all required elements are appropriately installed. This checklist shall include verifying negative pressure at a minimum of every 2 hours during the day.

7. Maintain a daily log of abatement contractor's activities. A log of the On-Site Industrial Hygienist's activities is not required. Log must include:

    a. Start and stop time.

    b. Number of abatement workers and supervisors on site.

    c. A separate section for each containment in progress with a description of work accomplished that day.

    d. A report on any incidents including but not limited to: loss of power, breach of containment, accidents, visit by MDE or MOSH inspector.

    e. A section for waste removal indicating quantity of waste removed and waste shipping record number.

8. Complete a post-abatement checklist to include visual inspection, verification of encapsulation, and whether final clearance samples pass or fail.

B. Impact to Lead-Containing Painted Surfaces:

1. Review Lead Compliance Program and Lead Waste Management Plans submitted by General Contractor and accepted by the Owner.

2. Report any observations of failure to comply with the accepted Plans or any Federal or State regulations to the worker's supervisor. If they are not immediately corrected, report the observation to the General Contractor and to the Owner's Representative with a recommendation that a stop work order be issued.

3. Issue a stop work order whenever lead concentrations in air exceed a Control Limit or whenever there is an immediate threat to the health or safety of a worker, the public, or the environment.

4. Verify that each worker and supervisor has a valid lead paint worker or supervisor photo identification card with them each day of work. Maintain a checklist of workers present each day with a mark indicating that their card was verified that day.

5. Inspect abatement contractor work practices for conformance with specification and Federal and State regulations.

6. Maintain a record of hazardous waste shipments including date shipped, quantity shipped, and shipping record number.

C. Universal Waste:

1. Review Work Plan submitted by the General Contractor and accepted by the Owner.

2. Verify that workers have received training in the hazards associated with the wastes.

3. Report any observations of failure of abatement contractor to comply with the submitted Work Plan or any Federal or State regulations to the supervisor of the abatement contractor. If they are not immediately corrected, report the observation to the General Contractor and to the Owner's Representative with a recommendation that a stop work order be issued.

4. Maintain a record of universal waste shipments including date shipped, quantity shipped, and shipping record number.

5. Verify that all universal wastes identified in this specification have been removed.

D. PCBs:

1. Review Work Plan submitted by the General Contractor and accepted by the Owner.

2. Verify that workers have received training in the hazards associated with PCBs.

3. Report any observations of failure of PCB contractor to comply with the submitted work plan or any Federal, State, or local regulations to the supervisor. If they are not immediately corrected, report the observation to the General Contractor and to the Owner with a recommendation that a stop work order be issued.

4. Collect samples, if requested, of any suspect PCB materials and have them analyzed at a contract laboratory.

5. Maintain a record of PCB waste shipments including date shipped, quantity shipped, and shipping record number.

6. Verify that all PCB equipment identified in this specification has been removed.

3.3 WORKER EXPOSURE MONITORING

A. Asbestos:

1. Collect daily exposure monitoring samples representative of the worker exposure for each class of worker performing Class I or Class II asbestos work.

2. Record all information required by 29 CFR 1926.1101 (n)(2).

3. Post results at the job site as soon as practical but at the latest 24 hours after receipt of results.

B. Lead:

1. Perform an initial exposure assessment for each task being performed.

2. Repeat exposure assessment at a minimum of once every three months.

3. Record all information required by 29 CFR 1926.62 (n)(1).

4. Post results at the job site as soon as practical but at the latest 24 hours after receipt of results.

3.4 AREA MONITORING TO EVALUATE CONTAINMENT EFFECTIVENESS

A. During asbestos abatement collect area samples from inside of the containment, near the exit from the decon, near the exit from a bagout (if used), and at the outlet from the negative air machine if accessible. The target volume for samples inside of the containment is 120 liters. The target volume for samples outside of the containment is 1200 liters. If the level of dust results in overloaded samples at these volumes, the target volume shall be decreased to a volume resulting in a dust loading that can be analyzed. Samples shall be analyzed on site and a file with all results shall be maintained on site.

3.5 FENCELINE MONITORING

A. During building demolition collect fence line samples at the four fence lines for the following parameters:

1. Respirable dust using a direct reading, real-time monitor. Data shall be collected at 1 minute intervals and downloaded daily.

2. Sample for asbestos and analyze on site during the first week and once per week thereafter.

3. Sample for crystalline silica and lead daily during the first week and once per week thereafter. Submit samples to a contract laboratory for analysis with a 72-hour turnaround time.

END OF SECTION 02 89 00

SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:

1. Footings.
2. Foundation walls.
3. Slabs-on-grade.
4. Suspended slabs.
5. Concrete toppings.
6. Building frame members.
7. Building walls.

B. Related Sections:
1. Section 31 20 00 "Earth Moving" for drainage fill under slabs-on-grade.
2. Section 32 16 00 "Curbs, Gutters, Sidewalks, and Driveways" for concrete pavement and walks.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

1.4 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable LEED Credits

1. MRc2
2. MRc4
3. MRc5
4. MRc7
5. IEQc4.1

B. LEED Requirements

1. MRc2: Construction Waste Management:

No less than the specified portion of all construction waste from the Project shall be diverted from disposal in a landfill and/or incineration in with the Project Requirements

for Construction Waste Management and Disposal. Refer to Specification Sections 017419 Construction Waste Management and Disposal and 013510 Sustainable Design Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

2. MRc4: Recycled Content Material:

No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the Project Requirements for Recycled Content Materials. All materials counted towards the computations of the proportion of the Recycled Content Materials shall comply with the standard minimum percentages of post-consumer waste materials and for the minimum percentages of pre-consumer waste materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

3. MRc5: Regionally Manufactured and/or Harvested Materials:

No less than the specified minimum proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the Project Site in accordance with the Project Requirements for Regionally Manufactured and/or Harvested Materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

4. MRc7: Certified Wood:

No less than the specified proportion of the building (permanently installed wood-based materials and products and all wood-based materials and products in construction) shall be certified by the Forest Stewardship Council (FSC) in accordance with the Project Requirements. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

5. IEQc4.1: Low Emitting Materials – Sealant and Adhesives:

All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the Project Requirements for Low Emitting Materials – Sealants and Adhesives. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments. Submitted mix designs shall clearly indicate where mix is to be used on the Project.

1. Indicate amounts of mixing water to be withheld for later addition at Project site.

2. Provide certification from the admixture manufacturer that chloride content complies with or exceeds specified requirements.

3. Provide certification from admixture manufacturer hat all admixtures are compatible with other required or proposed admixtures.

C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

D. Post-Installed Anchor Product Data: Submit data for proprietary materials, ICC-ES reports, manufacturer's specifications (including finishes and/or materials), Material Safety Data Sheets (MSDS) and installation procedures.
1. Submittals shall clearly indicate where each anchor type and diameter is intended to be used.
2. ICC-ES listings and performance data shall include recommended loading for each application.
3. Only products with an ICC-ES listing will be considered for substitution requests. Contractor shall submit for Engineer's review, calculations that are prepared by a registered Professional showing substituted product can achieve an equivalent holding capacity using the appropriate building procedure as required by the Building Code. The calculations shall indicate diameter and embedment depth, with consideration of all applicable load adjustment factors, for substituted product to achieve equivalent performance to that illustrated on the drawings. Any increase in material costs for such submittal shall be the responsibility of the contractor.

E. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional. Formwork shop drawings shall be signed and sealed by a registered professional engineer in the state of the project.
1. Shoring and reshoring: Indicate proposed schedule and sequence of stripping formwork shoring removal, and installing and removing reshoring.
2. Design loads: Indicate applicable dead, live, and other loads for which the formwork has been designed on the submittal.

F. Sleeve Locations: Submit plan showing dimensioned locations and sizes for review by Architect and Engineer prior to concrete placement.

G. Construction Joint Locations: Submit plan showing dimensioned location of proposed construction joints for concrete slabs and walls for review by Architect and Engineer prior to concrete placement.

H. Crack Control Joint Locations in Slabs-on-Grade: Submit plan showing dimensioned location of proposed construction joints and control joints for review by Architect and Engineer prior to concrete slab-on-grade placement. Include proposed time frame for installation of control joints if by sawcutting methods as specified herein.

I. Samples: For waterstop and vapor retarder.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer, manufacturer, and testing agency.

B. Welding certificates.

C. Material Certificates: For each of the following, signed by manufacturers, certifying that each material item complies with or exceeds the specified requirements.

1. Cementitious materials.
2. Admixtures.
3. Form materials and form-release agents.
4. Steel reinforcement and accessories.
5. Waterstops.
6. Floor and slab treatments.
7. Bonding agents.
8. Adhesives.
9. Vapor retarders.
10. Semirigid joint filler.
11. Joint-filler strips.
12. Repair materials.

D. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:

1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.

E. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.

F. Field quality-control reports.

G. Minutes of preinstallation conference.

1.7 QUALITY ASSURANCE

A. Concrete Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

B. Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I.

Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.

D. Post-Installed Anchor Installer Qualifications: Post-installed anchors shall be installed by a qualified contractor/installer with at least three years of experience performing similar installations and undergo training as follows:
   1. Installer training: Conduct a through training with the manufacturer or the manufacturer's representative for the contractor/installer. Training to consist of a review of the complete installation process for drilled-in anchors, to include but not limited to:
      a. Hole drilling procedure
      b. Hole preparation and cleaning technique
      c. Adhesive Injection & dispenser training and maintenance
      d. Rebar dowel preparation and installation
      e. Proof loading/torquing

E. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.

F. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M, "Structural Welding Code - Reinforcing Steel."

G. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

   1. ACI 301, "Specifications for Structural Concrete."
      a. Apply Sections 1 through 5 for normal weight concrete applications.
      b. Apply Section 7, "Lightweight Concrete," where lightweight concrete is used.
   2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

H. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

I. Mockups: Cast concrete slab-on-grade and formed-surface panels to demonstrate typical joints, surface finish, texture, tolerances, floor treatments, and standard of workmanship.

   1. Build panel approximately 200 sq. ft. (18.6 sq. m) for slab-on-grade and 100 sq. ft. (9.3 sq. m) for formed surface in the location indicated or, if not indicated, as directed by Architect.
   2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

J. Preinstallation Conference: Conduct conference at Project site.

   1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:

      a. Contractor's superintendent.
      b. Independent testing agency responsible for concrete design mixtures.
      c. Ready-mix concrete manufacturer.

d. Concrete subcontractor.

2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, semirigid joint fillers, forms and form removal limitations, shoring and reshoring procedures, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Avoid damaging coatings on steel reinforcement.

B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

C. Post-installed concrete anchors: Deliver to job site in manufacturer's or distributor's packing undamaged, complete with installation instructions. Store anchors and adhesives in accordance with manufacturer's recommendations. Protect and handle materials in accordance with manufacturer's recommendations to prevent damage or deterioration.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

1. Plywood, metal, or other approved panel materials.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch (19 by 19 mm), minimum.

D. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

E. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that will leave no corrodible metal closer than 1 inch (25 mm) to the plane of exposed concrete surface.
2. Furnish ties that, when removed, will leave holes no larger than 1 inch (25 mm) in diameter in concrete surface.
3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.2 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

B. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.

C. Plain Steel Wire: ASTM A 82/A 82M, as drawn.

D. Plain Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from as-drawn steel wire into flat sheets.

E. Epoxy-Coated Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed bars, ASTM A 775/A 775M or ASTM A 934/A 934M, epoxy coated, with less than 2 percent damaged coating in each 12-inch (300-mm) bar length.

F. Deformed-Steel Wire: ASTM A 496/A 496M.

G. Deformed-Steel Welded Wire Reinforcement: ASTM A 497/A 497M, flat sheet.

H. Epoxy-Coated Welded Wire Reinforcement: ASTM A 884/A 884M, Class A coated, Type 1, deformed steel.

2.3 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), plain-steel bars, cut true to length with ends square and free of burrs.

B. Epoxy-Coated Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), plain-steel bars, ASTM A 775/A 775M epoxy coated.

C. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating; compatible with epoxy coating on reinforcement and complying with ASTM A 775/A 775M.

D. Zinc Repair Material: ASTM A 780, zinc-based solder, paint containing zinc dust, or sprayed zinc.

E. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.

3. For zinc-coated reinforcement, use galvanized wire or dielectric-polymer-coated wire bar supports.

2.4 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:

1. Portland Cement: ASTM C 150, Type I or Type III, gray. Supplement with the following:

a. Fly Ash: ASTM C 618, Class F or C.
b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

2. Blended Hydraulic Cement: ASTM C 595, Type IS, portland blast-furnace slag or Type IP, portland-pozzolan cement.

B. Silica Fume: ASTM C 1240, amorphous silica.

C. Normal-Weight Aggregates: ASTM C 33, Class 3S for concrete subject to severe exposure and Class 1N for interior concrete coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.

1. Maximum Coarse-Aggregate Size: Varies per “Concrete Mixtures for Building Elements.”
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

D. Lightweight Aggregate: ASTM C 330. See “Concrete Mixtures for Building Elements” for maximum nominal coarse aggregate size. Aggregates shall be suitably processed, washed, and screened, and shall consist of durable particles without adherent coatings.

E. Water: ASTM C 94/C 94M and potable.
1. Free of foreign matter that may be harmful to concrete, reinforcement, or concrete accessories, including but not limited to oils, acids, alkalies, salts, and organic materials.
2. Free of deleterious amounts of chloride ions.

2.5 ADMIXTURES

A. General:
1. Calcium chloride or admixtures with more than 0.06 percent chloride ions are not permitted.
2. Specific admixtures, or manufacturers listed within this section, are acceptable only if manufacturer can submit evidence of product compatibility with other products within same concrete mix.

B. Air-Entraining Admixture: ASTM C 260.

C. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding

those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

D. Non-Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, non-set-accelerating, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

   a. BASF Construction Chemicals - Building Systems; Rheocrete 222+.
   b. Cortec Corporation; MCI- [2000] [2005NS].
   c. Grace Construction Products, W. R. Grace & Co.; DCI-S.
   d. Sika Corporation; FerroGard 901.

E. Chloride Ion Content: Maximum water soluble chloride ion concentrations in hardened concrete at ages 28 to 42 days contributed from the ingredients, including water, aggregates, cementitious materials, and admixtures shall be limited by ACI 318, Table 4.4.1.
1. Concrete on metal deck shall be considered to be in the same category as prestressed concrete when determining maximum chloride ion content for corrosion protection of reinforcement.

2.6 VAPOR RETARDERS

A. Sheet Vapor Retarder: ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape.

1. Products: Subject to compliance with requirements, provide one of the following :
   a. Fortifiber Building Systems Group; Moistop Ultra 15 .
   b. Grace Construction Products, W. R. Grace & Co.; Florprufe 120.
   c. Insulation Solutions, Inc.; Viper VaporCheck 16 .
   d. Meadows, W. R., Inc.; Perminator 15 mil .
   e. Raven Industries Inc.; Vapor Block 15 .
   f. Reef Industries, Inc.; Griffolyn Type-105 15 mil Green .
   g. Stego Industries, LLC; Stego Wrap 15 mil Class A .

2.7 LIQUID FLOOR TREATMENTS

A. VOC Content: Liquid floor treatments shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; that penetrates, hardens, densifies and seals concrete surfaces.

1. Products: Subject to compliance with requirements, provide one of the following:

a. ChemMasters; Chemisil Plus.
b. Dayton Superior Corporation; Day-Chem Sure Hard (J-17).
c. Euclid Chemical Company (The), an RPM company; UltraSil Li+.
d. Kaufman Products, Inc.; SureHard LS.
e. L&M Construction Chemicals, Inc.; Seal Hard.

2.8 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

2.9 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.

B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, aromatic polyurea with a Type A shore durometer hardness range of 90 to 95 per ASTM D 2240.

C. Bonding Compounds: Use in strict conformance with the manufacturer's written recommended application limitations, precautions, directions for use, including, but not limited to, surface preparation, mixing, placing, curing, and compatibility with substrate conditions.
1. Latex Bonding Agent: ASTM C 1059/C 1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
2. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
a. Types I and II: Acceptable at non-load bearing applications for bonding hardened or freshly mixed concrete to hardened concrete.
b. Types IV and V: Acceptable at load bearing applications for bonding hardened or freshly mixed concrete to hardened concrete.

D. Dovetail Anchor Slots: Hot-dip galvanized-steel sheet, not less than 0.034 inch (0.85 mm) thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.10 POST INSTALLED ANCHORS

A. The anchor designated on the Drawings has been selected based on the required design load capacity as compared to the Manufacturer's specific allowable load

capacity for that specific product. Drawings indicate type of anchor, size and length of embedment based on the specific product indicated. Refer to Division 01 "Product Requirements." Comparable products shall be submitted for review and approval by the engineer prior to installation.

B. Anchors selected shall be ICC-ES approved for cracked concrete. Only anchors with ICBO/ICC approval are approved for use.
   1. Acceptable anchorage systems listed for uncracked concrete are NOT acceptable for use in cracked concrete.
   2. Acceptable anchorage systems listed for cracked concrete are acceptable in both a cracked and uncracked application.

C. Expansion Anchors for Bolted Connections to Concrete (Mechanical Anchor)

   1. Only expansion anchors with ICBO/ICC approval are approved for use.
   2. Anchors shall be stud type threaded bolts with single piece multi-section wedges, with hex head nut, and washer and meet description in Federal Specification A-A 1923A, Type 4.
   3. Size and embedment: As indicated in Drawings. Where embedment is not indicated, submit proposed embedment prior to installation to Engineer for approval.
   4. Drawing Reference: Unless noted otherwise, drawing reference to "expansion anchor(s)" shall indicate the use of anchors specified by this paragraph. Sleeve, adhesive, and other type anchors shall only be provided if specifically referenced.
   5. Material for Bolts, Nuts, and Washers:

      a. Carbon Steel with Zinc-Plating in accordance with ASTM B 633, Type III, Fe/Zn 5: Use at interior environments free of moisture.
      b. ASTM A 276 or ASTM A 493, Type 316 Stainless Steel: Use at potentially corrosive environments, including but not limited to following:

         1) Exterior exposed conditions.
         2) Potentially wet environments.
         3) Attachment of exterior cladding materials.

   6. Following products are considered acceptable for use in uncracked concrete. Other products will be acceptable only if approved by ICBO and Engineer. Submit ICBO Report for Engineer's review.

      a. HILTI Corporation - "Kwik Bolt 3 Expansion Anchor"
      b. SIMPSON Strong-Tie Anchor Systems – "Wedge-All"
      c. ITW Redhead – "Trubolt Wedge Anchors"

   7. Following products are considered acceptable for use in cracked concrete. Other products will be acceptable only if approved by ICBO and Engineer. Submit ICBO Report for Engineer's review.

      a. HILTI Corporation - "Kwik Bolt TZ Expansion Anchor"
      b. SIMPSON Strong-Tie Anchor Systems – "Strong-Bolt Wedge Anchor"

D. Adhesive Anchors for Rebar Doweling

   1. Only adhesive anchor systems with ICBO/ICC approval are approved for use.
   2. Shall consist of deformed Grade 60 reinforcing bar and two component epoxy adhesive meeting ASTM C 881, Type IV, Grade 3, Classes B and C.

3. Size, length, and embedment of dowel as indicated in Drawings. Where embedment depth is not indicated, use embedment of 12 x rebar diameter, or submit proposed embedment prior to installation to Engineer for review.
4. Following products are considered acceptable for use in uncracked concrete. Other products will be acceptable only if approved by ICBO and Engineer. Submit ICBO Report for Engineer's review.

    a. HILTI Corporation – “HIT RE 500 Adhesive System” for typical applications. “HIT HY-200” is permissible only with Engineer’s written approval.
    b. SIMPSON Strong-Tie Anchor Systems – “ET Adhesive System”
    c. ITW Ramset/Redhead - "Epcon C6 Adhesive System"

5. Following products are considered acceptable for use in cracked concrete. Other products will be acceptable only if approved by ICBO and Engineer. Submit ICBO Report for Engineer's review.
    a. HILTI Corporation – “HIT RE 500-SD Adhesive System” (typical applications). “HIT HY-200” permissible only with Engineer’s written approval.
    b. SIMPSON Strong-Tie Anchor Systems – “SET-XP Epoxy Adhesive Anchors”

6. Above epoxy adhesive systems require special attention to ambient conditions and cure time prior to loading. Where ambient or other project conditions require alternate product, such as acrylic based adhesive, other product(s) of listed manufacturers may be considered by Engineer. Consult with product manufacturer and submit proposal for review/approval by Engineer prior to use.

E. Adhesive Anchors for Bolted Connections to Concrete:

1. Only adhesive anchor systems with ICBO/ICC approval are approved for use.
2. Shall consist of threaded steel rod, nut, washer, and two component epoxy adhesive meeting ASTM C 881, Type IV, Grade 3, Classes B and C.
3. Material for Bolts, Nuts, and Washers:

    a. Carbon steel conforming to ASTM A36, or better, except as noted below.
    b. ASTM F 593, Type 316 Stainless Steel: Use at potentially corrosive environments, including but not limited to following:

        1) Exterior exposed conditions.
        2) Potentially wet environments.
        3) Attachment of exterior cladding materials.

4. Size and Embedment: As indicated in Drawings. Where embedment is not indicated, submit proposed embedment prior to installation to Engineer for review.
5. Following products are considered acceptable for use in uncracked concrete. Other products will be acceptable only if approved by ICBO and Engineer. Submit ICBO Report for Engineer's review.

    a. HILTI Corporation – “HIT RE 500 Adhesive System or HIT HY-200 w/ HIT TZ rods.” Assume RE 500 system if adhesive is not noted on the drawings.
    b. SIMPSON Strong-Tie Anchor Systems – “ET Epoxy-Tie Adhesive System” or “SET Epoxy-Tie Adhesive System.” Assume ET system if adhesive is not noted on the drawings.

c. ITW Ramset/Redhead - "Epcon C6 Adhesive System"

6. Following products are considered acceptable for use in cracked concrete. Other products will be acceptable only if approved by ICBO and Engineer. Submit ICBO Report for Engineer's review.

   a. HILTI Corporation – “HIT RE 500-SD Adhesive System”
   b. SIMPSON Strong-Tie Anchor Systems – “SET-XP Epoxy Adhesive Anchors”

7. Above epoxy adhesive systems require special attention to ambient conditions and cure time prior to loading. Where ambient or other project conditions require alternate product, such as acrylic based adhesive, other product(s) of listed manufacturers may be considered by Engineer. Consult with product manufacturer and submit proposal for review/approval by Engineer prior to use.

2.11 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch (3.2 mm) and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3.2 to 6 mm) or coarse sand as recommended by underlayment manufacturer.
4. Compressive Strength: Not less than 4100 psi (29 MPa) at 28 days when tested according to ASTM C 109/C 109M.

B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch (6.4 mm) and that can be filled in over a scarified surface to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3.2 to 6 mm) or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5000 psi (34.5 MPa) at 28 days when tested according to ASTM C 109/C 109M.

2.12 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.

1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

B. Cementitious Materials: Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent.

C. Limit water-soluble, chloride-ion content in hardened concrete to 0.06 percent by weight of cement.

D. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.
4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.

2.13 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Minimum compressive strengths: See Contract Documents

B. Nominal Maximum Coarse Aggregate Sizes: See Contract Documents. Where nominal maximum coarse aggregate size is not noted on the documents:
1. Foundations, grade beams, basement walls: 1.5 inch maximum nominal coarse aggregate size.
2. Concrete Superstructure in a concrete frame system (includes columns, slabs, shear walls): 3/4 inch maximum nominal coarse aggregate size.
3. Slabs on Metal Deck: 1/2 inch maximum nominal coarse aggregate size.
4. All other concrete: 3/4 inch maximum nominal coarse aggregate size.

C. Water-to-Cement (W/C) Ratio
1. Water content and W/C ratio shall be lowest possible value consistent with maximum consolidation, workability, and density. Where multiple exposure classes apply, lowest W/C ratio shall be used.

2. Exposure classes F0, S0, P0, C0, C1: Maximum W/C ratios for normal weight concrete in the classes listed shall be as follows:

F'c at 28 days (psi)	Air-entrained concrete	Non-Air-entrained concrete
4000 and below	0.48	0.57
4500	0.45	0.53
5000 and above	0.40	0.48

3. All other exposure classes F1, F2, F3, S2, S3: Maximum W/C ratio for normal weight concrete shall be 0.45.

Exposure class	All normal weight concrete
C2	0.40
F1, F2, F3, S2, S3	0.45
S1, P1	0.50

4. Maximum W/C ratios for building retaining walls with habitable space below grade (basement walls) shall conform to C.2 and C.3 above, but in no case shall be greater than 0.45.
5. Maximum W/C ratios for the following conditions shall conform to C.2 and C.3 above, but in no case shall be greater than 0.40.
   a. Garage Cast in place slabs or topping slabs.
   b. Truck dock slabs
   c. Exterior concrete (roof concrete excluded, unless otherwise noted) exposed to weather.

D. Slump Limits: Proportion and design mixes to limit concrete slump at point of deposit as follows:

1.	Reinforced foundation walls and footings	4” plus or minus 1”
2.	Elevated Slabs, slabs-on-grade, columns, reinforced above grade walls, NWC slabs on metal deck	4” plus or minus 1”
3.	Pier or Caisson Concrete	Flowable concrete req’d
4.	Lightweight Concrete	4” plus or minus 1”

5. Flowable Concrete: 8” max. slump after addition of high-range water reducing admixture or plasticizing admixture, 3” max slump prior to addition

E. Air Content: Proportion and design mixes using approved air-entrained admixture as follows:
1. Normal Weight Concrete: Provide air content percentage per ACI 318-08, Table 4.4.1, unless otherwise noted herein. See General Notes for Exposure Classes.
2. Lightweight concrete: Air content shall be as recommended by concrete supplier, but in no case shall not be less than 4 percent or greater than 6 percent.
3. Reduce air content percentage for normal weight concrete for surfaces to receive troweled finish or dry-shake hardeners to a maximum of 3 percent. Do not allow air content of trowel finished floors to exceed 3 percent.

2.14 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.15 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For mixer capacity of 1 cu. yd. (0.76 cu. m) or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
2. For mixer capacity larger than 1 cu. yd. (0.76 cu. m), increase mixing time by 15 seconds for each additional 1 cu. yd. (0.76 cu. m).

3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:

1. Class A, 1/8 inch (3.2 mm) for smooth-formed finished surfaces.

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.

1. Install keyways, reglets, recesses, and the like, for easy removal.
2. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Chamfer exterior corners and edges of permanently exposed concrete as indicated in the architectural drawings.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded. All embedded items shall be installed perpendicular to substrate surface unless otherwise indicated.

1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
3. Install dovetail anchor slots in concrete structures as indicated.
4. Install mechanical anchors according to the manufacturer’s written instructions, including drill bit size, hole cleaning, bolt insertion into the hole, and nut tightening to proper torque.
    a. Drill to specified depth of embedment with carbide tipped drill bit. Use of core drill for installation of mechanical anchors is not permitted.
5. Install adhesive anchors according to the manufacuturer’s written instructions, including drill bit size, hole cleaning, adhesive installation, threaded rod or dowel installation, nut tightening to proper torque, and ambient temperature limitations of the adhesive system.
    a. Drill to specified depth of embedment with carbide tipped drill bit. Use of core drill for installation of mechanical anchors is not permitted unless written approval is obtained from the Engineer.
    b. Do not disturb or load anchor before manufacturer’s specified curing time.

3.3 REMOVING AND REUSING FORMS

A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained.

1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 SHORES AND RESHORES

A. Comply with ACI 318 (ACI 318M), ACI 301, and ACI 347 for design, installation, and removal of shoring, reshoring, and backshoring.

B. Shoring, reshoring, and backshoring operations are the responsibility of the Contractor. Shoring plans shall be overseen by a qualified registered professional engineer in the state of the project and shall be submitted to the Engineer for review prior to work.

C. Do not remove shoring or reshoring until the measurement of slab tolerances is complete.

D. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.

E. Reshoring, backshoring, or combination thereof is required for concrete slabs, joists, beams, girders, or other elevated concrete framing, when construction loads will be placed on new concrete prior to attainment of specified 28-day strength.

F. During reshoring or backshoring operations, no construction loads shall be permitted on newly stripped concrete.

G. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.5 VAPOR RETARDERS

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.

1. Lap joints 6 inches (150 mm) and seal with manufacturer's recommended tape.

3.6 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

1. Weld reinforcing bars according to AWS D1.4/D 1.4M, where indicated.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

F. Epoxy-Coated Reinforcement: Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963/D 3963M. Use epoxy-coated steel wire ties to fasten epoxy-coated steel reinforcement.

G. Zinc-Coated Reinforcement: Repair cut and damaged zinc coatings with zinc repair material according to ASTM A 780. Use galvanized steel wire ties to fasten zinc-coated steel reinforcement.

3.7 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
2. Provide dowels across construction joints as indicated by Drawings. Dowels shall be supported during concrete operations so as to remain parallel with slab or wall surface and perpendicular to joint.
3. Form keyed joints as indicated. Keyways shall be 1-1/2”x d/3 x continuous in walls, slabs, and between walls and footings, unless noted otherwise on the drawings. “d” denotes specified wall or slab thickness.
4. Structural slabs, beams, and girders: Horizontal unit of placement shall not exceed 90 feet in each direction. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
5. Slabs on metal deck: Horizontal unit of placement shall not exceed 90 feet in each direction.
6. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
7. Space vertical joints in foundation walls at 30’-0” on center maximum or as indicated in the documents, whichever is more stringent. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
8. Shear walls with a length less than 30’-0” do not require vertical construction joints. Shear walls with a length longer than 30’-0” shall have a construction joint in the middle third of the wall length. Contractor shall submit proposed location of joint for Engineer’s review and approval.
9. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
10. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

11. Avoid construction joints at areas specified to receive thin-set tile, terrazzo, or resilent floor finish materials. If unavoidable, Contractor shall coordinate joint location with the architect. Slab grinding, chipping, and filling at such occurrences to achieve specified floor tolerances will be at Contractor's expense.

C. Contraction Joints (also referred to as "Crack Control Joints") in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Joints shall be placed at a maximum of 15 feet on center in any direction, unless otherwise indicated by the documents or approval is given by the Engineer in writing. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch (3.2 mm). Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3.2-mm-) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
    a. Initial sawcuts shall be performed no more than 3 hours after final surface finishing of the slab with equipment specifically suited and designed for early concrete sawcutting (dry cut saw) without dislodging aggregate. Perform final sawcuts as soon as possible to achieve specified joint size.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
2. Terminate full-width joint-filler strips not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) below finished concrete surface where joint sealants, specified in Section 079200 "Joint Sealants," are indicated.
3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.8 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.

C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
2. Maintain reinforcement in position on chairs during concrete placement.
3. Screed slab surfaces with a straightedge and strike off to correct elevations.
4. Slope surfaces uniformly to drains where required.
5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When average high and low temperature is expected to fall below 40 deg F (4.4 deg C) for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

G. Hot-Weather Placement: Comply with ACI 301 and as follows:

1. Maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.9 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces not exposed to public view.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, or surfaces to be covered with a coating or covering material applied directly to concrete.

C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:

1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.

D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.10 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch (6 mm) in one direction.

1. Apply scratch finish to surfaces indicated, surfaces to receive concrete floor toppings, and surfaces to receive mortar setting beds for bonded cementitious floor finishes.

C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to surfaces indicated, surfaces to receive trowel finish, and surfaces to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.

D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until

surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces indicated, exposed to view, or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system .
2. Finish surfaces to the following tolerances, according to ASTM E 1155 (ASTM E 1155M), for a randomly trafficked floor surface:
   a. Specified overall values of flatness, F(F) 30; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 15; for suspended slabs.

E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated and where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.

1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.11 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.

D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel finish concrete surfaces.

3.12 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist

cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.

C. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

D. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

   a. Water.
   b. Continuous water-fog spray.
   c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

   a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
   b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
   c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.

3.13 LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions.

1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
2. Do not apply to concrete that is less than 28 days' old.
3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.

3.14 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.

1. Defer joint filling until concrete has aged at least six month(s). Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches (50 mm) deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.15 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 (1.18-mm) sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch (13 mm) in any dimension to solid concrete. Limit cut depth to 3/4 inch (19 mm). Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas by grinding.
3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch (6 mm) to match adjacent floor elevations. Prepare, mix, and apply repair topping and

primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.

6. Repair defective areas, except random cracks and single holes 1 inch (25 mm) or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch (19-mm) clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
7. Repair random cracks and single holes 1 inch (25 mm) or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.16 FIELD QUALITY CONTROL

A. Testing and Inspecting: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

B. Inspections:

1. Steel reinforcement placement.
2. Steel reinforcement welding.
3. Headed bolts and studs.
4. Verification of use of required design mixture.
5. Concrete placement, including conveying and depositing.
6. Curing procedures and maintenance of curing temperature.
7. Verification of concrete strength before removal of shores and forms from beams and slabs.

C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd. (4 cu. m), but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m) or fraction thereof.
2. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. (76 cu. m) or fraction thereof of each concrete mixture placed each day.

    a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

3. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
4. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C 173/C 173M, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
5. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each composite sample.
6. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
7. Compression Test Specimens: ASTM C 31/C 31M.

    a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
    b. Cast and field cure two sets of two standard cylinder specimens for each composite sample.

8. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.

    a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
    b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

9. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
10. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).
11. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
12. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
13. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
14. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
15. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

D. Measure floor and slab flatness and levelness according to ASTM E 1155 (ASTM E 1155M) within 48 hours of finishing.

3.17 PROTECTION OF LIQUID FLOOR TREATMENTS

A. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.

END OF SECTION 03 30 00

SECTION 04 20 00 - UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Concrete masonry units.
2. Decorative concrete masonry units.
3. Structural-clay facing tile.
4. Face brick
5. Mortar and grout.
6. Steel reinforcing bars.
7. Masonry joint reinforcement.
8. Ties and anchors.
9. Embedded flashing.
10. Miscellaneous masonry accessories.
11. Cavity-wall insulation.

B. Related Sections:

1. Division 03 Section "Cast-in-Place Concrete" for dovetail slots for masonry anchors.
2. Division 05 Section "Metal Fabrications" for furnishing steel lintels and shelf angles for unit masonry.
3. Division 07 Section “Fluid-Applied Membrane Air Barriers” for air barriers applied to unit masonry.
4. Division 07 Section "Sheet Metal Flashing and Trim" for exposed sheet metal flashing and for furnishing manufactured reglets installed in masonry joints.

1.3 DEFINITIONS

A. CMU(s): Concrete masonry unit(s).

B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 PERFORMANCE REQUIREMENTS

A. Provide structural unit masonry that develops indicated net-area compressive strengths at 28 days.

1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

1.5 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Owner will engage a qualified independent testing agency to perform preconstruction testing indicated below. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

1. Clay Masonry Unit Test: For each type of unit required, according to ASTM C 67 for compressive strength.
2. Concrete Masonry Unit Test: For each type of unit required, according to ASTM C 140 for compressive strength.
3. Mortar Test (Property Specification): For each mix required, according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 for air content.
4. Mortar Test (Property Specification): For each mix required, according to ASTM C 780 for compressive strength.
5. Grout Test (Compressive Strength): For each mix required, according to ASTM C 1019.
6. Prism Test: For each type of construction required, according to ASTM C 1314.

1.6 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable LEED Credits

1. MRc2
2. MRc4
3. MRc5

B. LEED Requirements

1. MRc2: Construction Waste Management

No less than the specified portion of all construction waste from the Project shall be diverted from disposal in a landfill and/or incineration in with the Project Requirements for Construction Waste Management and Disposal. Refer to Specification Sections 017419 Construction Waste Management and Disposal and 013510 Sustainable Design Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

2. MRc4: Recycled Content Material

No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the Project Requirements for Recycled Content Materials. All materials counted towards the computations of the proportion of the Recycled Content Materials shall comply with the standard minimum percentages of post-consumer waste materials and for the minimum percentages of pre-consumer waste materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

Contractor shall provide LEED credit verification as per Section 013300 Submittal Procedures.

3. MRc5: Regionally Manufactured Harvested Materials

   No less than the specified proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the project site in accordance with the project requirements for Regionally Manufactured and/or Harvested Materials. See Section 018113 Sustainable Design Requirements.

   Contractor shall provide LEED credit verification as per Section 013300 Submittal Procedures.

1.7 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For the following:

1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
2. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement." Show elevations of reinforced walls.
3. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.

C. Samples for Initial Selection:

1. Decorative CMUs, in the form of small-scale units.
2. Glazed structural-clay tile.
3. Colored mortar.
4. Weep holes/vents.

D. Samples for Verification: For each type and color of the following:

1. Decorative CMUs.
2. Glazed structural-clay tile.
3. Pigmented and colored-aggregate mortar. Make Samples using same sand and mortar ingredients to be used on Project. Label Samples to indicate types and amounts of pigments used.
4. Weep holes and vents.
5. Accessories embedded in masonry.

E. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.

1. Submittal is for information only. Neither receipt of list nor approval of mockup constitutes approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and approved in writing.

F. Qualification Data: For testing agency.

G. Qualification Data: For qualified Installer.

H. Material Certificates: For each type and size of the following:

1. Masonry units.

a. Include material test reports substantiating compliance with requirements.
b. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.

2. Cementitious materials. Include brand, type, and name of manufacturer.
3. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
4. Grout mixes. Include description of type and proportions of ingredients.
5. Reinforcing bars.
6. Joint reinforcement.
7. Anchors, ties, and metal accessories.

I. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 for air content.
2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

J. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

K. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

L. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.8 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM C 1093 for testing indicated.

B. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.

C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

D. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.

E. Mockups: Requirements for mockups of unit masonry with cast stone masonry are specified in Division 04 Section “Cast Stone Masonry.”

F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.9 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Deliver preblended, dry mortar mix in moisture-resistant containers designed for use with dispensing silos. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in covered weatherproof dispensing silos.

E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.10 PROJECT CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

1. Extend cover a minimum of 24 inches down both sides of walls and hold cover securely in place.
2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.

E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

1.11 COORDINATION

A. Advise installers of other work about specific requirements for placement of reinforcement, veneer anchors, flashing, and similar items to be built into stone masonry.

PART 2 - PRODUCTS

2.1 MASONRY UNITS, GENERAL

A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.

B. Fire-Resistance Ratings: Where indicated, provide units that comply with requirements for fire-resistance ratings indicated as determined by testing according to ASTM E 119, by equivalent masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

2.2 CONCRETE MASONRY UNITS

A. Regional Materials: Provide CMUs that have been manufactured within 500 miles of Project site from aggregates and cement that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

B. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.

1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
2. Provide bullnose units for outside corners unless otherwise indicated.

C. Integral Water Repellent: Provide units made with integral water repellent for exposed units and where indicated.

1. Integral Water Repellent: Liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested according to ASTM E 514 as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive, with

test period extended to 24 hours, shall show no visible water or leaks on the back of test specimen.

a. Products: Subject to compliance with requirements, provide one of the following :

1) ACM Chemistries; RainBloc.
2) BASF Aktiengesellschaft; Rheopel Plus.
3) Grace Construction Products, W. R. Grace & Co. - Conn.; Dry-Block.

D. CMUs: ASTM C 90.

1. Density Classification: Normal weight.
2. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.
3. Exposed Faces: Provide color and texture matching the range represented by Architect's sample.
4. Faces to Receive Plaster: Where units are indicated to receive a direct application of plaster, provide textured-face units made with gap-graded aggregates.

E. Decorative CMUs: ASTM C 90.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. York Building Products, Gemstone series ground face masonry units.

2. Density Classification: Normal weight.
3. Size (Width): Manufactured to dimensions specified in "CMUs" Paragraph.
4. Pattern and Texture:

a. Standard pattern, ground-face finish.

5. Colors: #Putty.

2.3 CONCRETE AND MASONRY LINTELS

A. General: Provide one of the following:

B. Concrete Lintels: Precast or formed-in-place concrete lintels complying with requirements in Division 03 Section "Cast-in-Place Concrete," and with reinforcing bars indicated.

C. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

2.4 STRUCTURAL-CLAY FACING TILE

A. General:

1. Provide solid, multicored, or hollow units, with shape and direction of cores optional unless otherwise indicated.
2. Where reinforced masonry is indicated, provide multicored units designed for use in reinforced, grouted masonry; either with vertical cores and with webs notched to receive horizontal reinforcement, or with horizontal cores and with holes in bed shells for placement of grout and to receive vertical reinforcement.
3. Where indicated for exterior applications, provide units recommended by manufacturer for exterior use in Project's location.
4. Provide special shapes where required for corners, jambs, coved bases, sills, and other special conditions indicated, including applications that cannot be produced by sawing standard units.

    a. Provide bullnose units for outside corners unless otherwise indicated.
    b. Provide coved internal corners.
    c. Provide recessed, coved base units unless otherwise indicated..

5. Where direct application of plaster is indicated or where bonded to backup masonry, provide units with rough, combed, or scored faces.

B. Glazed Structural-Clay Facing Tile: ASTM C 126, Grade S (select) .

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Elgin Butler Company, Structural Glazed Tile.

2. Density Classification: Normal weight
3. Sizes: 8W Series with actual face dimensions of 7-3/4 inches high by 15-3/4 inches long by widths indicated.
4. Width: Manufactured to dimensions 1/4 inch less than nominal dimensions.
5. Provide Type I (single-faced units) where only one finished face is exposed when units are installed, and Type II (double-faced units) where two opposite finished faces are exposed when units are installed.
6. Provide special units glazed on ends and tops, as well as faces for corners, jambs, sills, pilasters, columns, and other applications indicated, where glazed units are exposed on other surfaces and faces.
7. Colors and Patterns: #7450 ‘Slate’.

2.5 BRICK

A. General: Provide shapes indicated and as follows:

1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.

2. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.

3. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.

4. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.

B. Face Brick: ASTM C 216, Grade MW or SW, Type FBX.

1. Initial Rate of Absorption: Less than 30 g/30 sq. in. per minute when tested per ASTM C 67.

2. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."

3. Face Brick: McAvoy Brick “Havertown”. Match size, coursing and joint treatment of existing brick at SUI Building

2.6 MORTAR AND GROUT MATERIALS

A. Regional Materials: Provide aggregate for mortar and grout, cement, and lime that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

B. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

C. Hydrated Lime: ASTM C 207, Type S.

D. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.

E. Colored Cement Product: Packaged blend made from portland cement and hydrated lime and mortar pigments, all complying with specified requirements, and containing no other ingredients.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Colored Portland Cement-Lime Mix:

1) Capital Materials Corporation; Riverton Portland Cement Lime Custom Color.
2) Holcim (US) Inc.; Rainbow Mortamix Custom Color Cement/Lime.
3) Lafarge North America Inc.; Eaglebond Portland & Lime.
4) Lehigh Cement Company; Lehigh Custom Color Portland/Lime Cement.

2. Formulate blend as required to produce color indicated or, if not indicated, as selected from manufacturer's standard colors.
3. Pigments shall not exceed 10 percent of portland cement by weight.

F. Aggregate for Mortar: ASTM C 144.

1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
2. For joints less than 1/4-inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.

3. White-Mortar Aggregates: Natural white sand or crushed white stone.
4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

G. Aggregate for Grout: ASTM C 404.

H. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Euclid Chemical Company (The); Accelguard 80.
b. Grace Construction Products, W. R. Grace & Co. - Conn.; Morset.
c. Sonneborn Products, BASF Aktiengesellschaft; Trimix-NCA.

I. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with CMUs containing integral water repellent by same manufacturer.

1. Products: Subject to compliance with requirements, provide one of the following:

a. ACM Chemistries; RainBloc for Mortar.
b. BASF Aktiengesellschaft; Rheopel Mortar Admixture.
c. Grace Construction Products, W. R. Grace & Co. - Conn.; Dry-Block Mortar Admixture.

J. Water: Potable.

2.7 REINFORCEMENT

A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60.

B. Masonry Joint Reinforcement, General: ASTM A 951/A 951M.

1. Interior Walls: Hot-dip galvanized, carbon steel.
2. Exterior Walls: Stainless steel.
3. Wire Size for Side Rods: 0.187-inch diameter.
4. Wire Size for Cross Rods: 0.148-inch diameter.
5. Wire Size for Veneer Ties: 0.187-inch diameter.
6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
7. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.

C. Masonry Joint Reinforcement for Single-Wythe Masonry: Ladder type with single pair of side rods.

D. Masonry Joint Reinforcement for Multiwythe Masonry:

1. Adjustable (two-piece) type, ladder design, with one side rod at each face shell of backing wythe and with separate adjustable ties with pintle-and-eye connections having a maximum adjustment of 1-1/4 inches. Size ties to extend at least halfway through facing wythe but with at least 5/8-inch cover on outside

face. Ties have hooks or clips to engage a continuous horizontal wire in the facing wythe.

2.8 TIES AND ANCHORS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design ties and anchors.

B. Structural Performance of ties and anchors: Ties and anchors shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

C. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated.

1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M; with ASTM A 153/A 153M, Class B-2 coating.
2. Stainless-Steel Wire: ASTM A 580/A 580M, Type 304 .
3. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, with ASTM A 153/A 153M, Class B coating.
4. Stainless-Steel Sheet: ASTM A 666, Type 304 .
5. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
6. Stainless-Steel Bars: ASTM A 276 or ASTM a 666, Type 304.

D. Wire Ties, General: Unless otherwise indicated, size wire ties to extend at least halfway through veneer but with at least 5/8-inch cover on outside face. Outer ends of wires are bent 90 degrees and extend 2 inches parallel to face of veneer.

E. Adjustable Anchors for Connecting to Concrete: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.

1. Connector Section: Dovetail tabs for inserting into and compatible with dovetail slots in concrete, and attached to tie section; formed from 0.109-inch- thick, stainless-steel sheet.

a. 0.108-inch- thick, hot-dip galvanized sheet may be used at interior walls unless otherwise indicated.

2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from 0.187-inch- diameter, stainless-steel wire. Hot-dip-galvanized wire may be used at interior walls unless otherwise indicated.

2.9 MISCELLANEOUS ANCHORS

A. Anchor Bolts: Headed or L-shaped steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153/A 153M, Class C; of dimensions indicated.

2.10 EMBEDDED FLASHING MATERIALS

A. Metal Flashing: Provide metal flashing complying with Division 07 Section "Sheet Metal Flashing and Trim"" and as follows:

1. Stainless Steel: ASTM A 240/A 240M, Type 304, 0.016 inch thick.
2. Fabricate continuous flashings in sections 96 inches long minimum, but not exceeding 12 feet. Provide splice plates at joints of formed, smooth metal flashing.
3. Fabricate through-wall metal flashing embedded in masonry from stainless steel , with ribs at 3-inch intervals along length of flashing to provide an integral mortar bond.

    a. Products: Subject to compliance with requirements, provide one of the following :

        1) Cheney Flashing Company; Cheney Flashing (Dovetail) or Cheney 3-Way Flashing (Sawtooth).
        2) Keystone Flashing Company, Inc.; Keystone 3-Way Interlocking Thruwall Flashing.
        3) Sandell Manufacturing Co., Inc.; Mechanically Keyed Flashing.

4. Fabricate through-wall flashing with snaplock receiver on exterior face where indicated to receive counterflashing.
5. Fabricate through-wall flashing with drip edge where indicated. Fabricate by extending flashing 1/2 inch out from wall, with outer edge bent down 30 degrees and hemmed.
6. Fabricate through-wall flashing with sealant stop unless otherwise indicated. Fabricate by bending metal back on itself 3/4 inch at exterior face of wall and down into joint 1/4 inch to form a stop for retaining sealant backer rod.
7. Fabricate metal drip edges and sealant stops for ribbed metal flashing from plain metal flashing of same metal as ribbed flashing and extending at least 3 inches into wall with hemmed inner edge to receive ribbed flashing and form a hooked seam. Form hem on upper surface of metal so that completed seam will shed water.
8. Metal Drip Edge: Fabricate from stainless steel. Extend at least 3 inches into wall and 1/2 inch out from wall, with outer edge bent down 30 degrees and hemmed.
9. Metal Sealant Stop: Fabricate from stainless steel. Extend at least 3 inches into wall and out to exterior face of wall. At exterior face of wall, bend metal back on itself for 3/4 inch and down into joint 1/4 inch to form a stop for retaining sealant backer rod.
10. Metal Expansion-Joint Strips: Fabricate from stainless steel to shapes indicated.

B. Application: Unless otherwise indicated, use the following:

1. Where flashing is indicated to receive counterflashing, use metal flashing.
2. Where flashing is indicated to be turned down at or beyond the wall face, use metal flashing.
3. Where flashing is partly exposed and is indicated to terminate at the wall face, use metal flashing with a drip edge .
4. Where flashing is fully concealed, use metal flashing .

C. Solder and Sealants for Sheet Metal Flashings:

1. Solder for Stainless Steel: ASTM B 32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer.
2. Elastomeric Sealant: ASTM C 920, chemically curing silicone sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

D. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

2.11 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene urethane or PVC.

B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

D. Weep/Vent Products: Use the following unless otherwise indicated:

1. Mesh Weep/Vent: Free-draining mesh; made from polyethylene strands, full height and width of head joint and depth 1/8 inch less than depth of outer wythe; in color selected from manufacturer's standard.

a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1) Mortar Net USA, Ltd.; Mortar Net Weep Vents.

E. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.

1. Products: Subject to compliance with requirements, provide the following:

a. Archovations, Inc.; CavClear Masonry Mat.

2. Provide one the following configurations:

a. Sheets or strips full depth of cavity and installed to full height of cavity.

F. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and hold reinforcing bars in center of cells. Units are formed from 0.148-inch steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Dayton Superior Corporation, Dur-O-Wal Division; D/A 810, D/A 812 or D/A 817.
b. Heckmann Building Products Inc.; No. 376 Rebar Positioner.
c. Hohmann & Barnard, Inc.; #RB or #RB-Twin Rebar Positioner.
d. Wire-Bond; O-Ring or Double O-Ring Rebar Positioner.

2.12 CAVITY-WALL INSULATION

A. Mineral Wool Fibre Insulation

B. Basis-of-Design Product: Subject to compliance with requirements, provide CavityRock MD, by Roxul.

2.13 MASONRY CLEANERS

A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following :

a. Diedrich Technologies, Inc.
b. EaCo Chem, Inc.
c. ProSoCo, Inc.

2.14 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.
2. Use portland cement-lime mortar unless otherwise indicated.
3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with ASTM C 270, Property Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.

1. For masonry below grade or in contact with earth, use Type M .
2. For reinforced masonry, use Type S .
3. For mortar parge coats, use Type S .

4. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type S.

D. Pigmented Mortar: Use colored cement product.

1. Application: Use pigmented mortar for exposed mortar joints with the following units:

a. Decorative CMUs.
b. Glazed structural-clay facing tile.

E. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates and natural color or white cement as necessary to produce required mortar color.

1. Mix to match Architect's sample.
2. Application: Use colored aggregate mortar for exposed mortar joints with the following units:

a. Decorative CMUs.
b. Glazed structural-clay facing tile.

F. Grout for Unit Masonry: Comply with ASTM C 476.

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
2. Proportion grout in accordance with ASTM C 476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 3000 psi.
3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
2. Verify that foundations are within tolerances specified.
3. Verify that reinforcing dowels are properly placed.
4. Verify that dovetail slots and other items installed in substrates and require for extending into masonry are correctly installed.

B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.

B. Build chases and recesses to accommodate items specified in this and other Sections.

C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.

D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.

1. Mix units from several pallets or cubes as they are placed.

3.3 TOLERANCES

A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation do not vary by more than plus 1/2 inch or minus 1/4 inch.
2. For location of elements in plan do not vary from that indicated by more than plus or minus 1/2 inch.
3. For location of elements in elevation do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls do not vary from level by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
5. For lines and surfaces do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.
5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch from one masonry unit to the next.

3.4 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond ; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4-inches. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

D. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

F. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core.

H. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

I. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.

1. Install compressible filler in joint between top of partition and underside of structure above.

2. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide 1/2-inch clearance between end of anchor rod and end of tube. Space anchors 48 inches o.c. unless otherwise indicated.
3. Wedge non-load-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.
4. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Division 07 Section "Fire-Resistive Joint Systems."

3.5 MORTAR BEDDING AND JOINTING

A. Lay CMUs as follows:

1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.

B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

C. Lay structural-clay tile as follows:

1. Lay vertical-cell units with full head joints unless otherwise indicated. Provide bed joints with full mortar coverage on face shells and webs.
2. Lay horizontal-cell units with full bed joints unless otherwise indicated. Keep drainage channels, if any, free of mortar. Form head joints with sufficient mortar so excess will be squeezed out as units are placed in position. Butter both sides of units to be placed, or butter one side of unit already in place and one side of unit to be placed.
3. Maintain joint thicknesses indicated except for minor variations required to maintain bond alignment. If not indicated, lay walls with 1/4- to 3/8-inch- thick joints.

D. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

1. For glazed masonry units, use a nonmetallic jointer 3/4 inch or more in width.

E. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

3.6 COMPOSITE MASONRY

A. Bond wythes of composite masonry together using one of the following methods:

1. Masonry Joint Reinforcement: Installed in horizontal mortar joints.

a. Where bed joints of both wythes align, use tab-type reinforcement.
b. Where bed joints of wythes do not align, use adjustable (two-piece) type reinforcement.

B. Bond wythes of composite masonry together using bonding system indicated on Drawings.

C. Collar Joints: Solidly fill collar joints by parging face of first wythe that is laid and shoving units of other wythe into place.

D. Collar Joints in Clay Tile Masonry: After each course is laid, fill the vertical, longitudinal joint between wythes solidly with mortar at interior walls and partitions.

E. Corners: Provide interlocking masonry unit bond in each wythe and course at corners unless otherwise indicated.

1. Provide continuity with masonry joint reinforcement at corners by using prefabricated L-shaped units as well as masonry bonding.

F. Intersecting and Abutting Walls: Unless vertical expansion or control joints are shown at juncture, bond walls together as follows:

1. Provide continuity with masonry joint reinforcement by using prefabricated T-shaped units.

3.7 CAVITY WALLS

A. Bond wythes of cavity walls together using one of the following methods:

1. Masonry Joint Reinforcement: Installed in horizontal mortar joints.

a. Where bed joints of both wythes align, use tab-type reinforcement.
b. Where bed joints of wythes do not align, use adjustable (two-piece) type reinforcement
c. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable (two-piece) type reinforcement to allow for differential movement regardless of whether bed joints align.

2. Masonry Veneer Anchors: Comply with requirements for anchoring masonry veneers.

B. Bond wythes of cavity walls together using bonding system indicated on Drawings.

C. Keep cavities clean of mortar droppings and other materials during construction. Bevel beds away from cavity, to minimize mortar protrusions into cavity. Do not attempt to trowel or remove mortar fins protruding into cavity.

D. Apply air barrier to face of backup wythe to comply with Division 07 Section " Fluid-Applied Membrane Air Barriers."

E. Installing Cavity-Wall Insulation: Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry or other construction as shown. Install wedges or clips over masonry ties to hold insulation in place at board edges.

3.8 MASONRY JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.

1. Space reinforcement not more than 16 inches o.c.
2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings in addition to continuous reinforcement.

B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.

C. Provide continuity at wall intersections by using prefabricated T-shaped units.

D. Provide continuity at corners by using prefabricated L-shaped units.

3.9 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

A. Anchor masonry to structural steel and concrete where masonry abuts or faces structural steel or concrete to comply with the following:

1. Provide an open space not less than 1/2 inch wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

3.10 ANCHORING MASONRY VENEERS

A. Anchor masonry veneers to concrete and masonry backup with masonry-veneer anchors to comply with the following requirements:

1. Fasten anchors to concrete and masonry backup with metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener.
2. Embed connector sections and continuous wire in masonry joints. Provide not less than 2 inches of air space between back of masonry veneer and face of sheathing.
3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
4. Space anchors as indicated, but not more than 16 inches o.c. vertically and 24 inches o.c. horizontally with not less than 1 anchor for each 2.67 sq. ft. of wall area. Install additional anchors within 12 inches of openings and at intervals, not exceeding 36 inches, around perimeter.

3.11 CONTROL AND EXPANSION JOINTS

A. General: Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.

B. Form control joints in concrete masonry using one of the following methods:

1. Fit bond-breaker strips into hollow contour in ends of CMUs on one side of control joint. Fill resultant core with grout and rake out joints in exposed faces for application of sealant.
2. Install preformed control-joint gaskets designed to fit standard sash block.
3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar or rake out joint for application of sealant.
4. Install temporary foam-plastic filler in head joints and remove filler when unit masonry is complete for application of sealant.

C. Provide horizontal, pressure-relieving joints by either leaving an air space or inserting a compressible filler of width required for installing sealant and backer rod specified in Division 07 Section "Joint Sealants," but not less than 3/8 inch .

1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

3.12 LINTELS

A. Install steel lintels where indicated.

B. Provide concrete or masonry lintels where shown and where openings of more than 12 inches for brick-size units and 24 inches for block-size units are shown without structural steel or other supporting lintels.

C. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.

3.13 FLASHING, WEEP HOLES, CAVITY DRAINAGE, AND VENTS

A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated. Install vents at shelf angles, ledges, and other obstructions to upward flow of air in cavities, and where indicated.

B. Install flashing as follows unless otherwise indicated:

1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
2. At masonry-veneer walls, extend flashing through veneer, across air space behind veneer, and up face of sheathing at least 8 inches; with upper edge tucked under building paper or building wrap, lapping at least 4 inches.

3. At lintels and shelf angles, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.
4. Interlock end joints of ribbed sheet metal flashing by overlapping ribs not less than 1-1/2 inches or as recommended by flashing manufacturer, and seal lap with elastomeric sealant complying with requirements in Division 07 Section "Joint Sealants" for application indicated.
5. Install metal drip edges and sealant stops with ribbed sheet metal flashing by interlocking hemmed edges to form hooked seam. Seal seam with elastomeric sealant complying with requirements in Division 07 Section "Joint Sealants" for application indicated.

C. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.

D. Install weep holes in head joints in exterior wythes of first course of masonry immediately above embedded flashing and as follows:

1. Use specified weep/vent products to form weep holes.
2. Use wicking material to form weep holes above flashing under brick sills. Turn wicking down at lip of sill to be as inconspicuous as possible.
3. Space weep holes 24 inches o.c. unless otherwise indicated.
4. Space weep holes formed from plastic tubing or wicking material 16 inches o.c.
5. Cover cavity side of weep holes with plastic insect screening at cavities insulated with loose-fill insulation.
6. Trim wicking material flush with outside face of wall after mortar has set.

E. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in "Miscellaneous Masonry Accessories" Article.

F. Install vents in head joints in exterior wythes at spacing indicated. Use specified weep/vent products to form vents.

1. Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing and weep holes above horizontal blocking.

3.14 REINFORCED UNIT MASONRY INSTALLATION

A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.

1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.

B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.

C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.

1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
2. Limit height of vertical grout pours to not more than 60 inches.

3.15 FIELD QUALITY CONTROL

A. Testing and Inspecting: Engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

B. Inspections: Level 1 special inspections according to the "International Building Code."

1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
3. Place grout only after inspectors have verified proportions of site-prepared grout.

C. Testing Prior to Construction: One set of tests.

D. Clay Masonry Unit Test: For each type of unit provided, according to ASTM C 67 for compressive strength.

E. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.

F. Mortar Test (Property Specification): For each mix provided, according to ASTM C 780. Test mortar for mortar air content and compressive strength.

G. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.

3.16 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.

2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
5. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
6. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.

3.17 MASONRY WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

B. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.

1. Crush masonry waste to less than 4 inches in each dimension.
2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste. Fill material is specified in Division 31 Section "Earth Moving."
3. Do not dispose of masonry waste as fill within 18 inches of finished grade.

C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 042000

SECTION 04 72 00 - CAST STONE MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Cast-stone including the following**:**

a. Cast stone veneer

B. Related Sections:

1. Section 042000 "Unit Masonry" for installing cast-stone units in unit masonry.

1.3 DEFINITION

A. Cast stone veneer: A highly refined architectural concrete stone product manufactured to simulate fine grain texture of natural stone

1.4 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable LEED Credits

1. MRc2
2. MRc4
3. MRc5

B. LEED Requirements

1. MRc2: Construction Waste Management

No less than the specified portion of all construction waste from the Project shall be diverted from disposal in a landfill and/or incineration in with the Project Requirements for Construction Waste Management and Disposal. Refer to Specification Sections 017419 Construction Waste Management and Disposal and 013510 Sustainable Design Project Requirements.

Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

2. MRc4: Recycled Content Material

No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the Project Requirements for Recycled Content Materials. All materials counted towards the computations of the proportion of the Recycled Content Materials shall comply with the standard minimum percentages of post-consumer waste materials and for the minimum percentages of pre-consumer waste materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

Contractor shall provide LEED credit verification as per Section 013300 Submittal Procedures.

3. MRc5: Regionally Manufactured Harvested Materials

No less than the specified proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the project site in accordance with the project requirements for Regionally Manufactured and/or Harvested Materials. See Section 018113 Sustainable Design Requirements.

Contractor shall provide LEED credit verification as per Section 013300 Submittal Procedures.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For cast-stone units, include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Delegated-Design Submittal: For fabrication and installation details for cast-stone units. Include dimensions, profiles, cross sections, arrangement of joints, control joints details of reinforcement and anchorages, and indication of finished faces.

1. Include building elevations showing layout of units and locations of joints and anchors. Control joints shall match configuration of stone units.

C. Samples for Initial Selection: Actual mortar samples for colored mortar.

D. Samples for Verification:

1. For each color and texture of cast stone required, 20 inches (250 mm) square in size. Provide one sample to the Owner and two samples to the Architect.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer and testing agency.

1. Include copies of material test reports for completed projects, indicating compliance of cast stone with ASTM C 1364.

B. Material Test Reports: For each mix required to produce cast stone, based on testing according to ASTM C 1364.

1. Provide test reports based on testing within previous two years.

1.7 QUALITY ASSURANCE

A. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in State of Maryland and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cast stone masonry assemblies that are similar to those indicated for this Project in material, design, and extent. The Professional Engineer shall prepare and seal design calculations, Shop drawings, and other structural data related to the work of this Section.

C. Manufacturer and Installer Qualifications: A qualified manufacturer and installer of cast-stone units similar to those indicated for this Project, that has sufficient production capacity to manufacture required units, and is a plant certified by the Cast Stone Institute. Manufacturer and installer shall have not less than five years of experience in the cast stone industry.

D. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

E. Mockups: Build mockups to demonstrate aesthetic effects and set quality standards for materials and execution.

a. Mockups shall be built as complete wall assembly using full size unit components
b. Include typical window opening including head, jamb and sill conditions, at one end of exterior wall mockup. Make opening approximately 12 inches wide by 16 inches high.
c. Include a sealant-filled joint at least 16 inches long in mockup.
d. Include staggered control joints.
e. Include through-wall flashing installed for a 24-inch length in corner of mockup approximately 16 inches down from top of mockup, with a 12-inch length of flashing left exposed to view (omit stone masonry above half of flashing).
f. Include air barrier, insulation, veneer anchors, flashing, cavity drainage material, and weep holes in exterior masonry-veneer wall mockup.

2. Protect accepted mockups from the elements with weather-resistant membrane.
3. Approval of mockups is for color, texture, and blending of stone; relationship of mortar and sealant colors to stone colors; tooling of joints; and aesthetic qualities of workmanship.

a. Approval of mockups is also for other material and construction qualities Architect specifically approves in writing.
b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

F. Standards: Comply with requirements of the Cast Stone Institute Technical Manual.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Coordinate delivery of cast stone with unit masonry work to avoid delaying the Work and to minimize the need for on-site storage.

B. Pack, handle, and ship cast-stone units in suitable packs or pallets.

1. Lift with wide-belt slings; do not use wire rope or ropes that might cause staining. Move cast-stone units if required, using dollies with wood supports.
2. Store cast-stone units on wood skids or pallets with nonstaining, waterproof covers, securely tied. Arrange to distribute weight evenly and to prevent damage to units. Ventilate under covers to prevent condensation.

C. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

D. Store mortar aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

1.9 PROJECT CONDITIONS

A. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Comply with cold-weather construction requirements in TMS 602/ACI 530.1/ASCE 6.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and above and will remain so until cast stone has dried, but no fewer than seven days after completing cleaning.

B. Hot-Weather Requirements: Comply with hot-weather construction requirements in TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Cast Stone: Obtain cast-stone units from single source from single manufacturer.

B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color, from one manufacturer for each cementitious component and from one source or producer for each aggregate.

C. Basis-of-Design Product: Subject to compliance with requirements, provide Continental Cast Stone; Designer Collection, or a comparable product by one of the following:

a. Custom Cast Stone
b. Corinthian Cast Stone Inc
c. David Kucera, Inc

D. Color and finish: 1101E Greystone; Smooth.

2.2 CAST-STONE MATERIALS

A. General: Comply with ASTM C 1364.

B. Portland Cement: ASTM C 150/C 150M, Type I or Type III, containing not more than 0.60 percent total alkali when tested according to ASTM C 114. Provide natural color or white cement as required to produce cast-stone color indicated.

C. Coarse Aggregates: Granite, quartz, or limestone complying with ASTM C 33/C 33M; gradation and colors as needed to produce required cast-stone textures and colors.

D. Fine Aggregates: Natural sand or crushed stone complying with ASTM C 33/C 33M, gradation and colors as needed to produce required cast-stone textures and colors.

E. Color Pigment: ASTM C 979/C 979M, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, free of carbon black, nonfading, and resistant to lime and other alkalis.

F. Admixtures: Use only admixtures specified or approved in writing by Architect.

1. Do not use admixtures that contain more than 0.1 percent water-soluble chloride ions by mass of cementitious materials. Do not use admixtures containing calcium chloride.
2. Use only admixtures that are certified by manufacturer to be compatible with cement and other admixtures used.
3. Air-Entraining Admixture: ASTM C 260/C 260M.
4. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
5. Water-Reducing, Retarding Admixture: ASTM C 494/C 494M, Type D.
6. Water-Reducing, Accelerating Admixture: ASTM C 494/C 494M, Type E.

G. Reinforcement: Deformed steel bars complying with ASTM A 615/A 615M, Grade 60 (Grade 420). Use galvanized or epoxy-coated reinforcement.

1. Epoxy Coating: ASTM A 775/A 775M.
2. Galvanized Coating: ASTM A 767/A 767M.

H. Embedded Anchors and Other Inserts: Fabricated from stainless steel complying with ASTM A 240/A 240M, ASTM A 276, or ASTM A 666, Type 304.

I. Water: Potable.

2.3 CAST-STONE UNITS

A. Cast-Stone Units:

1. Units shall be manufactured using the vibrant dry tamp method.
2. Units shall be resistant to freezing and thawing as determined by laboratory testing according to ASTM C 666/C 666M, Procedure A, as modified by ASTM C 1364.
3. Compressive Strength ASTM C 1194: 6,500 psi, minimal at 28 days.
4. Absorption ASTM C 1195: 6% maximum at 28 days

B. Fabricate units with sharp arris and accurately reproduced details, with indicated texture on all exposed surfaces unless otherwise indicated.

1. Slope exposed horizontal surfaces 1:12 to drain unless otherwise indicated.
2. Provide raised fillets at backs of sills and at ends indicated to be built into jambs.
3. Provide drips on projecting elements unless otherwise indicated.

C. Fabrication Tolerances:

1. Variation in Cross Section: Do not vary from indicated dimensions by more than 1/8 inch (3 mm).
2. Variation in Length: Do not vary from indicated dimensions by more than 1/360 of the length of unit or 1/8 inch (3 mm), whichever is greater, but in no case by more than 1/4 inch (6 mm).
3. Warp, Bow, and Twist: Not to exceed 1/360 of the length of unit or 1/8 inch (3 mm), whichever is greater.
4. Location of Grooves, False Joints, Holes, Anchorages, and Similar Features: Do not vary from indicated position by more than 1/8 inch (3 mm) on formed surfaces of units and 3/8 inch (10 mm) on unformed surfaces.

D. Cure Units as Follows:

1. Cure units in enclosed, moist curing room at 95 to 100 percent relative humidity and temperature of 100 deg F (38 deg C) for 12 hours or 70 deg F (21 deg C) for 16 hours.
2. Keep units damp and continue curing to comply with one of the following:

    a. No fewer than five days at mean daily temperature of 70 deg F (21 deg C) or above.
    b. No fewer than six days at mean daily temperature of 60 deg F (16 deg C) or above.
    c. No fewer than seven days at mean daily temperature of 50 deg F (10 deg C) or above.
    d. No fewer than eight days at mean daily temperature of 45 deg F (7 deg C) or above.

E. Acid etch units after curing to remove cement film from surfaces to be exposed to view.

2.4 MORTAR MATERIALS

A. Provide mortar materials that comply with Section 042000 "Unit Masonry."

B. Portland Cement: ASTM C 150/C 150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

C. Hydrated Lime: ASTM C 207, Type S.

D. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.

E. Masonry Cement: ASTM C 91/C 91M.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Cemex S.A.B. de C.V.

b. Essroc.
c. Holcim (US) Inc.
d. Lafarge North America Inc.
e. Lehigh Hanson; Heidelberg Cement Group.

F. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C 979/C 979M. Use only pigments with a record of satisfactory performance in masonry mortar.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Davis Colors.
b. Lanxess Corporation.
c. Solomon Colors, Inc.

G. Colored Cement Product: Packaged blend made from portland cement and hydrated lime masonry cement or mortar cement and mortar pigments, all complying with specified requirements, and containing no other ingredients.

1. Formulate blend as required to produce color indicated or, if not indicated, as selected from manufacturer's standard colors.
2. Pigments shall not exceed 10 percent of portland cement by weight.
3. Pigments shall not exceed 5 percent of masonry cement or mortar cement by weight.

H. Aggregate for Mortar: ASTM C 144.

1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
2. For joints less than 1/4 inch (6 mm) thick, use aggregate graded with 100 percent passing the No. 16 (1.18-mm) sieve.
3. White-Mortar Aggregates: Natural white sand or crushed white stone.
4. Colored Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

I. Water: Potable.

2.5 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design attachment and anchorage of cast stone to masonry substrate.

2.6 ACCESSORIES

A. Anchors: 304 stainless steel complying with ASTM A 240/A 240M, ASTM A 276, or ASTM A 666.

B. Dowels: fabricated from Type 304 stainless steel complying with ASTM A 240/A 240M, ASTM A 276, or ASTM A 666.

C. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cast-stone manufacturer and expressly approved by cleaner manufacturer for use on cast stone and adjacent masonry materials.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Diedrich Technologies, Inc.; a division of Sandell Construction Solutions.
b. EaCo Chem, Inc.
c. PROSOCO, Inc.

2.7 MORTAR MIXES

A. Comply with requirements in Section 042000 "Unit Masonry" for mortar mixes.

2.8 SOURCE QUALITY CONTROL

A. Engage a qualified independent testing agency to sample and test cast-stone units according to ASTM C 1364.

1. Include one test for resistance to freezing and thawing.
2. Test for compressive strength and absorption of specimens selected at random from plant production.
3. Select samples at a rate of 3 per 500 cubic feet, with a minimum of 3 per production week.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SETTING CAST STONE IN MORTAR

A. Install cast-stone units to comply with requirements in Section 042000 "Unit Masonry."

B. Set cast stone as indicated on Drawings. Set units accurately in locations indicated, with edges and faces aligned according to established relationships and indicated tolerances.

1. Install anchors, supports, fasteners, and other attachments indicated or necessary to secure units in place.

2. Coordinate installation of cast stone with installation of flashing specified in other Sections.

C. Wet joint surfaces thoroughly before applying mortar or setting in mortar.

D. Set units in full bed of mortar with full head joints unless otherwise indicated.

1. Build anchors and ties into mortar joints as units are set.
2. Fill dowel holes and anchor slots with mortar.
3. Fill collar joints solid as units are set.
4. Build concealed flashing into mortar joints as units are set.
5. Keep head joints in copings and between other units with exposed horizontal surfaces open to receive sealant.
6. Keep joints at shelf angles open to receive sealant.

E. Rake out joints for pointing with mortar to depths of not less than 3/4 inch (19 mm). Rake joints to uniform depths with square bottoms and clean sides. Scrub faces of units to remove excess mortar as joints are raked.

F. Point mortar joints by placing and compacting mortar in layers not greater than 3/8 inch (10 mm). Compact each layer thoroughly and allow it to become thumbprint hard before applying next layer.

G. Tool exposed joints slightly concave when thumbprint hard. Use a smooth plastic jointer larger than joint thickness.

H. Rake out joints for pointing with sealant to depths of not less than 3/4 inch (19 mm). Scrub faces of units to remove excess mortar as joints are raked.

I. Point joints with sealant to comply with applicable requirements in Section 079200 "Joint Sealants."

1. Prime cast-stone surfaces to receive sealant and install compressible backer rod in joints before applying sealant unless otherwise indicated.

J. Provide sealant joints at head joints of copings and other horizontal surfaces; at expansion, control, and pressure-relieving joints; and at locations indicated.

1. Keep joints free of mortar and other rigid materials.
2. Build in compressible foam-plastic joint fillers where indicated.
3. Prime cast-stone surfaces to receive sealant and install compressible backer rod in joints before applying sealant unless otherwise indicated.
4. Prepare and apply sealant of type and at locations indicated to comply with applicable requirements in Section 079200 "Joint Sealants."

3.3 SETTING ANCHORED CAST STONE WITH SEALANT-FILLED JOINTS

A. Set cast stone as indicated on Drawings. Set units accurately in locations indicated, with edges and faces aligned according to established relationships and indicated tolerances.

1. Install anchors, supports, fasteners, and other attachments indicated or necessary to secure units in place.

2. Shim and adjust anchors, supports, and accessories to set cast stone in locations indicated with uniform joints.

B. Keep cavities open where unfilled space is indicated between back of cast-stone units and backup wall; do not fill cavities with mortar or grout.

C. Fill anchor holes with sealant.

1. Where dowel holes occur at pressure-relieving joints, provide compressible material at ends of dowels.

D. Set cast stone supported on clip or continuous angles on resilient setting shims. Use material of thickness required to maintain uniform joint widths. Hold shims back from face of cast stone a distance at least equal to width of joint.

E. Keep joints free of mortar and other rigid materials. Remove temporary shims and spacers from joints after anchors and supports are secured in place and cast-stone units are anchored. Do not begin sealant installation until temporary shims and spacers are removed.

F. Prime cast-stone surfaces to receive sealant and install compressible backer rod in joints before applying sealant unless otherwise indicated.

G. Prepare and apply sealant of type and at locations indicated to comply with applicable requirements in Section 079200 "Joint Sealants."

3.4 INSTALLATION TOLERANCES

A. Variation from Plumb: Do not exceed 1/8 inch in 10 feet (3 mm in 3 m) or 1/4 inch in 20 feet (6 mm in 6 m).

B. Variation from Level: Do not exceed 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 3/8 inch maximum.

C. Variation in Joint Width: Do not vary joint thickness more than 1/8 inch in 36 inches (3 mm in 900 mm) or one-fourth of nominal joint width, whichever is less.

D. Variation in Plane between Adjacent Surfaces (Lipping): Do not vary from flush alignment with adjacent units or adjacent surfaces indicated to be flush with units by more than 1/16 inch.

3.5 ADJUSTING AND CLEANING

A. Remove and replace stained and otherwise damaged units and units not matching approved Samples. Cast stone may be repaired if methods and results are approved by Architect.

B. Replace units in a manner that results in cast stone matching approved Samples, complying with other requirements, and showing no evidence of replacement.

C. In-Progress Cleaning: Clean cast stone as work progresses.

1. Remove mortar fins and smears before tooling joints.

2. Remove excess sealant immediately, including spills, smears, and spatter.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed cast stone as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample; leave one sample uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of cast stone.
3. Protect adjacent surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
4. Wet surfaces with water before applying cleaners; remove cleaners promptly by rinsing thoroughly with clear water.
5. Clean cast stone by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
6. Clean cast stone with proprietary acidic cleaner applied according to manufacturer's written instructions.

END OF SECTION 04 72 00

SECTION 05 12 00 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Structural steel.
2. Grout.

B. Related Sections:

1. Section 01 40 00 "Quality Requirements" for independent testing agency procedures and administrative requirements.
2. Section 05 12 13 "Architecturally Exposed Structural Steel Framing" for additional requirements for architecturally exposed structural steel.
3. Section 05 31 00 "Steel Decking" for field installation of shear connectors through deck.
4. Section 05 50 00 "Metal Fabrications" for steel lintels and shelf angles not attached to structural-steel frame, miscellaneous steel fabrications, and other metal items not defined as structural steel.
5. Section 05 51 00 "Metal Stairs."
6. Section 09 91 23 "Interior Painting" and Section 09 96 00 "High-Performance Coatings" for surface-preparation and priming requirements.
7. Division 03 30 00 for epoxy and adhesive anchor attachments.

1.3 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable LEED Credits

1. MRc2
2. MRc4
3. MRc5

B. LEED Requirements

1. MRc2: Construction Waste Management:

No less than the specified portion of all construction waste from the Project shall be diverted from disposal in a landfill and/or incineration in with the Project Requirements for Construction Waste Management and Disposal. Refer to Specification Sections 017419 Construction Waste Management and Disposal and 013510 Sustainable Design Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

2. MRc4: Recycled Content Material:

No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the Project Requirements for Recycled Content Materials. All materials counted towards the computations of the proportion of the Recycled Content Materials shall comply with the standard minimum percentages of post-consumer waste materials and for the minimum percentages of pre-consumer waste materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

3. MRc5: Regionally Manufactured and/or Harvested Materials:

No less than the specified minimum proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the Project Site in accordance with the Project Requirements for Regionally Manufactured and/or Harvested Materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

1.4 DEFINITIONS

A. Structural Steel: Elements of structural-steel frame, as classified by AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

1.5 PERFORMANCE REQUIREMENTS

A. Connections: Provide details of connections required by the Contract Documents to be selected or completed by structural-steel fabricator, including comprehensive engineering analysis by a qualified professional engineer in the state of the Project, to withstand loads indicated and comply with other information and restrictions indicated.

1. Select and complete connections using typical details indicated and AISC's "Manual of Steel Construction, 13th Edition".
2. Use ASD; data are given at service-load level.

B. Moment Connections: Type FR, fully restrained.

C. Lateral Force Resisting System Construction: See Contract Drawings.

1.6 ACTION SUBMITTALS

A. General:
1. Submittals and shop drawings shall not be made by using reproductions of Contract Drawings.
2. Submittals and shop drawings shall be submitted through General Contractor to Architect. Any fabrication of material before approval of drawings will be at the risk of Contractor.
   a. Fabricated material and connections shall fit within architectural constraints.

a. Fabricator alone shall be responsible for errors of detailing and fabrication.

3. Contractor shall provide a proposed submittal schedule showing anticipated steel shop drawing submission dates a minimum of two (2) weeks prior to the first steel shop drawing submittal.
4. Steel submissions shall be submitted such that each individual construction sequence is a separate stand alone submittal package with an Erection Plan, Assembly Drawings, and Piece Mark Drawings. Typical Details, Connections, Calculations and Sections may be submitted as one submittal package at Contractors option, but must be received prior to the first sequence submission. Sequence submittals shall be submitted in the order that they will be Fabricated and Erected. Processing time for review of each sequence shall be allowed and shall not be assumed to be concurrent.
5. Sequences larger than the floor area of the largest single floor of the building will require additional review and processing time. Additional review and processing time shall not be assumed to be concurrent. Any sequence anticipated to be larger than the maximum single floor area shall be clearly indicated in the submittal schedule and brought to the Architect's/Engineer's attention for discussion of review times prior to submission of said sequence.

B. Product Data: For each type of product indicated.

C. LEED Submittals:

1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
2. Laboratory Test Reports for Credit IEQ 4: For primers, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

D. Connection Drawings and Calculations:
1. Proposed variations in typical details shown on drawings will be considered and such variations must have preliminary approval prior to preparation of detailed shop drawings.
2. Connection drawings and details shall be prepared under supervision and sealed by a professional Engineer Registered in State of the project. Fabricator shall submit certification by professional Engineer that connection design is in accordance with applicable codes and specifications.
3. Fabricator's engineer shall submit complete design calculations for each connection. Such calculations shall show details of assembled joint with bolts and welds required. Where predesigned connections are taken directly from tables in AISC Manual, calculations need not be submitted provided job design conditions precisely match those assumed in tables, data taken from tables is clearly identified with table number, and such connections are so indicated in calculations submitted. Design calculations shall be sealed by fabricator's registered professional engineer. Shop drawings submitted without complete design calculations will not be approved.

E. Shop Drawings: Show fabrication of structural-steel components. Submit in advance of fabrication complete shop drawings prepared under the supervision of fabricator's registered professional Engineer for fabrication of each component part of structural steel framing.

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
2. Include member size, length, and camber.
3. Include embedment drawings.
4. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
5. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.
6. Include material specifications.
7. Indicate piece marks for field assembly.

F. Erection Drawings: Submit erection drawings (“E” Sheets) as part of shop drawings, showing complete information necessary for erection of each component part of structural steel framing.

1. Indicate setting drawings, templates and directions for installation of anchor rods and other anchorage devices embedded in concrete or masonry work.
2. Indicate dimensions for alignment and elevation of each member.
3. Indicate location of members and attachments by match-marking of piece members.
4. Indicate piece marks for field assembly.
5. Include type and location of each field connection, including splices.
6. Indicate required number and location of shear connectors on each member.
7. Indicate details of each field connection or typical connection.
8. Indicate size, length and type of bolts required in each field connection.

G. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for each welded joint whether prequalified or qualified by testing, including the following:

1. Power source (constant current or constant voltage).
2. Electrode manufacturer and trade name, for demand critical welds.

H. Certificate of Conformance: Submit manufacturer’s certificate of conformance and/or supporting Charpy V-Notch test reports for complete-joint-penetration weld filler metal where steel backer bars for CJP groove welded T and corner joints are elected by the Contractor to remain in place. Certificate of Conformance or test reports shall show filler metal has a specified Charpy V-Notch toughness of 20 ft-lbs at 40 degrees F.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer, fabricator, professional engineer, and testing agency.

B. Welding certificates.

C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

D. Mill test reports for structural steel, including chemical and physical properties.

E. Product Test Reports: For the following:

1. Bolts, nuts, and washers including mechanical properties and chemical analysis.
2. Direct-tension indicators.
3. Tension-control, high-strength bolt-nut-washer assemblies.
4. Shear stud connectors.
5. Shop primers.
6. Nonshrink grout.

F. Source quality-control reports.

1.8 QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD.

B. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category CSE.

C. Shop-Painting Applicators: Qualified according to SSPC-QP 3, "Standard Procedure for Evaluating Qualifications of Shop Painting Applicators."

D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1. Welders and welding operators performing work on bottom-flange, demand-critical welds shall pass the supplemental welder qualification testing, as required by AWS D1.8. FCAW-S and FCAW-G shall be considered separate processes for welding personnel qualification.

E. Comply with applicable provisions of the following specifications and documents:
1. AISC 303 - "Code of Standard Practice for Steel Buildings and Bridges,"
   a. Section 3.1.2 and Section 3.3 is hereby modified by deletion of the “Commentary.”
   b. Section 3.3 is hereby modified by deletion as follows: “When discrepancies exist between structural Design Drawings and the architectural, electrical, or mechanical Design Drawings or Design Drawings for other trades, the structural Design Drawings shall govern.”
   c. Section 4.4 is hereby modified by deletion of the following: “These drawings shall be returned to the Fabricator within 14 calendar days.” Also delete “Commentary” in same section.
2. AISC 360 - "Specification for Structural Steel Buildings” dated March 9, 2005.
3. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

F. Preinstallation Conference: Conduct conference at Project site.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the site at such intervals to ensure uninterrupted progress of work.

B. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.

1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

C. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.

1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
2. Clean and relubricate bolts and nuts that become dry or rusty before use.
3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.

1.10 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

A. General: All structural steel materials to be domestically manufactured in the United States of America.

B. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 50 percent.

C. See General Notes for Structural Steel ASTM designations and grades, u.n.o.

D. Steel Castings: ASTM A 216/A 216M, Grade WCB with supplementary requirement S11.

E. Steel Forgings: ASTM A 668/A 668M.

F. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

A. General:
1. Bolts, connectors, and anchors shall be new and not be reused.

B. High-Strength Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, (ASTM A 563M, Class 8S) heavy-hex carbon-steel nuts; and ASTM F 436 (ASTM F 436M), Type 1, hardened carbon-steel washers; all with plain finish.

1. Direct-Tension Indicators: ASTM F 959, Type 325 (ASTM F 959M, Type 8.8), compressible-washer type with plain finish.

C. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.

D. Headed Anchor Rods: See general notes for grades. Headed anchor rods shall be straight.

1. Nuts: ASTM A 563 (ASTM A 563M) heavy-hex carbon steel.
2. Plate Washers: ASTM A 36/A 36M carbon steel.
3. Washers: ASTM F 436 (ASTM F 436M), Type 1, hardened carbon steel.
4. Finish: Plain at interior conditions, Hot-dip zinc coating, ASTM A 153/A 153M, Class C.

E. Sleeve Nuts: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1018.

2.3 PRIMER

A. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. Primer: Comply with Section 09 91 23 "Interior Painting" and Section 09 96 00 "High-Performance Coatings."

C. Primer: SSPC-Paint 25, Type II, iron oxide, zinc oxide, raw linseed oil, and alkyd.

D. Primer: SSPC-Paint 23, latex primer.

E. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.

F. Galvanizing Repair Paint: ASTM A 780.

2.4 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, ready-to-use nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time. Grout shall have no drying shrinkage at any age.
1. Non-metallic grout shall be used in all conditions unless noted otherwise.
2. Compressive strength at 7 days: 6000 psi minimum.
3. Compressive strength at 28 days: 8000 psi minimum.

2.5 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC 360.

1. Camber structural-steel members where indicated.
2. Identify high-strength structural steel according to ASTM A 6/A 6M and maintain markings until structural steel has been erected.
3. Mark and match-mark materials for field assembly.
4. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.

C. Bolt Holes: Cut, drill, punch, or mechanically thermally cut standard bolt holes perpendicular to metal surfaces.

D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 3, "Power Tool Cleaning."

F. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

G. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel framing members.

1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.6 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened.

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

2.7 SHOP PRIMING

A. Shop prime steel surfaces except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches (50 mm).
2. Surfaces to be field welded.
3. Surfaces to be high-strength bolted with slip-critical connections.
4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
5. Galvanized surfaces.

B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:

1. SSPC-SP 2, "Hand Tool Cleaning."
2. SSPC-SP 3, "Power Tool Cleaning."

C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils (0.038 mm). Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

D. Painting: Prepare steel and apply a one-coat, nonasphaltic primer complying with SSPC-PS Guide 7.00, "Painting System Guide 7.00: Guide for Selecting One-Coat Shop Painting Systems," to provide a dry film thickness of not less than 1.5 mils (0.038 mm).

2.8 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/A 123M.

1. Fill vent and drain holes that will be exposed in the finished Work unless they will function as weep holes, by plugging with zinc solder and filing off smooth.
2. Galvanize lintels and shelf angles attached to structural-steel frame and located in exterior walls, u.n.o.
3. Galvanize all steel exposed to weather, u.n.o.

2.9 SOURCE QUALITY CONTROL

A. Testing Agency: Owner will engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports.

1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.

B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

C. Bolted Connections: Shop-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

D. Welded Connections: In addition to visual inspection, shop-welded connections will be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

1. Liquid Penetrant Inspection: ASTM E 165.
2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
3. Ultrasonic Inspection: ASTM E 164.
4. Radiographic Inspection: ASTM E 94.

E. Full Penetration Welded Connections: In addition to visual inspection, complete joint penetration groove welds shall be ultrasonically tested for the entire weld length, in each designated joint per AWS D1.1 to the following extents:
1. 100 percent of welds splicing beams, girders, columns, or braces.
2. 100 percent of column to base plate welds at rigid (lateral) column frame bases.
3. 100 percent of CJP beam to column welds, continuity plate welds, and shear tabs.

F. Non-Destructive Testing of Welds:
1. Ultrasonic Testing (UT): ASTM E164
   a. Divide connections into groups containing not less than 40 connections. Test 25 percent of the connections in each group. If any weld is rejected, test all the connections in group.

G. In addition to visual inspection, perform magnetic particle testing for full length of fillet welds on continuity plates and backing bar removal areas, and 25% of remaining fillet welds.

H. In addition to visual inspection, shop-welded shear connectors will be tested and inspected according to requirements in AWS D1.1/D1.1M for stud welding and as follows:

1. Bend tests will be performed if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
2. Tests will be conducted on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1/D1.1M.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify, with steel Erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.

1. Prepare a certified survey of bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.
   1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

B. Templates shall be provided and be securely in place to preclude misplacements of anchor rods. Rods shall be installed at locations and with projections established by approved structural steel shop drawings. Subsequent displacement of anchor rods is the responsibility of the General Contractor.

3.3 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.

B. Base Bearing and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
   1. Set base and bearing plates for structural members shall be set level and to proper alignment with shim packs unless noted otherwise on the Contract Documents. Fabricator shall provide shim packs.
   2. Weld plate washers to top of baseplate.
   3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
   4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

   1. Level and plumb individual members of structure.
   2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

E. Splice members only where indicated.

F. Do not use thermal cutting during erection unless approved by Architect. Finish thermally cut sections within smoothness limits in AWS D1.1/D1.1M.

G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

H. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

3.4 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened.

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth. Backing bars MUST be removed if the project is in Seismic Design Category C and D. Contractor may elect to leave backing bars in place for all other projects if all following requirements are met:
   a. Manufacturer shall submit a Certificate of Conformance and supporting Charpy V-Notch test reports showing filler metal used for backing bars has a toughness of 20 ft-lbs at 40 degrees F.
   b. Certificate shall be received by the Engineer prior to the start of steel erection.
3. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field quality control and testing, including special inspections required by local building codes and the International Building Codes.

B. General Field Inspection:
1. Verify location and setting of anchor rods by witness of Contractor’s final check prior to setting of steel members.
2. Verify plumbness of columns is within allowable tolerance per AISC Code and Commentary.
3. Verify that bracing and guying/cables, if required to secure framing during erection, are installed.

C. Bolted Connections: Bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
1. Minimum inspection requirements using the stated publication are as follows:
   a. All bolts indicated to be “slip-critical” shall be inspected.
   b. Two bolts in each bearing type bolted connection between girders and columns shall be inspected.
   c. 10 percent of the remaining bolts, but not less than 2 in each connection shall be inspected.

2. Bolts that fail shall be retightened and all remaining bolts in the connection shall be retested. Costs of retests on connections that fail shall be the Contractor's responsibility.

D. Welded Connections: Field welds will be visually inspected according to AWS D1.1/D1.1M.

1. In addition to visual inspection, field welds will be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

    a. Liquid Penetrant Inspection: ASTM E 165.
    b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
    c. Ultrasonic Inspection: ASTM E 164.
    d. Radiographic Inspection: ASTM E 94.
2. In addition to visual inspection, 100 percent of full-penetration, moment connection field welds shall be ultrasonically tested according to AWS D1.1.
3. Column splice welds shall be inspected by ultrasonic testing per AWS D1.1 to the following extent:
    a. Rigid (Lateral) Columns: 100% of splice welds at each level shall be tested.
    b. Non-Frame Columns: 25% of splice welds at each level shall be tested.

4. Non-Destructive Testing of Remaining Welds:
    a. Ultrasonic Testing (UT): ASTM E164
        1) Divide connections into groups containing not less than 40 connections. Test 25 percent of the connections in each group. If any weld is rejected, test all the connections in group.
5. Extent of testing procedure shall be the entire weld length in each designated joint.
6. Welds found unacceptable shall be repaired by methods permitted in AWS code and be retested. Costs of repair and additional testing shall be the Contractor's responsibility.

E. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:

1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
2. Conduct tests on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1/D1.1M.

F. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

3.6 REPAIRS AND PROTECTION

A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780.

B. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

C. Touchup Painting: Cleaning and touchup painting are specified in Section 09 91 13 "Exterior Painting" Section 09 91 23 "Interior Painting."

END OF SECTION 05 12 00

SECTION 05 21 00 - STEEL JOIST FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. K-series steel joists.
2. KCS-type K-series steel joists.
3. Joist accessories.

B. Related Requirements:

1. Section 03 30 00 "Cast-in-Place Concrete" for installing bearing plates in concrete.
2. Section 04 20 00 "Unit Masonry" for installing bearing plates in unit masonry.
3. Section 05 12 00 "Structural Steel Framing" for field-welded shear connectors.

1.3 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable LEED Credits

1. MRc2
2. MRc4
3. MRc5

B. LEED Requirements

1. MRc2: Construction Waste Management:

No less than the specified portion of all construction waste from the Project shall be diverted from disposal in a landfill and/or incineration in with the Project Requirements for Construction Waste Management and Disposal. Refer to Specification Sections 017419 Construction Waste Management and Disposal and 013510 Sustainable Design Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

2. MRc4: Recycled Content Material:

No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the Project Requirements for Recycled Content Materials. All materials counted towards the computations of the proportion of the Recycled Content Materials shall comply with the

standard minimum percentages of post-consumer waste materials and for the minimum percentages of pre-consumer waste materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

3. MRc5: Regionally Manufactured and/or Harvested Materials:

No less than the specified minimum proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the Project Site in accordance with the Project Requirements for Regionally Manufactured and/or Harvested Materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

1.4 DEFINITIONS

A. SJI's "Specifications": Steel Joist Institute's "Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders."

B. Special Joists: Steel joists or joist girders requiring modification by manufacturer to support nonuniform, unequal, or special loading conditions that invalidate load tables in SJI's "Specifications."

1.5 ACTION SUBMITTALS

A. Product Data: For each type of joist, accessory, and product.

B. LEED Submittals:

1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
2. Laboratory Test Reports for Credit EQ 4: For primers, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Shop Drawings:

1. Include layout, designation, number, type, location, and spacing of joists.
2. Include joining and anchorage details, bracing, bridging, and joist accessories; splice and connection locations and details; and attachments to other construction.
3. Indicate locations and details of bearing plates to be embedded in other construction.
4. Indicate locations where erection diagonal bridging is required to be maintained as permanent bridging on the shop drawings.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer.

B. Welding certificates.

C. Manufacturer certificates.

D. Mill Certificates: For each type of bolt.

E. Comprehensive engineering analysis of special joists signed and sealed by the qualified professional engineer responsible for its preparation.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer certified by SJI to manufacture joists complying with applicable standard specifications and load tables in SJI's "Specifications."

1. Manufacturer's responsibilities include providing professional engineering services for designing special joists to comply with performance requirements.

B. Welding Qualifications: Qualify field-welding procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle joists as recommended in SJI's "Specifications."

B. Protect joists from corrosion, deformation, and other damage during delivery, storage, and handling.

1.9 SEQUENCING

A. Deliver steel bearing plates to be built into cast-in-place concrete and masonry construction.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide special joists and connections capable of withstanding design loads indicated.

1. Use ASD; data are given at service-load level.
2. Design special joists to withstand design loads with live-load deflections no greater than the following:

a. Floor Joists: Vertical deflection of 1/360 of the span.
b. Roof Joists: Vertical deflection of 1/360 of the span.

B. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 50 percent.

2.2 K-SERIES STEEL JOISTS

A. Manufacture steel joists of type indicated according to "Standard Specifications for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members, underslung ends, and parallel top chord.

1. Joist Type: K-series steel joists and KCS-type K-series steel joists.

B. Steel Joist Substitutes: Manufacture according to "Standard Specifications for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle or -channel members.

C. Provide holes in chord members for connecting and securing other construction to joists.

D. Top-Chord Extensions: Extend top chords of joists with SJI's Type S top-chord extensions where indicated, complying with SJI's "Specifications."

E. Extended Ends: Extend bearing ends of joists with SJI's Type R extended ends where indicated, complying with SJI's "Specifications."

F. Camber joists according to SJI's "Specifications."

G. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches (1:48).

2.3 PRIMERS

A. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. Primer: SSPC-Paint 15, or manufacturer's standard shop primer complying with performance requirements in SSPC-Paint 15.

C. Primer: Provide shop primer that complies with Section 09 91 23 "Interior Painting." And Section 09 96 00 "High-Performance Coatings."

2.4 JOIST ACCESSORIES

A. Bridging: Provide bridging anchors and number of rows of horizontal or diagonal bridging of material, size, and type required by SJI's "Specifications" for type of joist, chord size, spacing, and span. Furnish additional erection bridging if required for stability. Permanent diagonal bridging shall be provided at joist supported gymnasium equipment such that the load of the gymnasium equipment is distributed over two or more joists.

B. Fabricate steel bearing plates from ASTM A 36/A 36M steel with integral anchorages of sizes and thicknesses indicated. Hot-dip zinc coat according to ASTM A 123/A 123M.

C. Steel bearing plates with integral anchorages are specified in Section 055000 "Metal Fabrications."

D. Furnish ceiling extensions, either extended bottom-chord elements or a separate extension unit of enough strength to support ceiling construction. Extend ends to within 1/2 inch (13 mm) of finished wall surface unless otherwise indicated.

E. Carbon-Steel Bolts and Threaded Fasteners: ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6), carbon-steel, hex-head bolts and threaded fasteners; carbon-steel nuts; and flat, unhardened steel washers.

1. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.

F. High-Strength Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, heavy hex steel structural bolts; ASTM A 563 (ASTM A 563M) heavy hex carbon-steel nuts; and ASTM F 436 (ASTM F 436M) hardened carbon-steel washers.

1. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.

G. Welding Electrodes: Comply with AWS standards.

H. Galvanizing Repair Paint: ASTM A 780.

I. Furnish miscellaneous accessories including splice plates and bolts required by joist manufacturer to complete joist assembly.

2.5 CLEANING AND SHOP PAINTING

A. Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories by hand-tool cleaning, SSPC-SP 2 or power-tool cleaning, SSPC-SP 3.

B. Do not prime paint joists and accessories to receive sprayed fire-resistive materials.

C. Apply one coat of shop primer to joists and joist accessories to be primed to provide a continuous, dry paint film not less than 1 mil (0.025 mm) thick.

D. Shop priming of joists and joist accessories is specified in Section 09 91 23 "Interior Painting" and Section 09 96 00 "High-Performance Coatings."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates, embedded bearing plates, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Do not install joists until supporting construction is in place and secured.

B. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Specifications," joist manufacturer's written recommendations, and requirements in this Section.

1. Before installation, splice joists delivered to Project site in more than one piece.
2. Space, adjust, and align joists accurately in location before permanently fastening.
3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.
4. Delay rigidly connecting bottom-chord extensions to columns or supports until dead loads are applied.
5. Coordinate with Contract Drawings for locations where erection diagonal bridging shall be replaced with permanent horizontal bridging after deck is installed and fully welded. Contractor is responsible for coordination with all trades to allow for installation of duct work, piping and other utilities per the Contract Drawings. Locations where erection diagonal bridging is required to be maintained as permanent bridging shall be shown on the shop drawings.

C. Field weld joists to supporting steel bearing plates and framework. Coordinate welding sequence and procedure with placement of joists. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.

D. Bolt joists to supporting steel framework using carbon-steel bolts.

E. Bolt joists to supporting steel framework using high-strength structural bolts. Comply with Research Council on Structural Connection's "Specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts" for high-strength structural bolt installation and tightening requirements.

F. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and bolted connections and to perform field tests and inspections and prepare test and inspection reports.

B. Visually inspect field welds according to AWS D1.1/D1.1M.

1. In addition to visual inspection, test field welds according to AWS D1.1/D1.1M and the following procedures, as applicable:

a. Liquid Penetrant Inspection: ASTM E 165.
b. Magnetic Particle Inspection: ASTM E 709.
c. Ultrasonic Testing: ASTM E 164.
d. Radiographic Testing: ASTM E 94.

C. Visually inspect bolted connections.

D. Correct deficiencies in Work that test and inspection reports have indicated are not in compliance with specified requirements.

E. Perform additional testing to determine compliance of corrected Work with specified requirements.

3.4 PROTECTION

A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Touchup Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists, bearing plates, abutting structural steel, and accessories.

1. Clean and prepare surfaces by hand-tool cleaning according to SSPC-SP 2, or power-tool cleaning according to SSPC-SP 3.
2. Apply a compatible primer of same type as primer used on adjacent surfaces.

C. Touchup Painting: Cleaning and touchup painting are specified in Section 09 91 23 "Interior Painting" and Section 099600 "High-Performance Coatings."

D. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that joists and accessories are without damage or deterioration at time of Substantial Completion.

END OF SECTION 05 21 00

SECTION 05 31 00 - STEEL DECKING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Roof deck.
2. Acoustical roof deck.
3. Cellular roof deck.
4. Acoustical cellular deck.
5. Composite floor deck.
6. Noncomposite form deck.

B. Related Requirements:

1. Section 03 30 00 "Cast-in-Place Concrete" for normal-weight and lightweight structural concrete fill over steel deck.
2. Section 05 12 00 "Structural Steel Framing" for shop- and field-welded shear connectors.
3. Section 05 50 00 "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.
4. Section 09 91 13 "Exterior Painting" for repair painting of primed deck and finish painting of deck.
5. Section 09 91 23 "Interior Painting" for repair painting of primed deck and finish painting of deck.

1.3 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable LEED Credits

1. MRc2
2. MRc4
3. MRc5

B. LEED Requirements

1. MRc2: Construction Waste Management:

No less than the specified portion of all construction waste from the Project shall be diverted from disposal in a landfill and/or incineration in with the Project Requirements for Construction Waste Management and Disposal. Refer to Specification Sections 017419 Construction Waste Management and Disposal and 013510 Sustainable

Design Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

2. MRc4: Recycled Content Material:

No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the Project Requirements for Recycled Content Materials. All materials counted towards the computations of the proportion of the Recycled Content Materials shall comply with the standard minimum percentages of post-consumer waste materials and for the minimum percentages of pre-consumer waste materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

3. MRc5: Regionally Manufactured and/or Harvested Materials:

No less than the specified minimum proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the Project Site in accordance with the Project Requirements for Regionally Manufactured and/or Harvested Materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of deck, accessory, and product indicated.

B. LEED Submittals:

1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

2. MRc2

3. MRc5

C. Shop Drawings:

1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

1.5 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Product Certificates: For each type of steel deck.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that each of the following complies with requirements:

1. Power-actuated mechanical fasteners.
2. Acoustical roof deck.

D. Evaluation Reports: For steel deck.

E. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code - Sheet Steel."

C. FM Global Listing: Provide steel roof deck evaluated by FM Global and listed in its "Approval Guide, Building Materials" for Class 1 fire rating and Class 1-90 windstorm ratings.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

B. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

C. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

D. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.2 ROOF DECK

A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. ASC Profiles, Inc.; a Blue Scope Steel company.
2. Canam United States; Canam Group Inc.
3. CMC Joist & Deck.
4. Consolidated Systems, Inc.; Metal Dek Group.
5. Cordeck.
6. DACS, Inc.
7. Epic Metals Corporation.
8. Marlyn Steel Decks, Inc.
9. New Millennium Building Systems, LLC.
10. Nucor Corp.; Vulcraft Group.
11. Roof Deck, Inc.
12. Valley Joist; Subsidiary of EBSCO Industries, Inc.
13. Verco Manufacturing Co.
14. Wheeling Corrugating Company; Div. of Wheeling-Pittsburgh Steel Corporation.

B. Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:
1. Galvanized and Shop-Primed Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33 (230) G90 (Z180) zinc coating; cleaned, pretreated, and primed with manufacturer's standard baked-on, rust-inhibitive primer.

S. Slocum: Since this deck is usually not seen, select “manufacturer’s standard” for most economical option.

a. Color: White.
2. Deck Profile: As indicated in the documents.
3. Profile Depth: As indicated in the documents.
4. Design Uncoated-Steel Thickness: As indicated in the documents.
5. Span Condition: Triple span or more.
6. Side Laps: Overlapped or interlocking seam at Contractor's option.

2.3 ACOUSTICAL ROOF DECK

A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. ASC Profiles, Inc.; a Blue Scope Steel company.
2. Canam United States; Canam Group Inc.
3. CMC Joist & Deck.
4. Consolidated Systems, Inc.; Metal Dek Group.
5. Cordeck.
6. DACS, Inc.
7. Epic Metals Corporation.
8. Marlyn Steel Decks, Inc.
9. New Millennium Building Systems, LLC.
10. Nucor Corp.; Vulcraft Group.
11. Roof Deck, Inc.
12. Wheeling Corrugating Company; Div. of Wheeling-Pittsburgh Steel Corporation.

B. Acoustical Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:
   1. Galvanized and Shop-Primed Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33 (230) G90 (Z180) zinc coating; cleaned, pretreated, and primed with manufacturer's standard baked-on, rust-inhibitive primer.

      a. Color: White.
   2. Deck Profile: As indicated in the documents.
   3. Cellular Deck Profile: As indicated in the documents, with bottom plate.
   4. Profile Depth: As indicated in the documents.
   5. Design Uncoated-Steel Thicknesses; Deck Unit/Bottom Plate: As indicated in the documents.
   6. Span Condition: Triple span or more.
   7. Side Laps: Overlapped or interlocking seam at Contractor's option.
   8. Acoustical Perforations: Cellular deck units with manufacturer's standard perforated flat-bottom plate welded to ribbed deck.
   9. Sound-Absorbing Insulation: Manufacturer's standard premolded roll or strip of glass or mineral fiber.

      a. Factory install sound-absorbing insulation into cells of cellular deck.

   10. Acoustical Performance: NRC 0.65, tested according to ASTM C 423.

2.4 CELLULAR ROOF DECK

A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   1. ASC Profiles, Inc.; a Blue Scope Steel company.
   2. Canam United States; Canam Group Inc.
   3. CMC Joist & Deck.
   4. Consolidated Systems, Inc.; Metal Dek Group.
   5. Cordeck.
   6. DACS, Inc.
   7. Epic Metals Corporation.
   8. Marlyn Steel Decks, Inc.
   9. New Millennium Building Systems, LLC.
   10. Nucor Corp.; Vulcraft Group.
   11. Roof Deck, Inc.
   12. Wheeling Corrugating Company; Div. of Wheeling-Pittsburgh Steel Corporation.

B. Cellular Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:
   1. Galvanized and Shop-Primed Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33 (230) G90 (Z180) zinc coating; cleaned, pretreated, and primed with manufacturer's standard baked-on, rust-inhibitive primer.

      a. Color: White.
   2. Cellular Deck Profile: As indicated in the documents, with bottom plate.
   3. Profile Depth: As indicated in the documents.

4. Design Uncoated-Steel Thicknesses; Deck Unit/Bottom Plate: As indicated in the documents.
5. Span Condition: Triple span or more.
6. Side Laps: Overlapped or interlocking seam at Contractor's option.

2.5 ACOUSTICAL CELLULAR DECK

A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. ASC Profiles, Inc.; a Blue Scope Steel company.
2. Canam United States; Canam Group Inc.
3. CMC Joist & Deck.
4. Consolidated Systems, Inc.; Metal Dek Group.
5. Cordeck.
6. DACS, Inc.
7. Epic Metals Corporation.
8. Marlyn Steel Decks, Inc.
9. New Millennium Building Systems, LLC.
10. Nucor Corp.; Vulcraft Group.
11. Roof Deck, Inc.
12. Wheeling Corrugating Company; Div. of Wheeling-Pittsburgh Steel Corporation.

B. Acoustical Cellular Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:
1. Galvanized and Shop-Primed Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33 (230) G90 (Z180) zinc coating; cleaned, pretreated, and primed with manufacturer's standard baked-on, rust-inhibitive primer.

   a. Color: White.
2. Cellular Deck Profile: As indicated in the documents, with bottom plate.
3. Profile Depth: As indicated in the documents.
4. Design Uncoated-Steel Thicknesses; Deck Unit/Bottom Plate: As indicated in the documents.
5. Span Condition: Triple span or more.
6. Side Laps: Overlapped or interlocking seam at Contractor's option.
7. Acoustical Perforations: Cellular deck units with manufacturer's standard perforated flat-bottom plate welded to ribbed deck.
8. Sound-Absorbing Insulation: Manufacturer's standard premolded roll or strip of glass or mineral fiber.

   a. Factory install sound-absorbing insulation into cells of cellular deck.

9. Acoustical Performance: NRC 0.65, tested according to ASTM C 423.

2.6 COMPOSITE FLOOR DECK

A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. ASC Profiles, Inc.; a Blue Scope Steel company.
2. Canam United States; Canam Group Inc.
3. CMC Joist & Deck.
4. Consolidated Systems, Inc.; Metal Dek Group.
5. Cordeck.
6. DACS, Inc.
7. Epic Metals Corporation.
8. Marlyn Steel Decks, Inc.
9. New Millennium Building Systems, LLC.
10. Nucor Corp.; Vulcraft Group.
11. Roof Deck, Inc.
12. Verco Manufacturing Co.
13. Wheeling Corrugating Company; Div. of Wheeling-Pittsburgh Steel Corporation.

B. Composite Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specifications and Commentary for Composite Steel Floor Deck," in SDI Publication No. 31, with the minimum section properties indicated, and with the following:
1. Galvanized-Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33 (230), G60 (Z180) zinc coating.
2. Galvanized and Shop-Primed Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33 zinc coating; with unpainted top surface and cleaned and pretreated bottom surface primed with manufacturer's standard gray or white baked-on, rust-inhibitive primer.
3. Profile Depth: As indicated in the documents.
4. Design Uncoated-Steel Thickness: As indicated in the documents.
5. Span Condition: Triple span or more.

2.7 NONCOMPOSITE FORM DECK

A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. ASC Profiles, Inc.; a Blue Scope Steel company.
2. Canam United States; Canam Group Inc.
3. CMC Joist & Deck.
4. Consolidated Systems, Inc.; Metal Dek Group.
5. Cordeck.
6. DACS, Inc.
7. Epic Metals Corporation.
8. Marlyn Steel Decks, Inc.
9. New Millennium Building Systems, LLC.
10. Nucor Corp.; Vulcraft Group.
11. Roof Deck, Inc.
12. Verco Manufacturing Co.
13. Wheeling Corrugating Company; Div. of Wheeling-Pittsburgh Steel Corporation.

B. Noncomposite Form Deck: Fabricate ribbed-steel sheet noncomposite form-deck panels to comply with "SDI Specifications and Commentary for Noncomposite Steel Form Deck," in SDI Publication No. 31, with the minimum section properties indicated, and with the following:

1. Galvanized-Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33 (230), G90 (Z275) zinc coating.

2. Profile Depth: As indicated in the documents.
3. Design Uncoated-Steel Thickness: As indicated in the documents.
4. Span Condition: As indicated in the documents.
5. Side Laps: Overlapped or interlocking seam at Contractor's option.

2.8 ACCESSORIES

A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.

C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 (4.8-mm) minimum diameter.

D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi (230 MPa), not less than 0.0359-inch (0.91-mm) design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

F. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi (230 MPa), of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 31 for overhang and slab depth.

G. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck unless otherwise indicated.

H. Piercing Hanger Tabs: Piercing steel sheet hanger attachment devices for use with floor deck.

I. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, 0.0598 inch (1.52 mm) thick, with factory-punched hole of 3/8-inch (9.5-mm) minimum diameter.

J. Flat Sump Plates: Single-piece steel sheet, 0.0747 inch (1.90 mm) thick, of same material and finish as deck. For drains, cut holes in the field.

K. Recessed Sump Pans: Single-piece steel sheet, 0.0747 inch (1.90 mm) thick, of same material and finish as deck, with 3-inch- (76-mm-) wide flanges and level or sloped recessed pans of 1-1/2-inch (38-mm) minimum depth. For drains, cut holes in the field.

L. Galvanizing Repair Paint: ASTM A 780.

M. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, and requirements in this Section.

B. Install temporary shoring before placing deck panels if required to meet deflection limitations.

C. Locate deck bundles to prevent overloading of supporting members.

D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.

1. Align cellular deck panels over full length of cell runs and align cells at ends of abutting panels.

E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.

G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.

H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

I. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

3.3 ROOF-DECK INSTALLATION

A. Deck attachment shall be sufficient to develop diaphragm shear strength capacity indicated on the drawings, and shall be in accordance with the manufacturer’s recommendations. Attachment guidelines indicated in sections 3.3B through 3.3D are minimum requirements only.

B. Fasten roof-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter that is not less than 1-1/2 inches (38 mm) long, and as follows:

1. Weld Diameter: 5/8 inch, nominal.
2. Weld Spacing: Weld edge and interior ribs of deck units with a minimum of two welds per deck unit at each support. Space welds 12 inches in the field of roof and 6 inches (150 mm) apart in roof corners and perimeter, based on roof-area definitions in FMG Loss Prevention Data Sheet 1-28.

3. Weld Washers: Install weld washers at each weld location where metal thickness is less than 0.028 inches. Weld washers shall have a minimum thickness of 0.0598 inches and have a nominal 3/8 inch diameter whole.

C. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of 1/2 of the span, 36 inches, and a minimum of 4 fasteners between supports. Use one of the two attachment methods as follows:

1. Mechanically fasten with self-drilling, No. 10 (4.8-mm-) diameter or larger, carbon-steel screws.
2. Fasten with a minimum of 1-1/2-inch- (38-mm-) long welds.

D. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 2 inches (38 mm), with end joints as follows:

1. End Joints: Lapped 2 inches (51 mm) minimum or butted at Contractor's option.

E. Roof Sump Pans and Sump Plates: Install over openings provided in roof deck and weld or mechanically fasten flanges to top of deck. Space welds or mechanical fasteners not more than 12 inches (305 mm) apart with at least one weld or fastener at each corner.

1. Install reinforcing channels or zees in ribs to span between supports and weld or mechanically fasten.

F. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld or mechanically fasten to substrate to provide a complete deck installation.

1. Weld cover plates at changes in direction of roof-deck panels unless otherwise indicated.

G. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.

H. Sound-Absorbing Insulation: Installation into topside ribs of deck as specified in Division 07 Section “Thermal Insulation”.

3.4 FLOOR-DECK INSTALLATION

A. Fasten floor-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:

1. Weld Diameter: 5/8 inch, nominal, minimum.
2. Weld Spacing: Weld edge ribs of panels at each support. Space additional welds an average of 12 inches (305 mm) apart, but not more than 18 inches (457 mm) apart.
3. Weld Spacing: Space and locate welds as indicated.
4. Weld Washers: Install weld washers at each weld location where metal thickness is less than 0.028 inches. Weld washers shall have a minimum thickness of 0.0598 inches and have a nominal 3/8 inch diameter whole.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of half of the span or 36 inches (914 mm), and as follows:

1. Mechanically fasten with self-drilling, No. 10 (4.8-mm-) diameter or larger, carbon-steel screws.
2. Fasten with a minimum of 1-1/2-inch- (38-mm-) long welds.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 2 inches with end joints as follows:

1. End Joints: Butted.

D. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations unless otherwise indicated.

E. Floor-Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.

F. Install piercing hanger tabs at 14 inches apart in both directions, within 9 inches (228 mm) of walls at ends, and not more than 12 inches (305 mm) from walls at sides unless otherwise indicated.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Field welds will be subject to inspection.

C. Testing agency will report inspection results promptly and in writing to Contractor and Architect.

D. Remove and replace work that does not comply with specified requirements.

E. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.6 PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Repair Painting: Wire brush and clean rust spots, welds, and abraded areas on both surfaces of prime-painted deck immediately after installation, and apply repair paint.

1. Apply repair paint, of same color as adjacent shop-primed deck, to bottom surfaces of deck exposed to view.
2. Wire brushing, cleaning, and repair painting of bottom deck surfaces are included in Section 09 91 13 "Exterior Painting" and Section 09 91 23 "Interior Painting."

C. Repair Painting: Wire brushing, cleaning, and repair painting of rust spots, welds, and abraded areas of both deck surfaces are included in Section 09 91 13 "Exterior Painting" and Section 09 91 23 "Interior Painting."

D. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05 31 00

SECTION 05 40 00 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Exterior non-load-bearing wall framing.
2. Soffit framing.
3. Bracing

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for masonry shelf angles and connections.
2. Division 09 Section "Non-Structural Metal Framing" for interior non-load-bearing, metal-stud framing and ceiling-suspension assemblies capable of withstanding design loads and deflection limits specified under “Performance Requirements” article with non-structural metal framing, as determined by professional engineer responsible for the engineering services in Section 054000.

1.3 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable Leed Credits

1. MRc2
2. MRc4
3. MRc5

B. LEED Requirements

1. MRc2: CONSTRUCTION WASTE MANAGEMENT

No less than the specified portion of all construction waste from the Project shall be diverted from disposal in a landfill and/or incineration in with the Project Requirements for Construction Waste Management and Disposal. Refer to Specification Sections 017419 Construction Waste Management and Disposal and 013510 Sustainable Design Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

2. MRc4: RECYCLED CONTENT MATERIAL

No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the Project Requirements for Recycled Content Materials. All materials counted

towards the computations of the proportion of the Recycled Content Materials shall comply with the standard minimum percentages of post-consumer waste materials and for the minimum percentages of pre-consumer waste materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures

3. MRc5: REGIONALLY MANUFACTURED HARVESTED MATERIALS

No less than the specified minimum proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the Project Site in accordance with the Project Requirements for Regionally Manufactured and/or Harvested Materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of cold-formed steel framing product and accessory.

B. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.

C. Shop Drawings:

1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

D. Delegated-Design Submittal: For cold-formed steel framing.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Welding certificates.

C. Product Test Reports: For each listed product, for tests performed by [manufacturer and witnessed by a qualified testing agency] [a qualified testing agency].

1. Steel sheet.
2. Expansion anchors.
3. Power-actuated anchors.
4. Mechanical fasteners.
5. Vertical deflection clips.
6. Horizontal drift deflection clips
7. Miscellaneous structural clips and accessories.

D. Research Reports: For non-standard cold-formed steel framing, from ICC-ES.

1.6 QUALITY ASSURANCE

A. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent. The Professional Engineer shall prepare and seal design calculations, Shop drawings, and other structural data related to the work of this Section.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with a minimum of five years experience.

D. Installer Qualifications: An experienced installer, with a minimum five years experience, who has completed cold-formed metal framing similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

E. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated.

F. Product Tests: Mill certificates or data from a qualified independent testing agency indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, ductility, and metallic-coating thickness.

G. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."

H. Fire-Test-Response Characteristics: Where indicated, provide cold-formed metal framing identical to that of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

I. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."

1. Comply with AISI's "Standard for Cold-Formed Steel Framing - Truss Design."
2. Comply with AISI's "Standard for Cold-Formed Steel Framing - Header Design."

J. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering cold-formed metal framing that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide cold-formed metal framing by one of the following:

1. Allied Studco.
2. AllSteel Products, Inc.
3. California Expanded Metal Products Company.
4. Clark Steel Framing.
5. Consolidated Fabricators Corp.; Building Products Division.
6. Craco Metals Manufacturing, LLC.
7. Custom Stud, Inc.
8. Dale/Incor.
9. Design Shapes in Steel.
10. Dietrich Metal Framing; a Worthington Industries Company.
11. Formetal Co. Inc. (The).
12. Innovative Steel Systems.
13. MarinoWare; a division of Ware Industries.
14. Quail Run Building Materials, Inc.
15. SCAFCO Corporation.
16. Southeastern Stud & Components, Inc.
17. Steel Construction Systems.
18. Steeler, Inc.
19. Super Stud Building Products, Inc.
20. United Metal Products, Inc.

2.2 MATERIALS

A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

B. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:

1. Grade: As required by structural performance .
2. Coating: G90 (Z275) or equivalent .

C. Steel Sheet for Vertical Deflection Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:

1. Grade: As required by structural performance.
2. Coating: G90 (Z275).

2.3 EXTERIOR NON-LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0538 inch (1.37 mm).
2. Flange Width: 2 inches (51 mm).
3. Section Properties: As required by structural performance calculations.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0538 inch (1.37 mm) Matching steel studs;
2. Flange Width: 1-1/4 inches (32 mm).

C. Vertical Deflection Clips: Manufacturer's standard bypass or head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Dietrich Metal Framing; a Worthington Industries Company.
b. MarinoWare, a division of Ware Industries.
c. SCAFCO Corporation
d. The Steel Network, Inc.

D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal and lateral loads and transfer them to the primary structure, and as follows:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

2. Minimum Base-Metal Thickness: 0.0538 inch (1.37 mm) .
3. Flange Width: 1 inch (25 mm) plus twice the design gap requirement .

E. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.

1. Outer Track: Of web depth to allow free vertical movement of inner track, with flanges designed to support horizontal and lateral loads and transfer them to the primary structure, and as follows:

a. Minimum Base-Metal Thickness: 0.0538 inch (1.37 mm);
b. Flange Width: 1 inch (25 mm) plus twice the design gap requirement .

2. Inner Track: Of web depth indicated, and as follows:

a. Minimum Base-Metal Thickness: 0.0538 inch (1.37 mm);

b. Flange Width: equal to sum of outer deflection track flange width plus 1 inch (25 mm).

F. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure.

2.4 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:

1. Supplementary framing.
2. Bracing, bridging, and solid blocking.
3. Web stiffeners.
4. Anchor clips.
5. End clips.
6. Foundation clips.
7. Gusset plates.
8. Stud kickers, knee braces, and girts.
9. Joist hangers and end closures.
10. Hole reinforcing plates.
11. Backer plates.

2.5 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.

B. Anchor Bolts: ASTM F 1554, Grade 55, threaded carbon-steel and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C. Size and type as recommended by Contractor’s registered professional engineer to suit fastening or anchorage condition.

C. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.

E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.

1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

F. Welding Electrodes: Comply with AWS standards.

2.6 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: ASTM A 780.

B. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

C. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107, with fluid consistency and 30-minute working time.

D. Shims: Load bearing, high-density multimonomer plastic, nonleaching.

E. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch (6.4 mm) thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

2.7 FABRICATION

A. Fabricate cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.

1. Fabricate framing assemblies using jigs or templates.
2. Cut framing members by sawing or shearing; do not torch cut.
3. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.

    a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.

4. Fasten other materials to cold-formed metal framing by welding, bolting, or screw fastening, according to Shop Drawings.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.

C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch (3 mm).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Verify all field dimensions and as per drawings

C. Verify site conditions and dimensions under provisions of Division 1, “Execution”.

3.2 PREPARATION

A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.

B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that are required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

C. Install load bearing shims or grout between the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations to ensure a uniform bearing surface on supporting concrete or masonry construction.

D. Install sealer gaskets to isolate the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations.

3.3 INSTALLATION, GENERAL

A. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed metal framing according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions" and to manufacturer's written instructions unless more stringent requirements are indicated.

C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.

1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch (1.6 mm).
2. Where applicable, fasten framing members to adjoining steel construction by welding.

D. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened.

1. Cut framing members by sawing or shearing; do not torch cut.
2. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.

    a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.

E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

G. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.

H. Install insulation, specified in Division 07 Section "Thermal Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.

J. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:

    1. Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated on shop drawings and in accordance with design calculations. Butt weld joints in tracks or splice with channel inserts.

B. Fasten both flanges of studs to top and bottom track, unless otherwise indicated. Space studs as follows:

    1. Stud Spacing: 16 inches (406 mm).
    2. Positions studs vertically in tracks and space not more than 2 inches from abutting walls and at each side of openings, unless otherwise indicated. Install studs full length between tracks without splices. Provide doubled studs at openings 2-foot wide or larger. Provide tripled studs at corners, positioned to receive interior and exterior finishes. Fasten studs to top and bottom track by welding both flanges to tracks.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.

1. Install single-leg deflection tracks and anchor to building structure.
2. Install double deep-leg deflection tracks and anchor outer track to building structure.
3. Connect vertical deflection clips to bypassing or infill studs and anchor to building structure.
4. Connect drift clips to cold formed metal framing and anchor to building structure.

E. Install horizontal bridging in wall studs, spaced in rows indicated on Shop Drawings but not more than 48 inches (1220 mm) apart. Fasten at each stud intersection.

1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches (305 mm) of single deflection track. Install a combination of flat, taut, steel sheet straps of width and thickness indicated and stud or stud-track solid blocking of width and thickness matching studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.

    a. Install solid blocking at centers indicated on Shop Drawings.

2. Bridging: Cold-rolled steel channel welded or mechanically fastened to webs of punched studs.
3. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
4. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable wall-framing system.

3.5 FIELD QUALITY CONTROL

A. Testing: Engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Field and shop welds will be subject to testing and inspecting.

C. Testing agency will report test results promptly and in writing to Contractor and Architect.

D. Remove and replace work where test results indicate that it does not comply with specified requirements.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

F. Field inspection shall include, but is not limited to:

1. See that all steel is properly stored and protected.
2. Vertical and horizontal alignment of all metal studs before and after welding, and when directed by the Architect.
3. All joints, prior to welding, for required clearance and preparation.
4. Type of equipment and material used to make connections.
5. All welded and bolted field connections.
6. Check field touch-up painting prior to covering by architectural materials.
7. Inspector shall mark all bolted and welded connections when they are finally approved.

G. Notification: It shall be the responsibility of the Contractor to see that the Inspection Agency is supplied with a complete set of Contract Drawings and Specifications and approved Shop Drawings. It is the Contractor's responsibility to notify the Agency Construction Manager and Inspection Agency before the start of erection of steel, a sufficient time before such work is started in order that the Inspection Agency may properly schedule the required inspections.

H. Contractor's Responsibility: Acceptance of the field inspection done by the Inspection Agency pertaining to the cold formed metal framing does not relieve the Contractor of his responsibility to insure that the project has the proper sizes, strength, fabrication and erection procedures and any other requirements of the Contract Documents.

I. Certified reports indicating that all joints tested by non-destructive testing meet all of the requirements of the Contract Documents, shall be submitted to the Architect prior to completion of other work preventing access for any possible repairs.

J. Certified reports indicating that all joints tested by non-destructive testing meet all of the requirements of the Contract Documents shall be submitted to the Architect prior to completion of other work preventing access for any possible repairs.

K. Upon completion of the installation of the studs, the Contractor shall submit a written certification that the studs as erected meet all of the requirements of the Contract Documents.

3.6 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure that cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05 40 00

SECTION 05 50 00 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Steel framing and supports for ceiling-braced toilet compartments.
2. Steel framing and supports for mounted gymnasium equipment
3. Steel framing and supports for countertops.
4. Steel tube reinforcement for low partitions.
5. Steel framing and supports for mechanical and electrical equipment.
6. Steel framing and supports for hoist beams
7. Steel framing and supports for applications where framing and supports are not specified in other Sections.
8. Elevator machine beams, hoist beams,.
9. Steel shapes for supporting elevator door sills.
10. Shelf angles.
11. Metal ladders.
12. Elevator pit sump covers.
13. Miscellaneous steel trim including steel angle corner guards.
14. Loose bearing and leveling plates for applications where they are not specified in other Sections.

B. Products furnished, but not installed, under this Section include the following:

1. Loose steel lintels.
2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
3. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.

C. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for installing anchor bolts, steel pipe sleeves, slotted-channel inserts, wedge-type inserts, and other items cast into concrete.
2. Section 042000 "Unit Masonry" for installing loose lintels, anchor bolts, and other items built into unit masonry.
3. Division 05 Section "Metal Stairs."
4. Division 05 Section "Pipe and Tube Railings."
5. Section 051200 "Structural Steel Framing."
6. Division 07 section “Security Joint Sealants” for requirements for and locations to receive security joint sealants..

7. Divison 09 Section “High Performance Coatings” for priming and finishing of metal fabrications.
8. Division 10 Section "Wire Mesh Partitions."
9. Division 11 Section “Tamper-Proof Metal Fasteners for requirements for and locations to receive security fasteners”.
10. Section 129300 "Site Furnishings" for bicycle racks and bollards.

1.3 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.4 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable Leed Credits

1. MRc2
2. MRc4
3. MRc5
4. IEQc4.2

B. LEED Requirements

1. MRc2: CONSTRUCTION WASTE MANAGEMENT

No less than the specified portion of all construction waste from the Project shall be diverted from disposal in a landfill and/or incineration in with the Project Requirements for Construction Waste Management and Disposal. Refer to Specification Sections 017419 Construction Waste Management and Disposal and 013510 Sustainable Design Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

2. MRc4: RECYCLED CONTENT MATERIAL

No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the Project Requirements for Recycled Content Materials. All materials counted towards the computations of the proportion of the Recycled Content Materials shall comply with the standard minimum percentages of post-consumer waste materials and for the minimum percentages of pre-consumer waste materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures

3. MRc5: REGIONALLY MANUFACTURED HARVESTED MATERIALS

No less than the specified minimum proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the Project Site in accordance with the Project Requirements for Regionally Manufactured and/or Harvested Materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

4. IEQc4.2: LOW-EMITTING MATERIALS – PAINTS AND COATINGS

All paints and coatings in the building interior shall comply with the Project Requirements for Low Emitting Materials – Paints and Coatings. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

1.5 ACTION SUBMITTALS

A. Product Data: For the following:

1. Nonslip aggregates and nonslip-aggregate surface finishes.
2. Paint products.
3. Grout.

B. Shop Drawings: Show fabrication and installation details for metal fabrications.

1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

C. Coordination Drawings: Show components accommodating structural elements and mechanical, plumbing, fire-protection, fire-alarm, electrical, data and security electronics equipment.

D. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer.

B. Mill Certificates: Signed by stainless-steel manufacturers, certifying that products furnished comply with requirements.

C. Welding certificates.

D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

1.7 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
3. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

1.8 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design ladders including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

C. Structural Performance of Stairs: Metal stairs shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Uniform Load: 100 lbf/sq. ft. (4.79 kN/sq. m).
2. Concentrated Load: 300 lbf (1.33 kN) applied on an area of 4 sq. in. (2580 sq. mm).
3. Uniform and concentrated loads need not be assumed to act concurrently.
4. Stair Framing: Capable of withstanding stresses resulting from railing loads in addition to loads specified above.
5. Limit deflection of treads, platforms, and framing members to L/360 or 1/4 inch (6.4 mm), whichever is less.

D. Seismic Performance of Stairs: Metal stairs shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. Component Importance Factor: 1.5.

2.2 METALS

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

C. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

D. Stainless-Steel Sheet, Strip, and Plate: ASTM A 240/A 240M or ASTM A 666, Type 304.

E. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304.

F. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.

G. Rolled-Stainless-Steel Floor Plate: ASTM A 793.

H. Abrasive-Surface Floor Plate: Steel plate with abrasive granules rolled into surface or with abrasive material metallically bonded to steel.

I. Steel Tubing: ASTM A 500/A 500M, cold-formed steel tubing.

J. Steel Pipe: ASTM A 53/A 53M, Standard Weight (Schedule 40) unless otherwise indicated.

K. Zinc-Coated Steel Wire Rope: ASTM A 741.

1. Wire-Rope Fittings: Hot-dip galvanized-steel connectors with capability to sustain, without failure, a load equal to minimum breaking strength of wire rope with which they are used.

L. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.

1. Size of Channels: As indicated.
2. Material: Galvanized steel, ASTM A 653/A 653M, structural steel, Grade 33, with G90 coating; 0.079-inch nominal thickness.
3. Material: Cold-rolled steel, ASTM A 1008/A 1008M, structural steel, Grade 33; 0.0677-inch minimum thickness; hot-dip galvanized after fabrication.

M. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.

N. Aluminum Plate and Sheet: ASTM B 209 (ASTM B 209M), Alloy 6061-T6.

O. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T6.

P. Aluminum-Alloy Rolled Tread Plate: ASTM B 632/B 632M, Alloy 6061-T6.

Q. Aluminum Castings: ASTM B 26/B 26M, Alloy 443.0-F.

R. Bronze Extrusions: ASTM B 455, Alloy UNS No. C38500 (extruded architectural bronze).

S. Bronze Castings: ASTM B 584, Alloy UNS No. C83600 (leaded red brass) or No. C84400 (leaded semired brass).

T. Nickel Silver Extrusions: ASTM B 151/B 151M, Alloy UNS No. C74500.

U. Nickel Silver Castings: ASTM B 584, Alloy UNS No. C97600 (20 percent leaded nickel bronze).

2.3 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

1. Provide stainless-steel fasteners for fastening aluminum.

B. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.

1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.

C. Eyebolts: ASTM A 489.

D. Machine Screws: ASME B18.6.3.

E. Lag Screws: ASME B18.2.1.

F. Wood Screws: Flat head, ASME B18.6.1.

G. Plain Washers: Round, ASME B18.22.1.

H. Lock Washers: Helical, spring type, ASME B18.21.1.

I. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

J. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.

K. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.

1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
2. Material for Exterior Locations and Where Stainless Steel is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

L. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches by length indicated with anchor straps or studs not less than 3 inches long at not more than 8 inches o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B 633, Class Fe/Zn 5, as needed for fastening to inserts.

2.4 MISCELLANEOUS MATERIALS

A. Shop Primers: Provide primers that comply Section 099123 Interior Painting," and Section 099600 "High-Performance Coatings."

B. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

D. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

E. Concrete: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3000 psi (20 MPa).

2.5 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches (3.2 by 38 mm), with a minimum 6-inch (150-mm) embedment and 2-inch (50-mm) hook, not less than 8 inches (200 mm) from ends and corners of units and 24 inches (600 mm) o.c., unless otherwise indicated.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.

1. Fabricate units from slotted channel framing where indicated.
2. Furnish inserts for units installed after concrete is placed.

C. Fabricate supports for operable partitions from continuous steel beams of sizes recommended by partition manufacturer with attached bearing plates, anchors, and braces as recommended by partition manufacturer. Drill or punch bottom flanges of beams to receive partition track hanger rods; locate holes where indicated on operable partition Shop Drawings.

D. Fabricate steel girders for wood frame construction from continuous steel shapes of sizes indicated.

1. Provide bearing plates welded to beams where indicated.
2. Drill or punch girders and plates for field-bolted connections where indicated.
3. Where wood nailers are attached to girders with bolts or lag screws, drill or punch holes at 24 inches (600 mm) o.c.

E. Fabricate steel pipe columns for supporting wood frame construction from steel pipe with steel baseplates and top plates as indicated. Drill or punch baseplates and top plates for anchor and connection bolts and weld to pipe with fillet welds all around. Make welds the same size as pipe wall thickness unless otherwise indicated.

1. Unless otherwise indicated, fabricate from Schedule 40 steel pipe.
2. Unless otherwise indicated, provide 1/2-inch (12.7-mm) baseplates with four 5/8-inch (16-mm) anchor bolts and 1/4-inch (6.4-mm) top plates.

F. Galvanize miscellaneous framing and supports where indicated.

G. Prime miscellaneous framing and supports with primer specified in Section 099600 "High-Performance Coatings" where indicated.

2.7 SHELF ANGLES

A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch (19-mm) bolts, spaced not more than 6 inches (150 mm) from ends and 24 inches (600 mm) o.c., unless otherwise indicated.

1. Provide mitered and welded units at corners.
2. Provide open joints in shelf angles at expansion and control joints. Make open joint approximately 2 inches (50 mm) larger than expansion or control joint.

B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete.

C. Galvanize and prime shelf angles located in exterior walls.

D. Prime shelf angles located in exterior walls with primer specified in Section 099600 "High-Performance Coatings."

E. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

2.8 METAL LADDERS

A. General:

1. Comply with ANSI A14.3, except for elevator pit ladders.
2. For elevator pit ladders, comply with ASME A17.1/CSA B44.

B. Steel Ladders:

1. Space siderails 18 inches (457 mm) apart unless otherwise indicated.
2. Siderails: Continuous, 1/2-by-2-1/2-inch (12.7-by-64-mm) steel flat bars, with eased edges.
3. Rungs: 1-inch- (25-mm-) diameter steel bars.
4. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
5. Provide nonslip surfaces on top of each rung, either by coating rung with aluminum-oxide granules set in epoxy-resin adhesive or by using a type of manufactured rung filled with aluminum-oxide grout.
6. Provide nonslip surfaces on top of each rung by coating with abrasive material metallically bonded to rung.
7. Support each ladder at top and bottom and not more than 60 inches (1500 mm) o.c. with welded or bolted steel brackets.
8. Prime ladders, including brackets and fasteners, with primer specified in Section 099600 "High-Performance Coatings."

2.9 ELEVATOR PIT SUMP COVERS

A. Fabricate from abrasive-surface floor plate with four 1-inch- (25-mm-) diameter holes for water drainage and for lifting.

B. Fabricate from welded or pressure-locked steel bar grating Limit openings in gratings to no more than 3/4 inch (19 mm) in least dimension.

C. Provide steel angle supports as indicated.

2.10 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.

B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.

1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.

C. Galvanize and prime exterior miscellaneous steel trim.

D. Prime exterior miscellaneous steel trim with primer specified in Section 099600 "High-Performance Coatings."

2.11 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

B. Galvanize plates.

C. Prime plates with primer specified in Section 099600 "High-Performance Coatings."

2.12 LOOSE STEEL LINTELS

A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.

B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span, but not less than 8 inches (200 mm) unless otherwise indicated.

C. Galvanize and prime loose steel lintels located in exterior walls.

D. Prime loose steel lintels located in exterior walls with primer specified in Section 099600 "High-Performance Coatings."

2.13 STEEL WELD PLATES AND ANGLES

A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.14 FINISHES, GENERAL

A. Finish metal fabrications after assembly.

B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.15 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.

1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

B. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.

C. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.

D. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

2.16 ALUMINUM FINISHES

A. As-Fabricated Finish: AA-M12.

B. Clear Anodic Finish: AAMA 611, Class I, AA-M12C22A41.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

F. Corrosion Protection: Coat concealed surfaces of aluminum that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:

1. Cast Aluminum: Heavy coat of bituminous paint.
2. Extruded Aluminum: Two coats of clear lacquer.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

B. Anchor supports for ceiling hung toilet partitions securely to, and rigidly brace from, building structure.

C. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.

1. Where grout space under bearing plates is indicated for girders supported on concrete or masonry, install as specified in "Installing Bearing and Leveling Plates" Article.

D. Install pipe columns on concrete footings with grouted baseplates. Position and grout column baseplates as specified in "Installing Bearing and Leveling Plates" Article.

1. Grout baseplates of columns supporting steel girders after girders are installed and leveled.

3.3 INSTALLING BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before

packing with nonshrink grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.4 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

END OF SECTION 05 50 00

SECTION 05 51 13 - METAL PAN STAIRS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Preassembled steel stairs with concrete-filled treads.
2. Industrial-type, straight-run stairs with steel-grating treads
3. Steel tube railings attached to metal stairs.
4. Steel tube handrails attached to walls adjacent to metal stairs.
5. Railing gates at the level of exit discharge.

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for concrete fill for stair treads and platforms.
2. Section 055213 "Pipe and Tube Railings" for pipe and tube railings.
3. Division 05 Section "Metal Fabrications" for metal treads and nosings installed at locations other than in metal stairs.
1. Division 07 section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 09 Section “High-Performance Coatings” for shop- and touchup painting of metal stairs.
3. Division 11 Section “General Provisions for Detention Work”.
4. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages for metal stairs. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

C. Coordinate locations of hanger rods and struts with other work so that they do not encroach on required stair width and are within the fire-resistance-rated stair enclosure.

1.4 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable Leed Credits

1. MRc2
2. MRc4
3. MRc5
4. IEQc4.2

B. LEED Requirements

1. MRc2: CONSTRUCTION WASTE MANAGEMENT

No less than the specified portion of all construction waste from the Project shall be diverted from disposal in a landfill and/or incineration in with the Project Requirements for Construction Waste Management and Disposal. Refer to Specification Sections 017419 Construction Waste Management and Disposal and 013510 Sustainable Design Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

2. MRc4: RECYCLED CONTENT MATERIAL

No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the Project Requirements for Recycled Content Materials. All materials counted towards the computations of the proportion of the Recycled Content Materials shall comply with the standard minimum percentages of post-consumer waste materials and for the minimum percentages of pre-consumer waste materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures

3. MRc5: REGIONALLY MANUFACTURED HARVESTED MATERIALS

No less than the specified minimum proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the Project Site in accordance with the Project Requirements for Regionally Manufactured and/or Harvested Materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

4. IEQc4.2: LOW-EMITTING MATERIALS – PAINTS AND COATINGS

All paints and coatings in the building interior shall comply with the Project Requirements for Low Emitting Materials – Paints and Coatings. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

1.5 ACTION SUBMITTALS

A. Product Data: For metal pan stairs and the following:

1. Prefilled metal-pan-stair treads.

2. Nonslip aggregates and nonslip-aggregate finishes.
3. Abrasive nosings.
4. Photoluminescent Nosing

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

C. Samples for Verification: For each type and finish of nosing and tread.

D. Delegated-Design Submittal: For stairs and railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

B. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

Manufacturers: Subject to compliance with requirements, manufacturers whose products may be incorporated into the Work include, but are not limited to, the following

1. Alfab, Inc.
2. American Stair, Inc.
3. Lapeyre Stair Inc.
4. Pacific Stair Corporation.
5. Worthington Metal Fabricators.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design stairs and railings.

B. Structural Performance of Stairs: Metal stairs shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Uniform Load: 100 lbf/sq. ft. (4.79 kN/sq. m).

2. Concentrated Load: 300 lbf (1.33 kN) applied on an area of 4 sq. in. (2580 sq. mm).
3. Uniform and concentrated loads need not be assumed to act concurrently.
4. Stair Framing: Capable of withstanding stresses resulting from railing loads in addition to loads specified above.
5. Limit deflection of treads, platforms, and framing members to L/360 or 1/4 inch (6.4 mm), whichever is less.

C. Seismic Performance of Stairs: Metal stairs shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. Component Importance Factor: 1.5.

D. Structural Performance of Railings: Railings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Handrails and Top Rails of Guards:

a. Uniform load of 50 lbf/ft. (0.73 kN/m) applied in any direction.
b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
c. Uniform and concentrated loads need not be assumed to act concurrently.

2. Infill of Guards

a. Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).
b. Infill load and other loads need not be assumed to act concurrently.

2.3 METALS

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

C. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

D. Steel Tubing: ASTM A 500 (cold formed) or ASTM A 513.

E. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.

F. Uncoated, Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, either commercial steel, Type B, or structural steel, Grade 25 (Grade 170), unless another grade is required by design loads; exposed.

G. Uncoated, Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, either commercial steel, Type B, or structural steel, Grade 30 (Grade 205), unless another grade is required by design loads.

H. Galvanized-Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coating, either commercial steel, Type B, or structural steel, Grade 33 (Grade 230), unless another grade is required by design loads.

I. Expanded-Metal, Carbon Steel: ASTM F 1267, Type I (expanded), Class 1 (uncoated).

1. Style Designation: 3/4 number 13.

J. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T6.

K. Aluminum Castings: ASTM B 26/B 26M, Alloy 443.0-F.

2.4 ABRASIVE NOSINGS

A. Extruded Units: Aluminum units with abrasive filler consisting of aluminum oxide, silicon carbide, or a combination of both, in an epoxy-resin binder. Fabricate units in lengths necessary to accurately fit openings or conditions.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. ACL Industries, Inc.
b. American Safety Tread Co., Inc.
c. Amstep Products.
d. Balco, Inc.

B. Nosing Insert: Provide Integral Stair Nosing System with Photoluminescent stair nosing requirements.

a) Products with self-illuminating guidance strip for direct installation or with integral nonconductive base isolator extrusion specifically designed to self-attached and position on edge of steel stair pan to assist with proper installation during placement of concrete for pan tread stairs. Tape, ply-wood or other non-integral temporary protections shall not be allowed.
b) Adhesives, fasteners, and any incidental materials required for a complete installation, as recommended by the stair nosing manufacturer.

C. Provide anchors for embedding units in concrete, either integral or applied to units, as standard with manufacturer.

D. Apply bituminous paint to concealed surfaces of cast-metal units set into concrete.

E. Apply clear lacquer to concealed surfaces of extruded units set into concrete.

2.5 FASTENERS

A. General: Provide zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 12 for exterior use, and Class Fe/Zn 5 where built into exterior walls. Select fasteners for type, grade, and class required.

B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.

C. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.

1. Provide mechanically deposited or hot-dip, zinc-coated anchor bolts for stairs indicated to be shop primed with zinc-rich primer.

D. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.

1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, unless otherwise indicated.

2.6 MISCELLANEOUS MATERIALS

A. Shop Primers: Provide primers that comply with Section 099600 "High-Performance Coatings."

B. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.

C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

E. Concrete Materials and Properties: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi (20 MPa) unless otherwise indicated.

F. Nonslip-Aggregate Concrete Finish: Factory-packaged abrasive aggregate made from fused, aluminum-oxide grits or crushed emery; rustproof and nonglazing; unaffected by freezing, moisture, or cleaning materials.

G. Welded Wire Reinforcement: ASTM A 185/A 185M, 6 by 6 inches (152 by 152 mm), W1.4 by W1.4, unless otherwise indicated.

2.7 PRECAST CONCRETE TREADS

A. Concrete Materials and Properties: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, ready-mixed concrete with a minimum 28-day compressive strength of 5000 psi (35 MPa) and a total air content of not less than 4 percent or more than 6 percent.

B. Reinforcement: Galvanized, welded wire reinforcement, 2 by 2 inches (50 by 50 mm) by 0.062-inch- (1.6-mm-) diameter wire; comply with ASTM A 185/A 185M and ASTM A 82/A 82M, except for minimum wire size.

2.8 METAL BAR-GRATING TREADS

Metal Bar-Grating Stairs: Form treads to configurations shown from metal bar grating; fabricate to comply with NAAMM MBG 531, "Metal Bar Grating Manual."

1. Fabricate treads from welded or pressure-locked steel grating with 1-1/4-by-3/16-inch (32-by-5-mm) bearing bars at 15/16 inch (24 mm) o.c. and crossbars at 4 inches (100 mm) o.c.
2. Fabricate treads from welded or pressure-locked steel grating with openings in gratings no more than 5/16 inch (8 mm) in least dimension.
3. Surface: Plain.
4. Finish: Shop primed.
5. Fabricate grating treads with rolled-steel floor plate nosing and with steel angle or steel plate carrier at each end for stringer connections. Secure treads to stringers with bolts.

2.9 FABRICATION, GENERAL

A. Provide complete stair assemblies, including metal framing, hangers, struts, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.

1. Join components by welding unless otherwise indicated.
2. Use connections that maintain structural value of joined pieces.

B. Preassembled Stairs: Assemble stairs in shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

D. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

E. Form exposed work with accurate angles and surfaces and straight edges.

F. Weld connections to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Weld exposed corners and seams continuously unless otherwise indicated.
5. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 3 welds: partially dressed weld with spatter removed.

G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated. Locate joints where least conspicuous.

2.10 STAIR RAILINGS

A. Comply with applicable requirements in Section 055213 "Pipe and Tube Railings."

1. Rails may be bent at corners, rail returns, and wall returns, instead of using prefabricated fittings.
2. Connect posts to stair framing by direct welding unless otherwise indicated.

B. Steel Tube Railings: Fabricate railings to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of tube, post spacings, and anchorage, but not less than that needed to withstand indicated loads.

1. Rails and Posts: 1-1/2-inch- (38-mm-) square top and bottom rails and 1-1/2-inch- (38-mm-) square posts.
2. Picket Infill: 1/2-inch- (13-mm-) round pickets spaced less than 4 inches (100 mm) clear.

C. Welded Connections: Fabricate railings with welded connections. Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

1. Finish welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 2 welds: completely sanded joint, some undercutting and pinholes are okay as shown in NAAMM AMP 521.

D. Form changes in direction of railings as follows:

1. As detailed.

E. For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

F. Close exposed ends of railing members with prefabricated end fittings.

G. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch (6 mm) or less.

H. Connect posts to stair framing by direct welding unless otherwise indicated.

I. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnecting components and for attaching to other work. Furnish inserts and other anchorage devices for connecting to concrete or masonry work.

1. For nongalvanized railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves, except galvanize anchors embedded in exterior masonry and concrete construction.
2. Provide type of bracket with flange tapped for concealed anchorage to threaded hanger bolt and that provides 1-1/2-inch (38-mm) clearance from inside face of handrail to finished wall surface.

2.11 STEEL-FRAMED STAIRS

A. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual," Commercial Class, unless more stringent requirements are indicated.

B. Stair Framing:

1. Fabricate stringers of steel plates or channels.

    a. Provide closures for exposed ends of channel stringers.

2. Construct platforms of steel plate or channel headers and miscellaneous framing members as needed to comply with performance requirements.
3. Weld stringers to headers; weld framing members to stringers and headers.
4. Where masonry walls support metal stairs, provide temporary supporting struts designed for erecting steel stair components before installing masonry.

C. Metal Pan Stairs: Form risers, subtread pans, and subplatforms to configurations shown from steel sheet of thickness needed to comply with performance requirements, but not less than 0.067 inch (1.7 mm).
1. Steel Sheet: Galvanized-steel sheet.
2. Directly weld metal pans to stringers; locate welds on top of subtreads where they are concealed by concrete fill. Do not weld risers to stringers.
3. Attach risers and subtreads to stringers with brackets made of steel angles or bars. Weld brackets to stringers and attach metal pans to brackets by welding, riveting, or bolting.
4. Shape metal pans to include nosing integral with riser.
5. Attach abrasive nosings to risers.
6. At Contractor's option, provide stair assemblies with metal pan subtreads filled with reinforced concrete during fabrication.
7. Provide epoxy-resin-filled treads, reinforced with glass fibers, with slip-resistant, abrasive surface.
8. Provide subplatforms of configuration indicated or, if not indicated, the same as subtreads. Weld subplatforms to platform framing.

    a. Smooth Soffit Construction: Construct subplatforms with flat metal under surfaces to produce smooth soffits.

D. Abrasive-Coating-Finished, Formed-Metal Stairs: Form risers, treads, and platforms to configurations shown from steel sheet of thickness needed to comply with performance requirements, but not less than 0.097 inch (2.5 mm).

1. Steel Sheet: Uncoated hot-rolled steel sheet unless otherwise indicated.
2. Directly weld risers and treads to stringers; locate welds on underside of stairs.
3. Provide platforms of configuration indicated or, if not indicated, the same as treads. Weld platforms to platform framing.

4. Finish tread and platform surfaces with manufacturer's standard epoxy-bonded abrasive finish.

2.12 FINISHES

A. Finish metal stairs after assembly.

B. Preparation for Shop Priming: Prepare uncoated ferrous metal surfaces to comply with SSPC SP6/NACE No. 3, “Commercial Blast Cleaning.”

C. Apply shop primer to uncoated surfaces of metal stair components, except those with galvanized finishes and those to be embedded in concrete or masonry unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

PART 3 - EXECUTION

3.1 INSTALLING METAL PAN STAIRS

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.

C. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete unless otherwise indicated.

D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

E. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

F. Field Welding: Comply with requirements for welding in "Fabrication, General" Article.

G. Place and finish concrete fill for treads and platforms to comply with Section 033000 "Cast-in-Place Concrete."

1. Install abrasive nosings with anchors fully embedded in concrete. Center nosings on tread width.

3.2 ADJUSTING AND CLEANING

A. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099600 "High-Performance Coatings."

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

END OF SECTION 05 51 13

SECTION 05 52 13 - PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Steel pipe and tube railings.

B. Related Requirements:

1. Section 05 "Metal Pan Stairs" for steel tube railings associated with metal pan stairs.
2. Section 05 "Metal Grating Stairs" for steel tube railings associated with metal grating stairs.
3. Division 06 Section "Miscellaneous Rough Carpentry" for wood blocking for anchoring railings.
4. Division 07 section “Security Joint Sealants” for requirements for and locations to receive security joint sealants
5. Division 09 Section “High Performance Coatings” for shop finishing of steel tube railings.
6. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners

1.3 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable Leed Credits

1. MRc2
2. MRc4
3. MRc5
4. IEQc4.2

B. LEED Requirements

1. MRc2: CONSTRUCTION WASTE MANAGEMENT

No less than the specified portion of all construction waste from the Project shall be diverted from disposal in a landfill and/or incineration in with the Project Requirements for Construction Waste Management and Disposal. Refer to Specification Sections 017419 Construction Waste Management and Disposal and 013510 Sustainable Design Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

2. MRc4: RECYCLED CONTENT MATERIAL

   No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the Project Requirements for Recycled Content Materials. All materials counted towards the computations of the proportion of the Recycled Content Materials shall comply with the standard minimum percentages of post-consumer waste materials and for the minimum percentages of pre-consumer waste materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures

3. MRc5: REGIONALLY MANUFACTURED HARVESTED MATERIALS

   No less than the specified minimum proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the Project Site in accordance with the Project Requirements for Regionally Manufactured and/or Harvested Materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

4. IEQc4.2: LOW-EMITTING MATERIALS – PAINTS AND COATINGS

   All paints and coatings in the building interior shall comply with the Project Requirements for Low Emitting Materials – Paints and Coatings. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

1.4 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

C. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

1.5 ACTION SUBMITTALS

A. Product Data: For the following:

1. Manufacturer's product lines of mechanically connected railings.
2. Railing brackets.
3. Grout, anchoring cement, and paint products.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

C. Samples: For each type of exposed finish required.

1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters.
2. Fittings and brackets.
3. Assembled Sample of railing system, made from full-size components, including top rail, post, handrail, and infill. Sample need not be full height.

a. Show method of connecting and finishing members at intersections.

D. Delegated-Design Submittal: For railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Welding certificates.

C. Mill Certificates: Signed by manufacturers of stainless-steel products certifying that products furnished comply with requirements.

D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

E. Product Test Reports: For pipe and tube railings, for tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.

1.7 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

1.9 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain each type of railing from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design railings, including attachment to building construction.

B. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Handrails and Top Rails of Guards:

a. Uniform load of 50 lbf/ ft. (0.73 kN/m) applied in any direction.
b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
c. Uniform and concentrated loads need not be assumed to act concurrently.

2. Infill of Guards:

a. Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).
b. Infill load and other loads need not be assumed to act concurrently.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C, material surfaces).

2.3 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.

1. Provide type of bracket with flange tapped for concealed anchorage to threaded hanger bolt and that provides 1-1/2-inch (38-mm) clearance from inside face of handrail to finished wall surface.

2.4 STEEL AND IRON

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Tubing: ASTM A 500 (cold formed) or ASTM A 513.

C. Pipe: ASTM A 53/A 53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.

1. Provide galvanized finish for exterior installations and where indicated.

D. Plates, Shapes, and Bars: ASTM A 36/A 36M.

E. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.

2.5 FASTENERS

A. General: Provide the following:

1. Hot-Dip Galvanized Railings: Type 304 stainless-steel or hot-dip zinc-coated steel fasteners complying with ASTM A 153/A 153M or ASTM F 2329 for zinc coating.

B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.

C. Fasteners for Interconnecting Railing Components:

1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.
2. Provide tamper-resistant flat-head machine screws for exposed fasteners unless otherwise indicated.

D. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining, without failure, a load equal to 6 times the load imposed when installed in unit masonry and 4 times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.

1. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, unless otherwise indicated.

2.6 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

1. For railings, provide type and alloy as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.

B. Etching Cleaner for Galvanized Metal: Complying with MPI#25.

C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

D. Shop Primers: Provide primers that comply with Section 099600 "High-Performance Coatings."

E. Intermediate Coats and Topcoats: Provide products that comply with Section 099600 "High-Performance Coatings."

F. Epoxy Intermediate Coat: Complying with MPI #77 and compatible with primer and topcoat.

G. Polyurethane Topcoat: Complying with MPI #72 and compatible with undercoat.

H. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

I. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

J. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.

1. Water-Resistant Product: At exterior locations provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

2.7 FABRICATION

A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.

B. Shop assemble railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

D. Form work true to line and level with accurate angles and surfaces.

E. Fabricate connections that are exposed to weather in a manner that excludes water. Provide weep holes where water may accumulate.

F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.

G. Connections: Fabricate railings with welded connections unless otherwise indicated.

H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove flux immediately.
4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.

I. Form Changes in Direction as Follows:

1. As detailed.

J. For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

K. Close exposed ends of railing members with prefabricated end fittings.

L. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch (6 mm) or less.

M. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.

1. At brackets and fittings fastened to gypsum board partitions, provide crush-resistant fillers or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.

N. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.

O. For railing posts set in concrete, provide steel sleeves not less than 6 inches (150 mm) long with inside dimensions not less than 1/2 inch (13 mm) greater than outside dimensions of post, with metal plate forming bottom closure.

P. For removable railing posts, fabricate slip-fit sockets from steel tube or pipe whose ID is sized for a close fit with posts; limit movement of post without lateral load, measured at top, to not more than one-fortieth of post height. Provide socket covers designed and fabricated to resist being dislodged.

1. Provide chain with eye, snap hook, and staple across gaps formed by removable railing sections at locations indicated. Fabricate from same metal as railings.

Q. Toe Boards: Provide toe boards at railings around openings and at edge of open-sided floors and platforms.

2.8 STEEL AND IRON FINISHES

A. Galvanized Railings:
   1. Comply with ASTM A 123/A 123M for hot-dip galvanized railings.
   2. Comply with ASTM A 153/A 153M for hot-dip galvanized hardware.
   3. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
   4. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

B. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.

C. Preparing Galvanized Railings for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner.

D. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Shop, Field, and Maintenance Painting of Steel," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.

   1. Shop prime uncoated railings with unless primers specified in Section 099600 "High-Performance Coatings" are indicated.

E. Shop-Painted Finish: Comply with Section 099600 "High-Performance Coatings."

   1. Color: Match Architect's sample.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements are clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL

A. Fit exposed connections together to form tight, hairline joints.

B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

   1. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
   2. Set posts plumb within a tolerance of 1/16 inch in 3 feet (2 mm in 1 m).
   3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet (6 mm in 3.5 m).

C. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1. Coat, with a heavy coat of bituminous paint, concealed surfaces of aluminum that are in contact with grout, concrete, masonry, wood, or dissimilar metals.

D. Adjust railings before anchoring to ensure matching alignment at abutting joints.

E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.

B. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches (50 mm) beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches (150 mm) of post.

3.4 ANCHORING POSTS

A. Use metal sleeves preset and anchored into concrete for installing posts. After posts are inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.

B. Leave anchorage joint exposed with 1/8-inch (3-mm) buildup, sloped away from post.

C. Anchor posts to metal surfaces with oval flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:
1. For steel pipe railings, weld flanges to post and bolt to metal supporting surfaces.

D. Install removable railing sections, where indicated, in slip-fit metal sockets cast in concrete.

3.5 ATTACHING RAILINGS

A. Anchor railing ends at walls with round flanges anchored to wall construction and welded to railing ends.

B. Attach railings to wall with wall brackets. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

C. Secure wall brackets and railing end flanges to building construction as follows:

1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
2. For hollow masonry anchorage, use toggle bolts.

3.6 ADJUSTING AND CLEANING

A. Clean by washing thoroughly with clean water and soap and rinsing with clean water.

B. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 requirements for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.

C. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099113 "Exterior Painting," Section 099123 "Interior Painting," and Section 099600 "High-Performance Coatings."

D. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas, and repair galvanizing to comply with ASTM A 780/A 780M.

3.7 PROTECTION

A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

END OF SECTION 05 52 13

SECTION 06 10 53 - MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Rooftop equipment bases and support curbs.
2. Wood blocking, cants, and nailers.
3. Wood furring.
4. Plywood backing panels.

B. Related Requirements:

1. Section 061600 "Sheathing" for sheathing.

1.3 DEFINITIONS

A. Boards or Strips: Lumber of less than 2 inches nominal (38 mm actual) size in least dimension.

B. Dimension Lumber: Lumber of 2 inches nominal (38 mm actual) or greater size but less than 5 inches nominal (114 mm actual) size in least dimension.

C. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. NeLMA: Northeastern Lumber Manufacturers' Association.
2. NHLA: National Hardwood Lumber Association.
3. NLGA: National Lumber Grades Authority.
4. SPIB: The Southern Pine Inspection Bureau.
5. WCLIB: West Coast Lumber Inspection Bureau.
6. WWPA: Western Wood Products Association.

1.4 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable LEED Credits

1. MRc2
2. MRc4
3. MRc5
4. MRc7
5. IEQc4.2

6. IEQc4.4

B. LEED Requirements

1. MRc2: CONSTRUCTION WASTE MANAGEMENT

   No less than the specified portion of all construction waste from the Project shall be diverted from disposal in a landfill and/or incineration in with the Project Requirements for Construction Waste Management and Disposal. Refer to Specification Sections 017419 Construction Waste Management and Disposal and 013510 Sustainable Design Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

2. MRc4: Recycled Content Material

   No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the Project Requirements for Recycled Content Materials. All materials counted towards the computations of the proportion of the Recycled Content Materials shall comply with the standard minimum percentages of post-consumer waste materials and for the minimum percentages of pre-consumer waste materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

3. MRc5: REGIONALLY MANUFACTURED HARVESTED MATERIALS

   No less than the specified minimum proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the Project Site in accordance with the Project Requirements for Regionally Manufactured and/or Harvested Materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

4. MRc7: CERTIFIED WOOD

   No less than the specified proportion of the building (permanently installed wood-based materials and products and all wood-based materials and products in construction) shall be certified by the Forest Stewardship Council (FSC) in accordance with the Project Requirements. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

5. IEQc4.2: LOW-EMITTING MATERIALS – PAINTS AND COATINGS

   All paints and coatings in the building interior shall comply with the Project Requirements for Low Emitting Materials – Paints and Coatings. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

6. IEQc4.4: LOW EMITTING MATERIALS – COMPOSITE WOOD AND AGRIFIBER PRODUCTS

All composite wood and agrifiber products installed in the building interior and all laminating adhesives used to fabricate on-site and/or off-site shall comply with the Project Requirements for Low-Emitting Materials – Composite Wood and Agrifiber Products. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

1.6 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For the following, from ICC-ES:

1. Preservative-treated wood.
2. Fire-retardant-treated wood.
3. Power-driven fasteners.
4. Post-installed anchors.
5. Metal framing anchors.

1.7 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

B. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.

C. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Regional Materials: Dimension lumber[**, except treated materials,**] shall be manufactured within 500 miles (800 km) of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.

B. Certified Wood: Lumber and plywood shall be certified as "FSC Pure" or "FSC Mixed Credit" according to FSC STD-01-00 and FSC STD-40-004.

C. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.

D. Maximum Moisture Content of Lumber: 19 percent 19 percent for 2-inch nominal (38-mm actual) thickness or less; no limit for more than 2-inch nominal (38-mm actual) thickness unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.
2. For exposed items indicated to receive a stained or natural finish, chemical formulations shall not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: Treat items indicated on Drawings, and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet (3.2 m) beyond the centerline of the burners at any time during the test.

1. Treatment shall not promote corrosion of metal fasteners.
2. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.

C. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Kiln-dry plywood after treatment to a maximum moisture content of 15 percent.

D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.

1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.

E. Application: Treat items indicated on Drawings, and the following:
1. Concealed blocking.
2. Wood cants, nailers, curbs, equipment support bases, blocking, and similar members in connection with roofing.
3. Plywood backing panels.

2.4 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.
3. Rooftop equipment bases and support curbs.
4. Cants.
5. Furring.
6. Grounds.

B. Dimension Lumber Items: Standard, Stud, or No. 3 grade lumber of any of the following species:

1. Hem-fir (north); NLGA.
2. Mixed southern pine or southern pine; SPIB.
3. Spruce-pine-fir; NLGA.
4. Hem-fir; WCLIB or WWPA.
5. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
6. Western woods; WCLIB or WWPA.
7. Northern species; NLGA.
8. Eastern softwoods; NeLMA.

C. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

D. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

E. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.5 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: Plywood, DOC PS 1, Exterior, A-C, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch (19-mm) nominal thickness.

2.6 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Screws for Fastening to Metal Framing: ASTM C 1002, length as recommended by screw manufacturer for material being fastened.

D. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

2.7 MISCELLANEOUS MATERIALS

A. Adhesives for Gluing Furring to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.

1. Adhesives shall have a VOC content of 70 g/L or less.

B. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber or rubberized-asphalt compound, bonded to a high-density polyethylene

film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch (0.6 mm).

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

B. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry accurately to other construction. Locate furring, nailers, blocking,and similar supports to comply with requirements for attaching other construction.

C. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant-treated plywood backing panels with classification marking of testing agency exposed to view.

D. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.

E. Do not splice structural members between supports unless otherwise indicated.

F. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches (406 mm) o.c.

G. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:

1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches (2438 mm) o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches (2438 mm) o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal (38-mm actual) thickness.
3. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. (9.3 sq. m) and to solidly fill space below partitions.
4. Fire block concealed spaces behind combustible cornices and exterior trim at not more than 20 feet (6 m) o.c.

H. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

I. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

1. Use inorganic boron for items that are continuously protected from liquid water.
2. Use copper naphthenate for items not continuously protected from liquid water.

J. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

K. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
2. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.
3. ICC-ES evaluation report for fastener.

L. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

3.2 WOOD BLOCKING AND NAILER INSTALLATION

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

C. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches (38 mm) wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.3 WOOD FURRING INSTALLATION

A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.

3.4 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

B. Protect miscellaneous rough carpentry from weather. If, despite protection, miscellaneous rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 06 10 53

SECTION 06 16 00 - SHEATHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Wall sheathing.
2. Sheathing joint and penetration treatment.

B. Related Requirements:

1. Section 061053 "Miscellaneous Rough Carpentry" for plywood backing panels.
2. Section 072500 "Weather Barriers" for water-resistive barrier applied over wall sheathing.

1.3 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable LEED Credits

1. MRc2
2. MRc4
3. MRc5

B. LEED Requirements

1. MRc2: Construction Waste Management

   No less than the specified portion of all construction waste from the Project shall be diverted from disposal in a landfill and/or incineration in with the Project Requirements for Construction Waste Management and Disposal. Refer to Specification Sections 017419 Construction Waste Management and Disposal and 013510 Sustainable Design Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

2. MRc4: Recycled Content Material

   No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the Project Requirements for Recycled Content Materials. All materials counted towards the computations of the proportion of the Recycled Content Materials shall comply with the standard minimum percentages of post-consumer waste materials and for the minimum percentages of pre-consumer waste materials. Refer to Specification Section 013510 Sustainable Project Requirements.

Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

3. MRc5: REGIONALLY MANUFACTURED HARVESTED MATERIALS

No less than the specified minimum proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the Project Site in accordance with the Project Requirements for Regionally Manufactured and/or Harvested Materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Include physical properties of treated materials.
3. For fire-retardant treatments, include physical properties of treated plywood both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5516.
4. For products receiving waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

B. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance Ratings: As tested according to ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 WALL SHEATHING

A. Glass-Mat Gypsum Wall Sheathing: ASTM C 1177/1177M.

1. Products: Subject to compliance with requirements, provide one of the following:

a. CertainTeed Corporation; GlasRoc.
b. G-P Gypsum Corporation; Dens-Glass Gold.
c. Temple-Inland Inc.; GreenGlass
d. United States Gypsum Co.; Securock.

2. Type and Thickness: Regular, 1/2 inch (13 mm) and Type X, 5/8 inch (15.9 mm) thick.
3. Size: 48 by 96 inches (1219 by 2438 mm) for vertical installation.

B.

2.3 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. For wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

D. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached.

1. For steel framing less than 0.0329 inch (0.835 mm) thick, use screws that comply with ASTM C 1002.
2. For steel framing from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick, use screws that comply with ASTM C 954.

2.4 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

A. Sealant for Glass-Mat Gypsum Sheathing: Elastomeric, medium-modulus, neutral-curing silicone joint sealant compatible with joint substrates formed by gypsum sheathing and other materials, recommended by sheathing manufacturer for application indicated and complying with requirements for elastomeric sealants specified in Section 079200 "Joint Sealants."

B. Sealant for Glass-Mat Gypsum Sheathing: Silicone emulsion sealant complying with ASTM C 834, compatible with sheathing tape and sheathing and recommended by tape and sheathing manufacturers for use with glass-fiber sheathing tape and for covering exposed fasteners.

1. Sheathing Tape: Self-adhering glass-fiber tape, minimum 2 inches (50 mm) wide, 10 by 10 or 10 by 20 threads/inch (390 by 390 or 390 by 780 threads/m), of type recommended by sheathing and tape manufacturers for use with silicone emulsion sealant in sealing joints in glass-mat gypsum sheathing and with a history of successful in-service use.

2.5 MISCELLANEOUS MATERIALS

A. Adhesives for Field Gluing Panels to Wood Framing: Formulation complying with APA AFG-01 that is approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.

1. Adhesive shall have a VOC content of 70 g/L or less.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with the following:

1. Table 2304.9.1, "Fastening Schedule," in the ICC's International Building Code.

D. Use common wire nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.

E. Coordinate wall sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 GYPSUM SHEATHING INSTALLATION

A. Comply with GA-253 and with manufacturer's written instructions.
   1. Fasten gypsum sheathing to cold-formed metal framing with screws.
   2. Install panels with a 3/8-inch (9.5-mm) gap where non-load-bearing construction abuts structural elements.
   3. Install panels with a 1/4-inch (6.4-mm) gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.

B. Apply fasteners so heads bear tightly against face of sheathing, but do not cut into facing.

C. Horizontal Installation: Install sheathing with V-grooved edge down and tongue edge up. Interlock tongue with groove to bring long edges in contact with edges of adjacent panels without forcing. Abut ends over centers of studs, and stagger end joints of adjacent panels not less than one stud spacing. Attach at perimeter and within field of panel to each stud.

   1. Space fasteners approximately 8 inches (200 mm) o.c. and set back a minimum of 3/8 inch (9.5 mm) from edges and ends of panels.
   2. For sheathing under stucco cladding, panels may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.

D. Vertical Installation: Install vertical edges centered over studs. Abut ends and edges with those of adjacent panels. Attach at perimeter and within field of panel to each stud.

   1. Space fasteners approximately 8 inches (200 mm) o.c. and set back a minimum of 3/8 inch (9.5 mm) from edges and ends of panels.
   2. For sheathing under stucco cladding, panels may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.

E. Seal sheathing joints according to sheathing manufacturer's written instructions.

   1. Apply elastomeric sealant to joints and fasteners and trowel flat. Apply sufficient amount of sealant to completely cover joints and fasteners after troweling. Seal other penetrations and openings.
   2. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing joints and apply and trowel sealant to embed entire face of tape in sealant. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

END OF SECTION 06 16 00

SECTION 06 41 16 - PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Plastic-laminate-faced architectural cabinets.
2. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-faced architectural cabinets unless concealed within other construction before cabinet installation.

B. Related Requirements:

1. Section 061053 "MiscellaneousRough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing cabinets and concealed within other construction before cabinet installation.
2. Section 123661 “Simulated Stone Countertops”
3. Section 123616 “Metal Countertops”
4. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
5. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 DEFINITIONS

A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items unless concealed within other construction before woodwork installation.

1.4 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable LEED Credits

1. MRc2
2. MRc4
3. MRc5
4. MRc7
5. IEQ4.1
6. IEQc4.2
7. IEQc4.4

B. LEED Requirements

1. MRc2: CONSTRUCTION WASTE MANAGEMENT

   No less than the specified portion of all construction waste from the Project shall be diverted from disposal in a landfill and/or incineration in with the Project Requirements for Construction Waste Management and Disposal. Refer to Specification Sections 017419 Construction Waste Management and Disposal and 013510 Sustainable Design Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

2. MRc4: Recycled Content Material

   No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the Project Requirements for Recycled Content Materials. All materials counted towards the computations of the proportion of the Recycled Content Materials shall comply with the standard minimum percentages of post-consumer waste materials and for the minimum percentages of pre-consumer waste materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

3. MRc5: REGIONALLY MANUFACTURED HARVESTED MATERIALS

   No less than the specified minimum proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the Project Site in accordance with the Project Requirements for Regionally Manufactured and/or Harvested Materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

4. MRc7: CERTIFIED WOOD

   No less than the specified proportion of the building (permanently installed wood-based materials and products and all wood-based materials and products in construction) shall be certified by the Forest Stewardship Council (FSC) in accordance with the Project Requirements. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

5. IEQc4.1: LOW-EMITTING MATERIALS – SEALANT AND ADHESIVES

   All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the Project Requirements for Low Emitting Materials – Sealants and Adhesives. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

6. IEQc4.2: LOW-EMITTING MATERIALS – PAINTS AND COATINGS

   All paints and coatings in the building interior shall comply with the Project Requirements for Low Emitting Materials – Paints and Coatings. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

7. IEQc4.4: LOW EMITTING MATERIALS – COMPOSITE WOOD AND AGRIFIBER PRODUCTS

   All composite wood and agrifiber products installed in the building interior and all laminating adhesives used to fabricate on-site and/or off-site shall comply with the Project Requirements for Low-Emitting Materials – Composite Wood and Agrifiber Products. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product, including panel products, high-pressure decorative laminate, adhesive for bonding plastic laminate, and cabinet hardware and accessories.

   1. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.

B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

   1. Show details full size.
   2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
   3. Show locations and sizes of cutouts and holes for electrical switches, outlets and other items installed in architectural plastic-laminate cabinets.
   4. Apply AWI Quality Certification Program label to Shop Drawings.

C. Samples for Initial Selection:
   1. PVC edging strips

D. Samples for Verification:

   1. Plastic laminates, 8 by 10 inches (200 by 250 mm), for each type, color, pattern, and surface finish, with one sample applied to core material and specified edge material applied to one edge.
   2. Corner pieces as follows:

      a. Cabinet-front frame joints between stiles and rails, as well as exposed end pieces, 18 inches (450 mm) high by 18 inches (450 mm) wide by 6 inches (150 mm) deep.
      b. Miter joints for standing trim.

   3. Exposed cabinet hardware and accessories, one unit for each type.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and fabricator.

B. Product Certificates: For each type of product.

C. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

D. Evaluation Reports: For fire-retardant-treated materials, from ICC-ES.

1.7 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance. Shop is a certified participant in AWI's Quality Certification Program.

B. Installer Qualifications: Certified participant in AWI's Quality Certification Program.

C. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

D. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockups of typical plastic-laminate cabinets as shown on Drawings.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver cabinets until painting and similar operations that could damage woodwork have been completed in installation areas. If cabinets must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Field Measurements: Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed, and indicate measurements on Shop Drawings.

C. Established Dimensions: Where cabinets are indicated to fit to other construction, establish dimensions for areas where cabinets are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.10 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that cabinets can be supported and installed as indicated.

B. Hardware Coordination: Distribute copies of approved hardware schedule specified in Section 087111 "Door Hardware (Descriptive Specification)" to fabricator of architectural woodwork; coordinate Shop Drawings and fabrication with hardware requirements.

C. Electrical Coordination: Distribute copies of approved lighting fixture schedule as indicated on drawings to fabricator of architectural woodwork; coordinate Shop Drawings and fabrication with lighting requirements.

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of architectural plastic-laminate cabinets indicated for construction, finishes, installation, and other requirements.

1. Provide labels and certificates from AWI certification program indicating that woodwork, including installation, complies with requirements of grades specified.
2. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.

B. Grade: Custom.

C. Certified Wood: Wood products shall be certified as "FSC Pure"according to FSC STD-01-00 and FSC STD-40-004.

D. Type of Construction: Frameless.

E. Cabinet, Door, and Drawer Front Interface Style: Flush overlay.

F. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or, if not indicated, as required by woodwork quality standard.

1. Manufacturer: Subject to compliance with requirements, provide high-pressure decorative laminates by one of the following:

a. Abet Laminati, Inc.
b. Arborite; Division of ITW Canada, Inc.
c. Formica Corporation. **Basis-of-Design**
d. Lamin-Art, Inc.
e. Nevamar Company, LLC; Decorative Products Div.
f. Wilsonart International; Div. of Premark International, Inc.

G. Laminate Cladding for Exposed Surfaces:

1. Horizontal Surfaces: Grade HGS.
2. Postformed Surfaces: Grade HGP.
3. Vertical Surfaces: Grade HGS.
4. Edges: PVC

H. Materials for Semiexposed Surfaces:

1. Surfaces Other Than Drawer Bodies: Thermoset decorative panels.

   a. Edges of Plastic-Laminate Shelves: PVC edge banding, 0.12 inch (3 mm) thick, matching laminate in color, pattern, and finish.
   b. Edges of Thermoset Decorative Panel Shelves: PVC or polyester edge banding.
   c. For semiexposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate.

2. Drawer Sides and Backs: Thermoset decorative panels with PVC or polyester edge banding.

I. Dust Panels: 1/4-inch (6.4-mm) plywood or tempered hardboard above compartments and drawers unless located directly under tops.

J. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure decorative laminate, NEMA LD 3, Grade BKL.

K. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.

1. Join subfronts, backs, and sides with glued rabbeted joints supplemented by mechanical fasteners or glued dovetail joints.

L. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
1. As indicated on drawings.

2.2 WOOD MATERIALS

A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.

1. Wood Moisture Content: 5 to 10 percent.

B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.

C. Composite Wood Products: Products shall be made without urea formaldehyde.

D. Wood Products: Comply with the following:

1. Hardboard: AHA A135.4.
2. Medium-Density Fiberboard: ANSI A208.2, Grade MD, made with binder containing no urea formaldehyde.

3. Particleboard: ANSI A208.1, Grade M-2-Exterior Glue.
4. Particleboard: Straw-based particleboard complying with requirements in ANSI A208.1, Grade M-2, except for density.
5. Softwood Plywood: DOC PS 1, Medium Density Overlay.
6. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1, made with adhesive containing no urea formaldehyde.

2.3 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets except for items specified in Section 087111 "Door Hardware"

B. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 135 degrees of opening, self-closing.

C. Back-Mounted Pulls: BHMA A156.9, B02011.

D. Wire Pulls: Back mounted, solid metal, 5 inches (127 mm) long, 2-1/2 inches (63.5 mm) deep, and 5/16 inch (8 mm) in diameter.

E. Catches: Magnetic catches, BHMA A156.9, B03141.

F. Shelf Rests: BHMA A156.9, B04013; metal, two-pin type with shelf hold-down clip.

G. Drawer Slides: BHMA A156.9.

1. Heavy Duty (Grade 1HD-100 and Grade 1HD-200): Side mounted; full-extension type; zinc-plated steel ball-bearing slides.
2. Box Drawer Slides: Grade 1HD-100; for drawers not more than 6 inches (150 mm) high and 24 inches (600 mm) wide.
3. File Drawer Slides: Grade 1HD-200; for drawers more than 6 inches (150 mm) high or 24 inches (600 mm) wide.

H. Door Locks: BHMA A156.11, E07121.

I. Drawer Locks: BHMA A156.11, E07041.

J. Door and Drawer Silencers: BHMA A156.16, L03011.

K. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
1. Satin Stainless Steel: BHMA 630.

L. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

M. Grommets for Cable Passage through Countertops (locations inaccessible to detainees): 2-inch (51-mm) OD, black , molded-plastic grommets and matching plastic caps with slot for wire passage.

N. Secure Grommets (at student computer stations and other locations accessible to detainees): 13-7/8 inches wide by 2-13/16 inches deep, anodized aluminum, satin finish, removable lid with dust-blocking brushes at cable opening.

1. Product: Provide “Max 1/B-94” by Doug Mockett & Company, Inc. Secure lid in place with tamper-proof fasteners.

O. Legs: Mockett, TL28P-3.
1. Finish: Satin chrome

2.4 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

C. Adhesives: Do not use adhesives that contain urea formaldehyde.

D. Adhesive for Bonding Plastic Laminate: Unpigmented contact cement.

1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

2.5 FABRICATION

A. Fabricate cabinets to dimensions, profiles, and details indicated.

B. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

1. Notify Architect seven days in advance of the dates and times woodwork fabrication will be complete.
2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.

C. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

D. Fabricate countertops to dimensions, profiles, and details indicated. Provide front and end overhang of 1 inch (25 mm) over base cabinets

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition cabinets to average prevailing humidity conditions in installation areas.

B. Before installing cabinets, examine shop-fabricated work for completion and complete work as required.

3.2 INSTALLATION

A. Grade: Install cabinets to comply with same grade as item to be installed.

B. Assemble cabinets and complete fabrication at Project site to the extent that it was not completed in the shop.

C. Install cabinets level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm).

D. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

E. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork.

1. Use filler matching finish of items being installed.

F. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.

1. Install cabinets with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
2. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches (400 mm) o.c.

G. Countertops:
1. Grade: Install countertops to comply with same grade as item to be installed.
2. Install countertops level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm).
3. Scribe and cut countertops to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
4. Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
5. Install countertops with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
6. Secure backsplashes to tops with concealed metal brackets at 16 inches (400 mm) o.c. and to walls with adhesive.

7. Seal junctures of tops, splashes, and walls with mildew-resistant silicone sealant or another permanently elastic sealing compound recommended by countertop material manufacturer.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective cabinets and countertops, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean cabinets and countertops on exposed and semiexposed surfaces.

END OF SECTION 06 41 16

SECTION 07 13 26 - SELF-ADHERING SHEET WATERPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Modified bituminous sheet waterproofing.

B. Related Requirements:

1. Division 07 Section "Joint Sealants" for joint-sealant materials and installation.
2. Division 07 Section “Thermal Insulation” for insulation installed under this Section.

1.3 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable LEED Credits

1. MRc2
2. MRc4
3. MRc5
4. IEQc4.2

B. LEED Requirements

1. MRc2: CONSTRUCTION WASTE MANAGEMENT

   No less than the specified portion of all construction waste from the Project shall be diverted from disposal in a landfill and/or incineration in with the Project Requirements for Construction Waste Management and Disposal. Refer to Specification Sections 017419 Construction Waste Management and Disposal and 013510 Sustainable Design Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

2. MRc4: Recycled Content Material

   No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the Project Requirements for Recycled Content Materials. All materials counted towards the computations of the proportion of the Recycled Content Materials shall comply with the standard minimum percentages of post-consumer waste materials and for the minimum percentages of pre-consumer waste materials. Refer to Specification Section 013510 Sustainable Project Requirements.

Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

3. MRc5: REGIONALLY MANUFACTURED HARVESTED MATERIALS

   No less than the specified minimum proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the Project Site in accordance with the Project Requirements for Regionally Manufactured and/or Harvested Materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

4. IEQc4.2: LOW-EMITTING MATERIALS – PAINTS AND COATINGS

   All paints and coatings in the building interior shall comply with the Project Requirements for Low Emitting Materials – Paints and Coatings. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

   1. Include construction details, material descriptions, and tested physical and performance properties of waterproofing.
   2. Include manufacturer's written instructions for evaluating, preparing, and treating substrate.

B. Shop Drawings: Show locations and extent of waterproofing and details of substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions.

   1. Include setting drawings showing layout, sizes, sections, profiles, and joint details of pedestal-supported concrete pavers.

C. Samples: For each exposed product and for each color and texture specified, including the following products:

   1. 8-by-8-inch (200-by-200-mm) square of waterproofing and flashing sheet.
   2. 8-by-8-inch (200-by-200-mm) square of insulation.
   3. 4-by-4-inch (100-by-100-mm) square of drainage panel.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Field quality-control reports.

C. Sample Warranties: For special warranties.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by waterproofing manufacturer.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate.

1. Do not apply waterproofing in snow, rain, fog, or mist.

B. Maintain adequate ventilation during preparation and application of waterproofing materials.

1.8 WARRANTY

A. Manufacturer's Warranty: Manufacturer's standard materials-only warranty in which manufacturer agrees to furnish replacement waterproofing material for waterproofing that does not comply with requirements or that fails to remain watertight within specified warranty period.

1. Warranty does not include failure of waterproofing due to failure of substrate prepared and treated according to requirements or formation of new joints and cracks in substrate exceeding 1/16 inch (1.6 mm) in width.
2. Warranty Period: Five years from date of Substantial Completion.

B. Installer's Special Warranty: Specified form,signed by Installer, covering Work of this Section, for warranty period of two years.

1. Warranty includes removing and reinstalling protection board, drainage panels, insulation, pedestals, and pavers on plaza decks.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Source Limitations for Waterproofing System: Obtain waterproofing materials, protection course, and molded-sheet drainage panels from single source from single manufacturer.

2.2 MODIFIED BITUMINOUS SHEET WATERPROOFING

A. Modified Bituminous Sheet: Not less than 60-mil- (1.5-mm-) thick, self-adhering sheet consisting of 56 mils (1.4 mm) of rubberized asphalt laminated to a 4-mil- (0.10-mm-) thick, polyethylene film with release liner on adhesive side and formulated for application with primer or surface conditioner that complies with VOC limits of authorities having jurisdiction.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Carlisle Coatings & Waterproofing Inc.; CCW MiraDRI 860/861.
    b. CETCO Building Materials Group; Envirosheet.
    c. Henry Company; Blueskin WP 200.
    d. Meadows, W. R., Inc.; SealTight Mel-Rol.
    e. Polyguard Products; Polyguard 650.
    f. Tamko Roofing Products, Inc.; TW-60.

2. Physical Properties:

    a. Tensile Strength: 250 psi (1.7 MPa) minimum; ASTM D 412, Die C, modified.
    b. Ultimate Elongation: 300 percent minimum; ASTM D 412, Die C, modified.
    c. Low-Temperature Flexibility: Pass at minus 20 deg F (minus 29 deg C); ASTM D 1970.
    d. Crack Cycling: Unaffected after 100 cycles of 1/8-inch (3-mm) movement; ASTM C 836.
    e. Puncture Resistance: 40 lbf (180 N) minimum; ASTM E 154.
    f. Hydrostatic-Head Resistance: 150 feet (45 m) minimum; ASTM D 5385.
    g. Water Absorption: 0.15 percent weight-gain maximum after 48-hour immersion at 70 deg F (21 deg C); ASTM D 570.
    h. Vapor Permeance: 0.05 perms (2.9 ng/Pa x s x sq. m); ASTM E 96, Water Method.

2.3 AUXILIARY MATERIALS

A. General: Furnish auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with sheet waterproofing.

    1. Furnish liquid-type auxiliary materials that comply with VOC limits of authorities having jurisdiction.

B. Primer: Liquid waterborne primer recommended for substrate by sheet-waterproofing material manufacturer.

C. Surface Conditioner: Liquid, waterborne surface conditioner recommended for substrate by sheet-waterproofing material manufacturer.

D. Liquid Membrane: Elastomeric, two-component liquid, cold fluid applied, of trowel grade or low viscosity.

E. Substrate Patching Membrane: Low-viscosity, two-component, modified asphalt coating.

F. Metal Termination Bars: Aluminum bars, approximately 1 by 1/8 inch (25 by 3 mm) thick, predrilled at 9-inch (229-mm) centers.

2.4 MOLDED-SHEET DRAINAGE PANELS

A. Nonwoven-Geotextile-Faced, Molded-Sheet Drainage Panel: Manufactured composite subsurface drainage panels consisting of a nonwoven, needle-punched geotextile facing with an apparent opening size not exceeding No. 70 (0.21-mm) sieve laminated

to one side with or without a polymeric film bonded to the other side of a studded, nonbiodegradable, molded-plastic-sheet drainage core, with a vertical flow rate of 9 to 15 gpm per ft. (112 to 188 L/min. per m).

B. Woven-Geotextile-Faced, Molded-Sheet Drainage Panel: Manufactured composite subsurface drainage panels consisting of a woven-geotextile facing with an apparent opening size not exceeding No. 40 (0.425-mm) sieve laminated to one side with or without a polymeric film bonded to the other side of a studded, nonbiodegradable, molded-plastic-sheet drainage core, with a horizontal flow rate not less than 2.8 gpm per ft. (35 L/min. per m).

1. Puncture strength: 105 lbs.
2. Compressive Strength: 30,000 psf.

2.5 INSULATION

A. Insulation, General: Comply with Section 072100 "Thermal Insulation."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the waterproofing.

1. Verify that concrete has cured and aged for minimum time period recommended in writing by waterproofing manufacturer.
2. Verify that substrate is visibly dry and within the moisture limits recommended in writing by manufacturer. Test for capillary moisture by plastic sheet method according to ASTM D 4263.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for waterproofing application.

B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.

C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids.

E. Prepare, fill, prime, and treat joints and cracks in substrates. Remove dust and dirt from joints and cracks according to ASTM D 4258.

1. Install sheet strips of width according to manufacturer's written instructions and center over treated construction and contraction joints and cracks exceeding a width of 1/16 inch (1.6 mm) or 1/8 inch (3 mm) for modified bituminous deck-paving waterproofing.

F. Bridge and cover isolation joints and discontinuous deck-to-wall and deck-to-deck joints with overlapping sheet strips of widths according to manufacturer's written instructions.

1. Invert and loosely lay first sheet strip over center of joint. Firmly adhere second sheet strip to first and overlap to substrate.

G. Corners: Prepare, prime, and treat inside and outside corners according to ASTM D 6135.

1. Install membrane strips centered over vertical inside corners. Install 3/4-inch (19-mm) fillets of liquid membrane on horizontal inside corners and as follows:

a. At footing-to-wall intersections, extend liquid membrane in each direction from corner or install membrane strip centered over corner.
b. At plaza-deck-to-wall intersections, extend liquid membrane or sheet strips onto deck waterproofing and to finished height of sheet flashing.

H. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through waterproofing and at drains and protrusions according to ASTM D 6135.

3.3 MODIFIED BITUMINOUS SHEET-WATERPROOFING APPLICATION

A. Install modified bituminous sheets according to waterproofing manufacturer's written instructions and recommendations in ASTM D 6135.

B. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by sheet waterproofing in same day. Reprime areas exposed for more than 24 hours.

C. Apply and firmly adhere sheets over area to receive waterproofing. Accurately align sheets and maintain uniform 2-1/2-inch- (64-mm-) minimum lap widths and end laps. Overlap and seal seams, and stagger end laps to ensure watertight installation.

1. When ambient and substrate temperatures range between 25 and 40 deg F (minus 4 and plus 5 deg C), install self-adhering, modified bituminous sheets produced for low-temperature application. Do not use low-temperature sheets if ambient or substrate temperature is higher than 60 deg F (16 deg C).

D. Two-Ply Application: Install sheets to form a membrane with lap widths not less than 50 percent of sheet widths, to provide a minimum of two thicknesses of sheet membrane over areas to receive waterproofing.

E. Horizontal Application: Apply sheets from low to high points of decks to ensure that laps shed water.

F. Apply continuous sheets over already-installed sheet strips, bridging substrate cracks, construction, and contraction joints.

G. Seal edges of sheet-waterproofing terminations with mastic.

H. Install sheet-waterproofing and auxiliary materials to tie into adjacent waterproofing.

I. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Slit and flatten fishmouths and blisters. Patch with sheet waterproofing extending 6 inches (150 mm) beyond repaired areas in all directions.

J. Immediately install protection course with butted joints over waterproofing membrane.

3.4 MOLDED-SHEET DRAINAGE-PANEL INSTALLATION

A. Place and secure molded-sheet drainage panels, with geotextile facing away from wall or deck substrate, according to manufacturer's written instructions. Use adhesives or other methods that do not penetrate waterproofing. Lap edges and ends of geotextile to maintain continuity. Protect installed molded-sheet drainage panels during subsequent construction.

1. For vertical applications, install board insulation before installing drainage panels.

3.5 INSULATION INSTALLATION

A. Install one or more layers of board insulation to achieve required thickness over waterproofed surfaces. Cut and fit to within 3/4 inch (19 mm) of projections and penetrations.

B. On vertical surfaces, set insulation units in adhesive or tape applied according to manufacturer's written instructions.

3.6 IELD QUALITY CONTROL

A. Engage a site representative qualified by waterproofing membrane manufacturer to inspect substrate conditions, surface preparation, membrane application, flashings, protection, and drainage components, and to furnish daily reports to Architect.

B. Prepare test and inspection reports.

3.7 PROTECTION, REPAIR, AND CLEANING

A. Do not permit foot or vehicular traffic on unprotected membrane.

B. Protect waterproofing from damage and wear during remainder of construction period.

C. Correct deficiencies in or remove waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.

D. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 07 13 26

SECTION 07 14 16 - COLD FLUID-APPLIED WATERPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Polyurethane waterproofing.

B. Related Requirements:

1. Section 079200 "Joint Sealants" for joint-sealant materials and installation.

1.3 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable LEED Credits

1. MRc2
2. MRc4
3. MRc5
4. IEQc4.2

B. LEED Requirements

1. MRc2: CONSTRUCTION WASTE MANAGEMENT

   No less than the specified portion of all construction waste from the Project shall be diverted from disposal in a landfill and/or incineration in with the Project Requirements for Construction Waste Management and Disposal. Refer to Specification Sections 017419 Construction Waste Management and Disposal and 013510 Sustainable Design Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

2. MRc4: Recycled Content Material

   No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the Project Requirements for Recycled Content Materials. All materials counted towards the computations of the proportion of the Recycled Content Materials shall comply with the standard minimum percentages of post-consumer waste materials and for the minimum percentages of pre-consumer waste materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

3. MRc5: REGIONALLY MANUFACTURED HARVESTED MATERIALS

   No less than the specified minimum proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the Project Site in accordance with the Project Requirements for Regionally Manufactured and/or Harvested Materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

4. IEQc4.2: LOW-EMITTING MATERIALS – PAINTS AND COATINGS

   All paints and coatings in the building interior shall comply with the Project Requirements for Low Emitting Materials – Paints and Coatings. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include manufacturer's written instructions for evaluating, preparing, and treating substrate, technical data, and tested physical and performance properties of waterproofing.

B. Shop Drawings: Show locations and extent of waterproofing. Include details for substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions.

C. Samples: For the following products:

   1. Flashing sheet, 10 by 8 inches (250 by 200 mm).
   2. Drainage panel, 4 by 4 inches (100 by 100 mm).

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Field quality-control reports.

C. Sample Warranties: For special warranties.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by waterproofing manufacturer.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended in writing by waterproofing manufacturer.

1. Do not apply waterproofing to a damp or wet substrate, when relative humidity exceeds 85 percent, or when temperatures are less than 5 deg F (3 deg C) above dew point.
2. Do not apply waterproofing in snow, rain, fog or mist, or when such weather conditions are imminent during application and curing period.

B. Maintain adequate ventilation during application and curing of waterproofing materials.

1.8 WARRANTY

A. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace waterproofing that fails in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.
2. Warranty does not include failure of waterproofing due to failure of substrate prepared and treated according to requirements or formation of new joints and cracks in substrate that exceed 1/16 inch (1.6 mm) in width.

3.

B. Installer's Special Warranty: Specified form,signed by Installer, covering Work of this Section, for warranty period of two years.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Source Limitations for Waterproofing System: Obtain waterproofing materials from single source from single manufacturer.

2.2 SINGLE-COMPONENT POLYURETHANE WATERPROOFING

A. Single-Component, Modified Polyurethane Waterproofing: Comply with ASTM C 836 and with manufacturer's written physical requirements.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Carlisle Coatings & Waterproofing Inc.; CCW-525.
b. CETCO; LDC 60.
c. Pacific Polymers International, Inc.; Elasto-Deck B.T. 100% Solids .
d. Tremco Incorporated; Vulkem 250 GC .

2.3 AUXILIARY MATERIALS

A. General: Provide auxiliary materials recommended in writing by waterproofing manufacturer for intended use and compatible with one another and with waterproofing.

1. Furnish liquid-type auxiliary materials that comply with VOC limits of authorities having jurisdiction.

B. Primer: Manufacturer's standard primer, sealer, or surface conditioner; factory-formulated acrylic latex, polyurethane, or epoxy.

C. Sheet Flashing: 50-mil- (1.3-mm-) minimum, nonstaining, uncured sheet neoprene.

1. Adhesive: Manufacturer's recommended contact adhesive.

D. Membrane-Reinforcing Fabric: Manufacturer's recommended fiberglass mesh or polyester fabric, manufacturer's standard weight.

E. Joint Reinforcing Strip: Manufacturer's recommended fiberglass mesh or polyester fabric.

F. Joint Sealant: Multicomponent polyurethane sealant, compatible with waterproofing; ASTM C 920, Type M, Class 25 or greater; Grade NS for sloping and vertical applications and Grade P for deck applications; Use NT exposure; and as recommended by manufacturer for substrate and joint conditions.

1. Backer Rod: Closed-cell polyethylene foam.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance.

1. Verify that concrete has cured and aged for minimum time period recommended by waterproofing manufacturer.
2. Verify that substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

A. Clean and prepare substrate according to manufacturer's written recommendations. Provide clean, dust-free, and dry substrate for waterproofing application.

B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage or overspray affecting other construction.

C. Close off deck drains and other deck penetrations to prevent spillage and migration of waterproofing fluids.

D. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, acid residues, and other penetrating contaminants or film-forming coatings from concrete.

1. Abrasive blast clean concrete surfaces uniformly to expose top surface of fine aggregate according to ASTM D 4259 with a self-contained, recirculating, blast-cleaning apparatus. Remove material to provide a sound surface free of laitance, glaze, efflorescence, curing compounds, concrete hardeners, or form-

release agents. Remove remaining loose material and clean surfaces according to ASTM D 4258.

E. Remove fins, ridges, and other projections and fill honeycomb, aggregate pockets, and other voids.

3.3 PREPARATION AT TERMINATIONS AND PENETRATIONS

A. Prepare vertical and horizontal surfaces at terminations and penetrations through waterproofing and at expansion joints, drains, and sleeves according to ASTM C 898 and ASTM C 1471 and manufacturer's written instructions.

B. Prime substrate unless otherwise instructed by waterproofing manufacturer.

C. Apply waterproofing in two separate applications, and embed a joint reinforcing strip in the first preparation coat when recommended by waterproofing manufacturer.

1. Provide sealant cants around penetrations and at inside corners of deck-to-wall butt joints when recommended by waterproofing manufacturer.

3.4 JOINT AND CRACK TREATMENT

A. Prepare, treat, rout, and fill joints and cracks in substrate according to ASTM C 898 and ASTM C 1471 and waterproofing manufacturer's written instructions. Remove dust and dirt from joints and cracks, complying with ASTM D 4258, before coating surfaces.

1. Comply with ASTM C 1193 for joint-sealant installation.
2. Apply bond breaker between sealant and preparation strip.
3. Prime substrate and apply a single thickness of preparation strip extending a minimum of 3 inches (75 mm) along each side of joint. Apply waterproofing in two separate applications and embed a joint reinforcing strip in the first preparation coat.

3.5 WATERPROOFING APPLICATION

A. Apply waterproofing according to ASTM C 898 and ASTM C 1471 and manufacturer's written instructions.

B. Start installing waterproofing in presence of manufacturer's technical representative.

C. Apply primer over prepared substrate.

D. Unreinforced Waterproofing Applications: Mix materials and apply waterproofing by spray, roller, notched squeegee, trowel, or other application method suitable to slope of substrate.

1. Apply one or more coats of waterproofing to obtain a seamless membrane free of entrapped gases, with an average dry film thickness of 60 mils (1.5 mm) and a minimum dry film thickness of 50 mils (1.3 mm) at any point .
2. Apply waterproofing to prepared wall terminations and vertical surfaces.
3. Verify wet film thickness of waterproofing every 100 sq. ft. (9.3 sq. m).

E. Install protection course with butted joints over nominally cured membrane before starting subsequent construction operations.

1. Molded-sheet drainage panels may be used in place of a separate protection course to vertical applications when approved by waterproofing manufacturer.

3.6 FIELD QUALITY CONTROL

A. Engage a full time site representative qualified by the waterproofing membrane manufacturer to inspect substrate conditions, surface preparation, and application of the membrane, flashings, protection, and drainage components; and to furnish daily reports to Architect.

B. Flood Testing: Flood test each deck area for leaks, according to recommendations in ASTM D 5957, after completing waterproofing but before overlaying construction is placed. Install temporary containment assemblies, plug or dam drains, and flood with potable water.

1. Flood to an average depth of 2-1/2 inches (64 mm) with a minimum depth of 1 inch (25 mm) and not exceeding a depth of 4 inches (100 mm). Maintain 2 inches (50 mm) of clearance from top of sheet flashings.
2. Flood each area for 48 hours.
3. After flood testing, repair leaks, repeat flood tests, and make further repairs until waterproofing installation is watertight.

C. Engage an independent testing agency to observe flood testing and examine underside of decks and terminations for evidence of leaks during flood testing.

3.7 CURING, PROTECTION, AND CLEANING

A. Cure waterproofing according to manufacturer's written recommendations, taking care to prevent contamination and damage during application stages and curing.

1. Do not permit foot or vehicular traffic on unprotected membrane.

B. Protect waterproofing from damage and wear during remainder of construction period.

C. Protect installed insulation drainage panels from damage due to ultraviolet light, harmful weather exposures, physical abuse, and other causes. Immediately after installation, provide temporary coverings where insulation will be subject to abuse and cannot be concealed and protected by permanent construction.

D. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 07 14 16

SECTION 07 18 00 - TRAFFIC COATINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes traffic coatings and pavement markings for the following applications:

1. Outdoor recreation areas.

B. Related Requirements:

1. Division 03 Section "Cast-in-Place Concrete" for concrete substrates.

1.3 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable LEED Credits

1. MRc2
2. MRc4
3. MRc5
4. IEQc4.2

B. LEED Requirements

1. MRc2: CONSTRUCTION WASTE MANAGEMENT

   No less than the specified portion of all construction waste from the Project shall be diverted from disposal in a landfill and/or incineration in with the Project Requirements for Construction Waste Management and Disposal. Refer to Specification Sections 017419 Construction Waste Management and Disposal and 013510 Sustainable Design Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

2. MRc4: Recycled Content Material

   No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the Project Requirements for Recycled Content Materials. All materials counted towards the computations of the proportion of the Recycled Content Materials shall comply with the standard minimum percentages of post-consumer waste materials and for the minimum percentages of pre-consumer waste materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

3. MRc5: REGIONALLY MANUFACTURED HARVESTED MATERIALS

   No less than the specified minimum proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the Project Site in accordance with the Project Requirements for Regionally Manufactured and/or Harvested Materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

4. IEQc4.2: LOW-EMITTING MATERIALS – PAINTS AND COATINGS

   All paints and coatings in the building interior shall comply with the Project Requirements for Low Emitting Materials – Paints and Coatings. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product, including installation instructions.

B. Shop Drawings: For traffic coatings.

   1. Include details for treating substrate joints and cracks, flashings, deck penetrations, and other termination conditions.
   2. Include plans showing layout of pavement markings, lane separations, and defined parking spaces. Indicate, with international symbol of accessibility, spaces allocated for people with disabilities.

C. Samples for Initial Selection: For each type of exposed finish.

D. Samples for Verification: For each type of exposed finish, prepared on rigid backing.

   1. Provide stepped Samples on backing to illustrate buildup of traffic coatings.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For each type of traffic coating.

C. Field quality-control reports.

D. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For traffic coatings to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

B. Mockups: Build mockups to set quality standards for materials and execution.

1. Build mockup for each traffic coating and substrate to receive traffic coatings.
2. Size: 200 sq. ft. (18.5 sq. m) of each substrate to demonstrate surface preparation, joint and crack treatment, thickness, texture, color, and standard of workmanship.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Apply traffic coatings within the range of ambient and substrate temperatures recommended in writing by manufacturer. Do not apply traffic coatings to damp or wet substrates, when temperatures are below 40 deg F (5 deg C), when relative humidity exceeds 85 percent, or when temperatures are less than 5 deg F (3 deg C) above dew point.

1. Do not apply traffic coatings in snow, rain, fog, or mist, or when such weather conditions are imminent during the application and curing period. Apply only when frost-free conditions occur throughout the depth of substrate.

B. Do not install traffic coating until items that penetrate membrane have been installed.

C. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F (4.4 deg C) for oil-based materials 50 deg F (10 deg C) for water-based materials, and not exceeding 95 deg F (35 deg C).

1.9 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace traffic coating that fails in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Adhesive or cohesive failures.
b. Abrasion or tearing failures.
c. Surface crazing or spalling.
d. Intrusion of water, oils, gasoline, grease, salt, deicer chemicals, or acids into deck substrate.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Material Compatibility: Provide primers; base-, intermediate-, and topcoat; and accessory materials that are compatible with one another and with substrate under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

B. Source Limitations:

1. Obtain traffic coatings from single source from single manufacturer.
2. Obtain primary traffic-coating materials, including primers, from traffic-coating manufacturer. Obtain accessory materials including aggregates, sheet flashings, joint sealants, and substrate repair materials of types and from sources recommended in writing by primary material manufacturer.
3. Obtain pavement-marking paint from single source from single manufacturer.

2.2 TRAFFIC COATING - EXTERIOR

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

1. LymTal International, Inc.; Iso-Flex 760U-HL Low Odor HVT..
2. Pacific Polymers International, Inc.; Elasto-Deck 5000 T.C..
3. Tremco Incorporated, Sealant/Waterproofing Division; Vulkem 360/NF/950NF/951NF.

B. Primer: Manufacturer's standard factory-formulated primer recommended for substrate and conditions indicated.

C. Preparatory and Base Coats: Single- or multicomponent, aromatic liquid urethane elastomer.

D. Intermediate Coat: Single- or multicomponent, aliphatic liquid urethane elastomer .

E. Topcoat: Single- or multicomponent, aliphatic liquid urethane elastomer.

1. Color: As selected by Architect from manufacturer's full range .

F. Component Coat Thicknesses: As recommended by manufacturer for substrate and service conditions indicated, but not less than the following (measured excluding aggregate):

1. Base Coat: 25 mils minimum dry film thickness.
2. Intermediate Coat: 15 mils minimum dry film thickness.
3. Topcoat: 12 mils minimum dry film thickness.

G. Aggregate: Uniformly graded, washed silicon carbide sand of particle sizes, shape, and minimum hardness recommended in writing by traffic coating manufacturer.

1. Spreading Rate: As recommended by manufacturer for substrate and service conditions indicated, but not less than the following:

a. Intermediate Coat: 8 to 10 lb/100 sq. ft. (3.6 to 4.5 kg/10 sq. m) .
b. Topcoat: 8 to 10 lb/100 sq. ft. (3.6 to 4.5 kg/10 sq. m) .

2.3 ACCESSORY MATERIALS

A. Joint Sealants: As specified in Division 07 Section "Joint Sealants."

B. Sheet Flashing: Nonstaining.

1. Minimum Thickness: 60 mils (1.5 mm) .
2. Material: Sheet material recommended in writing by traffic coating manufacturer .

C. Adhesive: Contact adhesive recommended in writing by traffic coating manufacturer.

D. Reinforcing Strip: Fiberglass mesh recommended in writing by traffic coating manufacturer.

2.4 PAVEMENT MARKINGS

A. Pavement-Marking Paint: Latex, waterborne emulsion, lead and chromate free, ready mixed, complying with FS TT-P-1952, with drying time of less than 45 minutes.

1. Color: Yellow.

a. Use blue for spaces accessible to people with disabilities.

B. Glass Beads: AASHTO M 247, Type 1.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for surface smoothness, surface moisture, and other conditions affecting performance of traffic-coating work.

B. Verify that substrates are visibly dry and free of moisture.

1. Test for moisture according to ASTM D 4263.
2. Test for moisture content by method recommended in writing by traffic-coating manufacturer.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of traffic-coating work.

D. Proceed with installation only after substrate construction and penetrating work have been completed and unsatisfactory conditions have been corrected.

1. Begin coating application only after minimum concrete-curing and -drying period recommended in writing by traffic-coating manufacturer has passed and after substrates are dry.
2. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. General: Before applying traffic coatings, clean and prepare substrates according to ASTM C 1127 and manufacturer's written instructions to produce clean, dust-free, dry substrate for traffic-coating application. Remove projections, fill voids, and seal joints if any, as recommended in writing by traffic-coating manufacturer.

B. Schedule preparation work so dust and other contaminants from process do not fall on wet, newly coated surfaces.

C. Mask adjoining surfaces not receiving traffic coatings to prevent overspray, spillage, leaking, and migration of coatings. Prevent traffic-coating materials from entering deck substrate penetrations and clogging weep holes and drains.

D. Concrete Substrates: Mechanically abrade surface to a uniform profile acceptable to manufacturer, according to ASTM D 4259. Do not acid etch.

1. Remove grease, oil, paints, and other penetrating contaminants from concrete.
2. Remove concrete fins, ridges, and other projections.
3. Remove laitance, glaze, efflorescence, curing compounds, concrete hardeners, form-release agents, and other incompatible materials that might affect coating adhesion.
4. Remove remaining loose material to provide a sound surface, and clean surfaces according to ASTM D 4258.

3.3 TERMINATIONS AND PENETRATIONS

A. Prepare vertical and horizontal surfaces at terminations and penetrations through traffic coatings and at expansion joints, drains, and sleeves according to ASTM C 1127 and manufacturer's written instructions.

B. Provide sealant cants at penetrations and at reinforced and nonreinforced, deck-to-wall butt joints.

C. Terminate edges of deck-to-deck expansion joints with preparatory base-coat strip.

D. Install sheet flashings at deck-to-wall expansion and dynamic joints, and bond to deck and wall substrates according to manufacturer's written recommendations.

3.4 JOINT AND CRACK TREATMENT

A. Prepare, treat, rout, and fill joints and cracks in substrates according to ASTM C 1127 and manufacturer's written recommendations. Before coating surfaces, remove dust and dirt from joints and cracks according to ASTM D 4258.

1. Comply with recommendations in ASTM C 1193 for joint-sealant installation.

B. Apply reinforcing strip in traffic-coating system where recommended in writing by traffic-coating manufacturer.

3.5 TRAFFIC-COATING APPLICATION

A. Apply traffic coating according to ASTM C 1127 and manufacturer's written instructions.

B. Apply number of coats of specified compositions for each type of traffic coating at locations as indicated on Drawings.

C. Start traffic-coating application in presence of manufacturer's technical representative.

D. Verify that wet film thickness of each coat complies with requirements every 100 sq. ft. (9 sq. m).

E. Uniformly broadcast aggregate on coats specified to receive aggregate. Embed aggregate according to manufacturer's written instructions. After coat dries, sweep away excess aggregate.

F. Apply traffic coatings to prepared wall terminations and vertical surfaces to height indicated; omit aggregate on vertical surfaces.

G. Cure traffic coatings. Prevent contamination and damage during application and curing stages.

3.6 PAVEMENT MARKINGS

A. Do not apply pavement-marking paint for striping and other markings until layout, colors, and placement have been verified with Architect and traffic coating has cured.

B. Sweep and clean surface to eliminate loose material and dust.

C. Apply pavement-marking paint with mechanical equipment to produce markings of dimensions indicated with uniform straight edges. Apply at manufacturer's recommended rates for a 15-mil- (0.4-mm-) minimum, wet film thickness.

1. Apply graphic symbols and lettering with paint-resistant, die-cut stencils, firmly secured to surface. Mask an extended area beyond edges of each stencil to prevent paint application beyond stencil. Apply paint so that it cannot run beneath stencil.
2. Broadcast glass beads uniformly into wet pavement-marking paint at a rate of 6 lb/gal. (0.72 kg/L).

3.7 FIELD QUALITY CONTROL

A. Testing: Engage a qualified testing agency to perform the following field tests and inspections and prepare test reports:

1. Samples of material delivered to Project site shall be taken, identified, sealed, and certified in presence of Owner and Contractor.
2. Testing agency shall perform tests for characteristics specified, using applicable referenced testing procedures.

3. Testing agency shall verify thickness of coatings during traffic coating application.
4. If test results show traffic coating materials do not comply with requirements, remove noncomplying materials, prepare surfaces, and reapply traffic coatings.

B. Final Traffic Coating Inspection: Arrange for traffic coating manufacturer's technical personnel to inspect membrane installation on completion.

1. Notify Architect or Owner 48 hours in advance of date and time of inspection.

C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.8 PROTECTING AND CLEANING

A. Protect traffic coatings from damage and wear during remainder of construction period.

B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 071800

SECTION 07 21 00 - THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Foam-plastic board insulation.
2. Mineral wool board insulation.
3. Mineral-wool blanket insulation.
4. Spray polyurethane foam insulation.
5. Geofoam insulation for built-up interior concrete slab and steps

B. Related Requirements:

1. Divison 03 Section “Cast-in-Place Concrete” for vapor retarders installed under concrete slabs-on-grade.
2. Division 04 Section "Unit Masonry" for insulation installed in cavity walls.
3. Division 07 Section "Direct-Applied Finish System" for insulation specified as part of these systems.
4. Division 07 Section "Thermoplastic Polyolefin (TPO) Roofing" for insulation specified as part of roofing construction.
5. Division 07 Section "Fire-Resistive Joint Systems" for insulation installed as part of a perimeter fire-resistive joint system.
6. Division 09 Section “Gypsum Board” for sound attenuation blankets installed within gypsum and metal-framed wall assemblies.

1.3 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable LEED Credits

1. MRc2
2. MRc4
3. MRc5
4. IEQc4.2

B. LEED Requirements

1. MRc2: CONSTRUCTION WASTE MANAGEMENT

No less than the specified portion of all construction waste from the Project shall be diverted from disposal in a landfill and/or incineration in with the Project Requirements for Construction Waste Management and Disposal. Refer to Specification Sections 017419 Construction Waste Management and Disposal

and 013510 Sustainable Design Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

2. MRc4: Recycled Content Material

   No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the Project Requirements for Recycled Content Materials. All materials counted towards the computations of the proportion of the Recycled Content Materials shall comply with the standard minimum percentages of post-consumer waste materials and for the minimum percentages of pre-consumer waste materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

3. MRc5: REGIONALLY MANUFACTURED HARVESTED MATERIALS

   No less than the specified minimum proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the Project Site in accordance with the Project Requirements for Regionally Manufactured and/or Harvested Materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

4. IEQc4.2: LOW-EMITTING MATERIALS – PAINTS AND COATINGS

   All paints and coatings in the building interior shall comply with the Project Requirements for Low Emitting Materials – Paints and Coatings. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.5 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each product, for tests performed by a qualified testing agency.

B. Evaluation Reports: For foam-plastic insulation, from ICC-ES.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

B. Protect foam-plastic board insulation as follows:

1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site until just before installation time.
3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 - PRODUCTS

2.1 FOAM-PLASTIC BOARD INSULATION

A. Extruded-Polystyrene Board Insulation: ASTM C 578, of type and minimum compressive strength indicated below, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following :

a. DiversiFoam Products.
b. Dow Chemical Company (The).
c. Owens Corning.
d. Pactiv Building Products.

2. Type IV, 25 psi.

2.2 MINERAL-WOOL BOARD INSULATION

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Roxul Inc.
2. Thermafiber.

B. Unfaced, Mineral-Wool Board Insulation: ASTM C 612; with maximum flame-spread and smoke-developed indexes of 15 and zero, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics

1. Nominal density of 4 lb/cu. ft. (64 kg/cu. m), Types IA and IB, thermal resistivity of 4 deg F x h x sq. ft./Btu x in. at 75 deg F (27.7 K x m/W at 24 deg C).

2.3 MINERAL-WOOL BLANKETS

A. Insulation shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

B. Mineral-Wool Blanket, Unfaced: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following

    a. Roxul Inc.
    b. Thermafiber.

2.4 SPRAY POLYURETHANE FOAM INSULATION

A. Closed-Cell Polyurethane Foam Insulation: ASTM C 1029, Type II, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following :

    a. BASF Corporation.
    b. BaySystems NorthAmerica, LLC.
    c. Dow Chemical Company (The).
    d. ERSystems, Inc.
    e. Gaco Western Inc.
    f. Henry Company.
    g. NCFI; Division of Barnhardt Mfg. Co.
    h. SWD Urethane Company.
    i. Volatile Free, Inc.

2. Minimum density of 1.5 lb/cu. ft., thermal resistivity of 6.2 deg F x h x sq. ft./Btu x in. at 75 deg F.

B. Open-Cell Polyurethane Foam Insulation: Spray-applied polyurethane foam using water as a blowing agent, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following :

    a. BaySystems NorthAmerica, LLC.
    b. Demilec (USA) LLC.
    c. Gaco Western Inc.
    d. Icynene Inc.
    e. SWD Urethane Company.

2. Minimum density of 0.4 lb/cu. ft., thermal resistivity of 3.4 deg F x h x sq. ft./Btu x in. at 75 deg F.

2.5 GEOFOAM

A. Extruded-Polystyrene Board Insulation: ASTM C 578, Type IV, 1.55-lb/cu. ft. density, 25-psi compressive strength .

B. Connectors: Geofoam manufacturer's multibarbed, galvanized-steel sheet connectors or Deformed steel reinforcing bars, 3/4 inch in diameter .

2.6 THERMAL BARRIERS

A. Spray-applied thermal barrier coating: Water-based coating, limiting temperature rise of underlying spray polyurethane foam insulation to not more than 121 degrees F after 15 minutes of fire exposure complying with the standard time temperature curve of ASTM E 119.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited, to the following:

a. International Fireproof Technology Inc.; DC315

2.7 INSULATION FASTENERS

A. Adhesively Attached, Angle-Shaped, Spindle-Type Anchors: Angle welded to projecting spindle; capable of holding insulation of specified thickness securely in position indicated with self-locking washer in place.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Gemco; 90-Degree Insulation Hangers.

2. Angle: Formed from 0.030-inch- thick, perforated, galvanized carbon-steel sheet with each leg 2 inches square.
3. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch in diameter; length to suit depth of insulation indicated.

B. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates indicated without damaging insulation, fasteners, and substrates.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. AGM Industries, Inc.; TACTOO Adhesive.
b. Gemco; Tuff Bond Hanger Adhesive.

2.8 EXTRUDED POLYSTYRENE FOAM-PLASTIC BOARD

A. Extruded polystyrene boards in this article are also called "XPS boards." Roman numeral designators in ASTM C 578 are assigned in a fixed random sequence, and their numeric order does not reflect increasing strength or other characteristics.

B. Extruded Polystyrene Board, Type IV: ASTM C 578, Type IV, 25-psi (173-kPa) minimum compressive strength; unfaced; maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E 84.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean substrates of substances that are harmful to insulation or that interfere with insulation attachment.

3.2 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

C. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.3 INSTALLATION OF BELOW-GRADE INSULATION

A. On vertical footing and foundation wall surfaces, set insulation units using manufacturer's recommended adhesive according to manufacturer's written instructions.

1. If not otherwise indicated, extend insulation a minimum of 24 inches below exterior grade line.

B. On horizontal surfaces under slabs, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

1. If not otherwise indicated, extend insulation a minimum of 24 inches in from exterior walls.

3.4 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION

A. Insulation: Install in cavities formed by framing members according to the following requirements:

1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
3. Maintain 3-inch (76-mm) clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.

4. For metal-framed wall cavities where cavity heights exceed 96 inches (2438 mm), support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
5. Vapor-Retarder-Faced Blankets: Tape joints and ruptures in vapor-retarder facings, and seal each continuous area of insulation to ensure airtight installation.

B. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:

1. Mineral wool Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft. (40 kg/cu. m).
2. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.

C. Spray-Applied Cellulosic Insulation: Apply spray-applied insulation according to manufacturer's written instructions. Do not apply insulation until installation of pipes, ducts, conduits, wiring, and electrical outlets in walls is completed and windows, electrical boxes, and other items not indicated to receive insulation are masked. After insulation is applied, make flush with face of studs by using method recommended by insulation manufacturer.

3.5 GEOFOAM FILL

A. Install geofoam blocks in layers with abutting edges and ends and with the long dimension of each block at right angles to blocks in each subsequent layer. Offset joints of blocks in successive layers.

B. Install geofoam connectors at each layer of geofoam to resist horizontal displacement according to geofoam manufacturer's written instructions.

3.6 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 07 21 00

SECTION 07 24 15 –DIRECT-APPLIED FINISH SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Direct-applied finish system (DAFS) on exterior cement board and monolithic concrete.

B. Related Sections:

   1. Division 05 Section "Cold-Formed Metal Framing" for structural, load-bearing (transverse and axial) steel studs and joists that support lath and portland cement plaster.
   2. Division 06 Section "Sheathing" for sheathing and water-resistant barriers included in portland cement plaster assemblies.
   3. Section 079200 "Joint Sealants" for sealing joints in DAS with elastomeric joint sealants.

1.3 PERFORMANCE REQUIREMENTS

A. DAFS Performance: Comply with the following:

   1. Bond Integrity: Free from bond failure within DAFS components or between system and supporting wall construction, resulting from exposure to fire, wind loads, weather, or other in-service conditions.

B. Provide DAFS having physical properties and structural performance that comply with the following:

   1. Absorption-Freeze Resistance: No visible deleterious effects and negligible weight loss after 60 cycles per EIMA 101.01.
   2. Accelerated Weathering: Five samples per ICC-ES AC219 showing no cracking, checking, crazing, erosion, rusting, blistering, peeling, delamination, or other characteristics that might affect performance as a wall cladding after testing for 2000 hours when viewed under 5 times magnification per ASTM G 153 or ASTM G 155 .
   3. Accelerated Weathering: Five samples per ICC-ES AC219 showing no cracking, checking, crazing, erosion, rusting, blistering, peeling, delamination, or other characteristics that might affect performance as a wall cladding after testing for 2000 hours when viewed under 5 times magnification per ASTM G 153 or ASTM G 155 .
   4. Salt-Spray Resistance: No deleterious affects when tested according to ICC-ES AC219.

5. Tensile Adhesion: No failure in the base coat or finish coat when tested per ICC-ES AC219.
6. Water Resistance: Three samples, each consisting of 1/2-inch-thick DAFS applied to on 1/2-inch- (12.7-mm-) thick gypsum board; cured for 28 days; and showing no cracking, checking, crazing, erosion, rusting, blistering, peeling, or delamination after testing for 14 days per ASTM D 2247.

1.4 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable LEED Credits

1. MRc2
2. MRc4
3. MRc5
4. IEQc4.2

B. LEED Requirements

1. MRc2: CONSTRUCTION WASTE MANAGEMENT

No less than the specified portion of all construction waste from the Project shall be diverted from disposal in a landfill and/or incineration in with the Project Requirements for Construction Waste Management and Disposal. Refer to Specification Sections 017419 Construction Waste Management and Disposal and 013510 Sustainable Design Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

2. MRc4: Recycled Content Material

No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the Project Requirements for Recycled Content Materials. All materials counted towards the computations of the proportion of the Recycled Content Materials shall comply with the standard minimum percentages of post-consumer waste materials and for the minimum percentages of pre-consumer waste materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

3. MRc5: REGIONALLY MANUFACTURED HARVESTED MATERIALS

No less than the specified minimum proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the Project Site in accordance with the Project Requirements for Regionally Manufactured and/or Harvested Materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

4. IEQc4.2: LOW-EMITTING MATERIALS – PAINTS AND COATINGS

All paints and coatings in the building interior shall comply with the Project Requirements for Low Emitting Materials – Paints and Coatings. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor

shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show locations and installation of control and expansion joints including plans, elevations, sections, details of components, and attachments to other work.

C. Samples for Initial Selection: For each type of factory-prepared finish coat indicated.

1. Include similar Samples of joint sealants and exposed accessories involving color selection.

D. Samples for Verification: For each type of factory-prepared colored textured finish coat indicated; 12 by 12 inches (305 by 305 mm), and prepared on rigid backing.

1. Include sealants and exposed accessory Samples to verify color selected.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer, fabricator/erector, and testing agency.

B. Manufacturer Certificates: Signed by manufacturers certifying that DAFSS complies with requirements.

C. Material or Product Certificates: For cementitious materials and aggregates and for insulation, from manufacturer.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each water-/weather-resistive barrier, insulation, reinforcing mesh, joint sealant, and coating.

E. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For DAFS to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An installer who is certified in writing by DAFS manufacturer as qualified to install manufacturer's system using trained workers .
1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

B. Source Limitations: Obtain DAFS components from single source from single manufacturer and from sources approved by manufacturer as compatible with system components.

C. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution and set quality standards for fabrication and installation.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original, unopened packages with manufacturers' labels intact and clearly identifying products.

B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes.

1. Stack insulation board flat and off the ground.
2. Protect plastic insulation against ignition at all times. Do not deliver plastic insulating materials to Project site before installation time.

1.10 PROJECT CONDITIONS

A. Weather Limitations: Maintain ambient temperatures above 40 deg F (4.4 deg C) for a minimum of 24 hours before, during, and after adhesives or coatings are applied. Do not apply coatings during rainfall. Proceed with installation only when existing and forecasted weather conditions and ambient outdoor air, humidity, and substrate temperatures permit finish to be applied, dried, and cured according to manufacturers' written instructions and warranty requirements.

1.11 COORDINATION

A. Coordinate installation of DAFS with related Work specified in other Sections to ensure that wall assemblies, including sheathing, flashing, trim, joint sealants, windows, and doors, are protected against damage from the effects of weather, age, corrosion, moisture, and other causes. Do not allow water to penetrate behind flashing and barrier coating of DAFS.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Acrocrete, Inc.
2. Dryvit Systems, Inc.
3. Finestone; Degussa Wall Systems, Inc.
4. Sto Corp.

2.2 ACCESSORIES

A. General: Comply with ASTM C 1063 and coordinate depth of trim and accessories with thicknesses and number of plaster coats required.

B. Exterior Cement Board: Not less than 7/16-inch- (11-mm-) thick, fiber cement board complying with ASTM C 1186, Type A, for exterior applications.

1. Fasteners: Wafer-head or flat-head steel drill screws complying with ASTM C 954, with an organic-polymer coating or other corrosion-protective coating having a salt-spray resistance of more than 500 hours per ASTM B 117.

a. Size and Length: As recommended by sheathing manufacturer for type and thickness of sheathing board to be attached.

2.3 MISCELLANEOUS MATERIALS

A. Water for Mixing: Potable and free of substances capable of affecting plaster set or of damaging plaster, lath, or accessories.

B. Fiber for Base Coat: Alkaline-resistant glass or polypropylene fibers, 1/2 inch (13 mm) long, free of contaminants, manufactured for use in portland cement plaster.

C. Bonding Compound: ASTM C 932.

2.4 DIRECT-APPLIED FINISH MATERIALS

A. Base-Coat Materials: DAFS manufacturer's standard mixture complying with one of the following:

1. Job-mixed formulation of portland cement complying with ASTM C 150, Type I, white or natural color; and manufacturer's standard polymer-emulsion adhesive designed for use with portland cement.
2. Job-combined formulation of manufacturer's standard polymer-emulsion adhesive and manufacturer's standard dry mix containing portland cement.
3. Factory-blended dry formulation of portland cement, dry polymer admixture, and inert fillers to which only water is added at Project site.

B. Primer: DAFS manufacturer's standard factory-mixed, elastomeric-polymer primer for preparing base-coat surface for application of finish coat.

C. Finish-Coat Materials: DAFS manufacturer's standard acrylic-based coating with enhanced mildew resistance complying with the following:

1. Factory-mixed formulation of polymer-emulsion binder, colorfast mineral pigments, sound stone particles, and fillers.
2. Colors: As selected by Architect from manufacturer's full range.

2.5 MIXING

A. General: Comply with Direct-Applied Finish manufacturer's requirements for combining and mixing materials. Do not introduce admixtures, water, or other materials except as

recommended by Direct-Applied Finish manufacturer. Mix materials in clean containers. Use materials within time period specified by Direct-Applied Finish manufacturer or discard.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of EIFS and DAFS.

B. Examine roof edges, wall framing, flashings, openings, substrates, and junctures at other construction for suitable conditions where EIFS and DAFS will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

1. Begin coating application only after surfaces are dry.
2. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Protect contiguous work from moisture deterioration and soiling caused by application of DAFS. Provide temporary covering and other protection needed to prevent spattering of exterior finish coats on other work.

B. Protect DAFS, substrates, and wall construction behind them from inclement weather during installation. Prevent penetration of moisture behind EIFS and deterioration of substrates.

C. Prepare and clean substrates to comply with DAFS manufacturer's written instructions to obtain optimum bond between substrate and adhesive for insulation.

1. Concrete Substrates: Provide clean, dry, neutral-pH substrate for insulation installation. Verify suitability of substrate by performing bond and moisture tests recommended by/DAFS manufacturer.

3.3 EXTERIOR CEMENT-BOARD INSTALLATION

A. Exterior Cement Board: Install on metal framing to comply with cement-board manufacturer's written instructions and evaluation report acceptable to authorities having jurisdiction. Install board with steel drill screws spaced no more than 8 inches (203 mm) o.c. along framing with perimeter fasteners at least 3/8 inch (9.6 mm) but less than 5/8 inch (15.9 mm) from edges of boards.

3.4 INSTALLING ACCESSORIES

A. Install according to ASTM C 1063 and at locations indicated on Drawings.

B. Reinforcement for External Corners:

1. Install cornerbead at exterior locations.

C. Control Joints: Install control joints in specific locations approved by Architect for visual effect as follows:

1. As required to delineate plasterwork into areas (panels) of the following maximum sizes:

a. Vertical Surfaces: 144 sq. ft. (13.4 sq. m).
b. Horizontal and other Nonvertical Surfaces: 100 sq. ft. (9.3 sq. m).

2. At distances between control joints of not greater than 18 feet (5.5 m) o.c.
3. As required to delineate plasterwork into areas (panels) with length-to-width ratios of not greater than 2-1/2:1.
4. Where control joints occur in surface of construction directly behind plaster.
5. Where plasterwork areas change dimensions, to delineate rectangular-shaped areas (panels) and to relieve the stress that occurs at the corner formed by the dimension change.
6.

3.5 BASE-COAT INSTALLATION

A. Base Coat: Apply to exposed surfaces of insulation and/or exterior cement board in minimum thickness recommended in writing by DAFS manufacturer, but not less than 1/16-inch (1.6-mm) dry-coat thickness.

3.6 FINISH-COAT INSTALLATION

A. Primer: Apply over dry base coat according to DAFS manufacturer's written instructions.

B. Finish Coat: Apply over dry primed base coat, maintaining a wet edge at all times for uniform appearance, in thickness required by DAFS manufacturer to produce a uniform finish of color and texture matching approved sample and free of cold joints, shadow lines, and texture variations.

1. Texture: As selected by Architect from manufacturer's full range.

3.7 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Remove and replace DAFS where test results indicate that DAFS does not comply with specified requirements.

C. Prepare test and inspection reports.

3.8 PROTECTION

A. Remove temporary covering and protection of other work. Promptly remove coating materials from window and door frames and other surfaces outside areas indicated to receive DAFS coatings.

END OF SECTION 07 24 15

SECTION 07 26 00 - VAPOR RETARDERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Polyethylene vapor retarders.
2. Fire-retardant, reinforced-polyethylene vapor retarders.

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for under-slab vapor retarders.
2. Section 072100 "Thermal Insulation" for vapor retarders integral with insulation products.

1.3 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable LEED Credits

1. MRc2
2. MRc4
3. MRc5
4. IEQc4.2

B. LEED Requirements

1. MRc2: CONSTRUCTION WASTE MANAGEMENT

   No less than the specified portion of all construction waste from the Project shall be diverted from disposal in a landfill and/or incineration in with the Project Requirements for Construction Waste Management and Disposal. Refer to Specification Sections 017419 Construction Waste Management and Disposal and 013510 Sustainable Design Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

2. MRc4: Recycled Content Material

   No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the Project Requirements for Recycled Content Materials. All materials counted towards the computations of the proportion of the Recycled Content Materials shall comply with the standard minimum percentages of post-consumer waste materials and for the minimum percentages of pre-consumer waste materials.

Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

3. MRc5: REGIONALLY MANUFACTURED HARVESTED MATERIALS

   No less than the specified minimum proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the Project Site in accordance with the Project Requirements for Regionally Manufactured and/or Harvested Materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

4. IEQc4.2: LOW-EMITTING MATERIALS – PAINTS AND COATINGS

   All paints and coatings in the building interior shall comply with the Project Requirements for Low Emitting Materials – Paints and Coatings. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.5 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each product, for tests performed by a qualified testing agency.

PART 2 - PRODUCTS

2.1 POLYETHYLENE VAPOR RETARDERS

A. Polyethylene Vapor Retarders: ASTM D 4397, 10-mil- (0.25-mm-) thick sheet, with maximum permeance rating of 0.1 perm (5.7 ng/Pa x s x sq. m).

2.2 FIRE-RETARDANT, REINFORCED-POLYETHYLENE VAPOR RETARDERS

A. Fire-Retardant, Reinforced-Polyethylene Vapor Retarders: Sheet with outer layers of polyethylene film laminated to an inner reinforcing layer consisting of either nonwoven grid of nylon cord or polyester scrim and weighing not less than 20 lb/1000 sq. ft. (9 kg/100 sq. m), with maximum permeance rating of 0.1 perm (5.7 ng/Pa x s x sq. m).

   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

      a. DiversiFoam Products.
      b. Dow Chemical Company (The).
      c. Owens Corning.

2. Surface-Burning Characteristics: Maximum flame-spread and smoke-developed indexes of 75 and 200, respectively, per ASTM E 84.

2.3 ACCESSORIES

A. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.

B. Adhesive for Vapor Retarders: Product recommended by vapor-retarder manufacturer and has demonstrated capability to bond vapor retarders securely to substrates indicated.

C. Vapor-Retarder Fasteners: Pancake-head, self-tapping steel drill screws; with fender washers.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean substrates of substances that are harmful to vapor retarders, including removing projections capable of puncturing vapor retarders.

3.2 INSTALLATION OF VAPOR RETARDERS ON FRAMING

A. Place vapor retarders on side of construction indicated on Drawings.

B. Extend vapor retarders to extremities of areas to protect from vapor transmission. Secure vapor retarders in place with adhesives, vapor retarder fasteners, or other anchorage system as recommended by manufacturer. Extend vapor retarders to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.

C. Seal vertical joints in vapor retarders over framing by lapping no fewer than two studs and sealing with vapor-retarder tape according to vapor-retarder manufacturer's written instructions. Locate all joints over framing members or other solid substrates.

D. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarders.

E. Repair tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarders.

3.3 PROTECTION

A. Protect vapor retarders from damage until concealed by permanent construction.

END OF SECTION 07 26 00

SECTION 07 27 26 - FLUID-APPLIED MEMBRANE AIR BARRIERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes fluid-applied, vapor-retarding and vapor-permeable membrane air barriers.

B. Related Requirements:

1. Division 04 Section "Unit Masonry" for embedded flashings.
2. Division 06 Section "Sheathing" for wall sheathings and wall sheathing joint-and-penetration treatments.
3. Division 07 Section "Thermal Insulation" for foam-plastic board insulation.
4. Division 07 Section "Sheet Metal Flashing and Trim" for sheet metal flashings.
5. Division 07 Section "Joint Sealants" for joint-sealant materials and installation.

1.3 DEFINITIONS

A. Air-Barrier Material: A primary element that provides a continuous barrier to the movement of air.

B. Air-Barrier Accessory: A transitional component of the air barrier that provides continuity.

C. Air-Barrier Assembly: The collection of air-barrier materials and accessory materials applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.4 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable LEED Credits

1. MRc2
2. MRc4
3. MRc5
4. IEQc4.2

B. LEED Requirements

1. MRc2: CONSTRUCTION WASTE MANAGEMENT

No less than the specified portion of all construction waste from the Project shall be diverted from disposal in a landfill and/or incineration in with the Project Requirements for Construction Waste Management and Disposal. Refer to Specification Sections 017419 Construction Waste Management and Disposal and 013510 Sustainable Design Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

2. MRc4: Recycled Content Material

   No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the Project Requirements for Recycled Content Materials. All materials counted towards the computations of the proportion of the Recycled Content Materials shall comply with the standard minimum percentages of post-consumer waste materials and for the minimum percentages of pre-consumer waste materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

3. MRc5: REGIONALLY MANUFACTURED HARVESTED MATERIALS

   No less than the specified minimum proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the Project Site in accordance with the Project Requirements for Regionally Manufactured and/or Harvested Materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

4. IEQc4.2: LOW-EMITTING MATERIALS – PAINTS AND COATINGS

   All paints and coatings in the building interior shall comply with the Project Requirements for Low Emitting Materials – Paints and Coatings. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

   1. Include manufacturer's written instructions for evaluating, preparing, and treating substrate; technical data; and tested physical and performance properties of products.

B. Sustainable Design Submittals:

   1. Product Data: For coatings, indicating VOC content.
   2. Laboratory Test Reports: For coatings, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: For air-barrier assemblies.

1. Show locations and extent of air barrier. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
2. Include details of interfaces with other materials that form part of air barrier.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer. Include list of ABAA-certified installers and supervisors employed by the Installer, who work on Project.

B. Product Certificates: From air-barrier manufacturer, certifying compatibility of air barriers and accessory materials with Project materials that connect to or that come in contact with the barrier.

C. Product Test Reports: For each air-barrier assembly, for tests performed by a qualified testing agency.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1. Installer shall be licensed by ABAA according to ABAA's Quality Assurance Program and shall employ ABAA-certified installers and supervisors on Project.

B. Mockups: Build mockups to set quality standards for materials and execution and for preconstruction testing.

1. Build integrated mockups of exterior wall assembly , 150 sq. ft. (14 sq. m), incorporating backup wall construction, external cladding, window, storefront, door frame and sill, insulation, ties and other penetrations, and flashing to demonstrate surface preparation, crack and joint treatment, application of air barriers, and sealing of gaps, terminations, and penetrations of air-barrier assembly.

    a. Coordinate construction of mockups to permit inspection by Owner's testing agency of air barrier before external insulation and cladding are installed.
    b. Include junction with roofing membrane, building corner condition, and foundation wall intersection.
    c. If Architect determines mockups do not comply with requirements, reconstruct mockups and apply air barrier until mockups are approved.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Owner will engage a qualified testing agency to perform preconstruction testing on field mockups.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Remove and replace liquid materials that cannot be applied within their stated shelf life.

B. Protect stored materials from direct sunlight.

1.10 FIELD CONDITIONS

A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended by air-barrier manufacturer.

1. Protect substrates from environmental conditions that affect air-barrier performance.
2. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Source Limitations: Obtain primary air-barrier materials and air-barrier accessories from single source from single manufacturer.

B. VOC Content: 250 g/L or less.

C. Low-Emitting Materials: Products shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.2 PERFORMANCE REQUIREMENTS

A. General: Air barrier shall be capable of performing as a continuous vapor-retarding permeable air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air-barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, tie-ins to installed waterproofing, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

2.3 FLUID-APPLIED MEMBRANE AIR BARRIER

A. Fluid-Applied, Vapor-Retarding Membrane Air Barrier: synthetic polymer membrane.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Synthetic Polymer Membrane, non-combustible:

        1) Henry Company; Air-Bloc 21 FR.
        2) Carlisle; Fire Resist Barritech NP

2. Physical and Performance Properties:

    a. Membrane Air Permeance: Not to exceed 0.004 cfm x sq. ft. of surface area at 1.57-lbf/sq. ft. (0.02 L/s x sq. m of surface area at 75-Pa) pressure difference; ASTM E 2178.
    b. Membrane Vapor Permeance: Not to exceed 0.1 perm (5.8 ng/Pa x s x sq. m) ; ASTM E 96.

B. Fluid-Applied, Vapor-Permeable Membrane Air Barrier: synthetic polymer membrane.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

    a. Synthetic Polymer Membrane:

        1) Carlisle; Fire Resist Barritech VP
        2) Grace. W.R. & Co.; Perm-A-Barrier VPL

2. Physical and Performance Properties:

    a. Membrane Air Permeance: Not to exceed 0.004 cfm/ sq. ft. of surface area at 1.57-lbf/sq. ft. (0.02 L/s x sq. m of surface area at 75-Pa) pressure difference; ASTM E 2178.
    b. Membrane Vapor Permeance: Not less than 10 perms (580 ng/Pa x s x sq. m) ; ASTM E 96.

2.4 AUXILIARY MATERIALS

A. General: Auxiliary materials recommended by air barrier manufacturer for intended use and compatible with air barrier membrane. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.

B. Primer: Liquid waterborne primer recommended for substrate by manufacturer of air barrier material.

C. Counterflashing Strip: Modified bituminous, 40-mil- (1.0-mm-) thick, self-adhering sheet consisting of 32 mils (0.8 mm) of rubberized asphalt laminated to an 8-mil- (0.2-mm-) thick, crosslaminated polyethylene film with release liner backing.

D. Modified Bituminous Transition Strip: Vapor-retarding, 40-mil- (1.0-mm-) thick, smooth-surfaced, self-adhering; consisting of 36 mils (0.9 mm) of rubberized asphalt laminated to a 4-mil- (0.1-mm-) thick polyethylene film with release liner backing.

E. Adhesive-Coated Transition Strip: Vapor-permeable, 17-mil- (0.43-mm-) thick, self-adhering strip consisting of an adhesive coating over a permeable laminate with a permeance of 37 perms (2145 ng/Pa x s x sq. m).

F. Joint Sealant: ASTM C 920, single-component, neutral-curing silicone; Class 100/50 (low-modulus), Grade NS, Use NT related to exposure, and, as applicable to joint substrates indicated, Use O. Comply with Division 07 Section "Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance.

1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
2. Verify that concrete has cured and aged for minimum time period recommended by air barrier manufacturer.
3. Verify that concrete is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
4. Verify that masonry joints are flush and completely filled with mortar.
5. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

A. Clean, prepare, treat, and seal substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air barrier application.

B. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.

C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate patching membrane.

E. Remove excess mortar from masonry ties, shelf angles, and other obstructions.

F. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.

G. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

3.3 JOINT TREATMENT

A. Concrete and Masonry: Prepare, treat, rout, and fill joints and cracks in substrate according to ASTM C 1193 and air barrier manufacturer's written instructions. Remove dust and dirt from joints and cracks complying with ASTM D 4258 before coating surfaces.

1. Prime substrate and apply a single thickness of preparation coat strip extending a minimum of 3 inches (75 mm) along each side of joints and cracks. Apply a double thickness of air barrier membrane and embed a joint reinforcing strip in preparation coat.

B. Gypsum Sheathing: Fill joints greater than 1/4 inch (6 mm) with sealant according to ASTM C 1193 and with air barrier manufacturer's written instructions. Apply first layer of fluid air barrier membrane at joints. Tape joints with joint reinforcing strip after first layer is dry. Apply a second layer of fluid air barrier membrane over joint reinforcing strip.

3.4 TRANSITION STRIP INSTALLATION

A. Install strips, transition strips, and auxiliary materials according to air barrier manufacturer's written instructions to form a seal with adjacent construction and maintain a continuous air barrier.

1. Coordinate the installation of air barrier with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.
2. Install modified bituminous strip on roofing membrane or base flashing so that a minimum of 3 inches (75 mm) of coverage is achieved over both substrates.

B. Apply primer to substrates at required rate and allow to dry. Limit priming to areas that will be covered by air barrier sheet in same day. Reprime areas exposed for more than 24 hours.

1. Prime glass-fiber-surfaced gypsum sheathing with number of prime coats needed to achieve required bond, with adequate drying time between coats.

C. Connect and seal exterior wall air barrier membrane continuously to roofing membrane air barrier, concrete below-grade structures, floor-to floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials .

D. At end of each working day, seal top edge of strips and transition strips to substrate with termination mastic.

E. Apply joint sealants forming part of air barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

F. Wall Openings: Prime concealed perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply modified bituminous transition strip or adhesive-coated transition strip so that a minimum of 3 inches (75 mm) of coverage is achieved over both substrates. Maintain 3 inches (75 mm) of full contact over firm bearing to perimeter frames with not less than 1 inch (25 mm) of full contact.

1. Modified Bituminous and Adhesive-Coated Transition Strips: Roll firmly to enhance adhesion.
2. Apply transition strips to isolate preservative-treated wood from metal curtainwall and windo framing.

G. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air barrier membrane with foam sealant.

H. Seal strips and transition strips around masonry reinforcing or ties and penetrations with termination mastic.

I. Seal top of through-wall flashings to air barrier with an additional 6-inch- (150-mm-) wide, modified bituminous strip.

J. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.

K. Repair punctures, voids, and deficient lapped seams in strips and transition strips. Slit and flatten fishmouths and blisters. Patch with transition strips extending 6 inches (150 mm) beyond repaired areas in strip direction.

3.5 AIR BARRIER MEMBRANE INSTALLATION

A. Apply air barrier membrane to form a seal with strips and transition strips and to achieve a continuous air barrier according to air barrier manufacturer's written instructions.

B. Apply air barrier membrane within manufacturer's recommended application temperature ranges.

C. Apply primer to substrates at required rate and allow to dry. Limit priming to areas that will be covered by air barrier sheet in same day. Reprime areas exposed for more than 24 hours.

1. Prime glass-fiber-surfaced gypsum sheathing with number of prime coats needed to achieve required bond, with adequate drying time between coats.

D. Apply a continuous unbroken air barrier to substrates according to the following minimum thickness. Apply membrane in full contact around protrusions such as masonry ties.

1. Vapor-Retarding Membrane Air Barrier: Apply to manufacturer’s required minimum thickness for trowel-applied or spray-applied membrane.
2. Vapor-Permeable Membrane Air Barrier: Apply to manufacturer’s required minimum thickness for trowel-applied or spray-applied membrane.

E. Lap liquid applied membrane 1 inch over self-adhering transition membranes to seal leading edge according to air barrier manufacturer's written instructions.

F. Do not cover air barrier until it has been tested and inspected by Owner's testing agency.

G. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air barrier components.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections and prepare test reports.

B. Inspections: Air barrier materials and installation are subject to inspection for compliance with requirements. Inspections may include the following:

1. Continuity of air barrier system has been achieved throughout the building envelope with no gaps or holes.
2. Continuous structural support of air barrier system has been provided.
3. Masonry and concrete surfaces are smooth, clean and free of cavities, protrusions, and mortar droppings.
4. Site conditions for application temperature and dryness of substrates have been maintained.
5. Maximum exposure time of materials to UV deterioration has not been exceeded.
6. Surfaces have been primed, if applicable.
7. Laps in strips and transition strips have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fishmouths.
8. Termination mastic has been applied on cut edges.
9. Strips and transition strips have been firmly adhered to substrate.
10. Compatible materials have been used.
11. Transitions at changes in direction and structural support at gaps have been provided.
12. Connections between assemblies (membrane and sealants) have complied with requirements for cleanliness, preparation and priming of surfaces, structural support, integrity, and continuity of seal.
13. All penetrations have been sealed.

3.7 CLEANING AND PROTECTION

A. Protect air barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.

1. Protect air barrier from exposure to UV light and harmful weather exposure as required by manufacturer. Remove and replace air barrier exposed for more than 30 days.
2. Protect air barrier from contact with creosote, uncured coal-tar products, TPO, EPDM, flexible PVC membranes, and sealants not approved by air barrier manufacturer.

B. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended by manufacturer of affected construction.

C. Remove masking materials after installation.

END OF SECTION 07 27 26

SECTION 07 41 13.16 - STANDING-SEAM METAL ROOF PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes
1. Standing-seam metal roof panels.
2. Seam-mounted snow guards.
3. Gutters and Downspouts

B. Related Sections:

1. Section 075423 ‘Thermoplastic Polyolefin (TPO) Roofing’, for roofing insulation.
2. Section 076200 ‘Sheet Metal Flashing And Trim’
3. Section 077100 ‘’Roof Specialties’ for roof edge drainage systems

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review methods and procedures related to metal panel installation, including manufacturer's written instructions.
3. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
4. Review structural loading limitations of deck during and after roofing.
5. Review flashings, special details, drainage, penetrations, equipment curbs, and condition of other construction that affect metal panels.
6. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
7. Review temporary protection requirements for metal panel systems during and after installation.
8. Review procedures for repair of metal panels damaged after installation.
9. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.4 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable LEED Credits

1. SSc7.2

2. MRc2
3. MRc4
4. MRc5
5. IEQc4.2

B. LEED Requirements

1. SSc7.2:

   All roofing materials shall comply with the project requirements for Heat Island Effect, Roof. See Section 013510 Sustainable Design Requirements.Contractor shall provide LEED credit verification as per section 013300 Submittal Procedures.

2. MRc2: CONSTRUCTION WASTE MANAGEMENT

   No less than the specified portion of all construction waste from the Project shall be diverted from disposal in a landfill and/or incineration in with the Project Requirements for Construction Waste Management and Disposal. Refer to Specification Sections 017419 Construction Waste Management and Disposal and 013510 Sustainable Design Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

3. MRc4: Recycled Content Material

   No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the Project Requirements for Recycled Content Materials. All materials counted towards the computations of the proportion of the Recycled Content Materials shall comply with the standard minimum percentages of post-consumer waste materials and for the minimum percentages of pre-consumer waste materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

4. MRc5: REGIONALLY MANUFACTURED HARVESTED MATERIALS

   No less than the specified minimum proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the Project Site in accordance with the Project Requirements for Regionally Manufactured and/or Harvested Materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

5. IEQc4.2: Low Emitting Materials: Paints and Coatings

   All paints and coatings in the building interior shall comply with the Project Requirements for Low Emitting Materials – Paints and Coatings. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

B. Sustainable Design Submittals:

1. Product Test Reports: For roof materials, documentation indicating that roof materials comply with Solar Reflectance Index requirements.
2. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.

C. Shop Drawings:

1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
2. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches (1:10).

D. Samples for Initial Selection: For each type of metal panel indicated with factory-applied color finishes.

1. Include similar Samples of trim and accessories involving color selection.

E. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.

1. Metal Panels: 12 inches (305 mm) long by actual panel width. Include clips, fasteners, closures, and other metal panel accessories.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each product, for tests performed by a qualified testing agency.

C. Field quality-control reports.

D. Sample Warranties: For special warranties.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal panels to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. UL-Certified, Portable Roll-Forming Equipment: UL-certified, portable roll-forming equipment capable of producing metal panels warranted by manufacturer to be the same as factory-formed products. Maintain UL certification of portable roll-forming equipment for duration of work.

C. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockups for typical roof area only, including accessories.

a. Size: 12 feet (3.5 m) long by 6 feet (1.75 m).
b. Each type of exposed seam and seam termination.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.

B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Retain strippable protective covering on metal panels during installation.

1.10 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

1.11 COORDINATION

A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

B. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.12 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including rupturing, cracking, or puncturing.
b. Deterioration of metals and other materials beyond normal weathering.

2. Warranty Period: Two years from date of Substantial Completion.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

C. Special Weather tightness Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that fail to remain weathertight, including leaks, within specified warranty period.

1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General: Provide metal roof panel system meeting performance requirements as determined by application of specified tests by a qualified testing agency on manufacturer's standard assemblies.

B. Air Infiltration: Maximum 0.03 cfm/sq. ft. (0.3 L/s per sq. m) per ASTM E 1680 at a static-air-pressure difference of 4 lbf/sq. ft. (191.5 Pa).

C. Water Penetration Static Pressure: No uncontrolled water penetration at a static pressure of 6.4 lbf/sq. ft(306.4 Pa) when tested per ASTM E 1646.

D. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592:

1. Wind Loads: As indicated on Drawings.
2. Other Design Loads: As indicated on Drawings.
3. Deflection Limits: For wind loads, no greater than 1/180 of the span.

E. Hydrostatic-Head Resistance: No water penetration when tested according to ASTM E 2140.

F. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.

1. Uplift Rating: UL 90.

G. FM Global Listing: Provide metal roof panels and component materials that comply with requirements in FM Global 4471 as part of a panel roofing system and that are listed in FM Global's "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Global markings.

1. Fire/Windstorm Classification: Class 1A- 90.
2. Hail Resistance: SH.

H. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

I. Energy Performance:

1. Solar Reflectance Index: Minimum 78 for roof slopes of 2:12 or less and 29 for roof slopes greater than 2:12 per ASTM E 1980.

J. Fire Performance Characteristics: Provide metal roof panel system with the following fire-test characteristics.

1. Surface-Burning Characteristics: Provide metal roof panel system with the following characteristics when tested per ASTM E 84.
   a. Flame spread index: 25 or less.
   b. Smoke developed index: 450 or less.

K. Snow Guards Performance Requirements: Provide snow guards that withstand exposure to weather and resist thermally induced movement without failure, rattling, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.
1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

L. Structural Performance:
1. Snow Loads: As indicated on Drawings.

2.2 STANDING-SEAM METAL ROOF PANELS

A. General: Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates, and accessories required for weathertight installation.

1. Steel Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E 1514.

B. Vertical-Rib, Seamed-Joint, Standing-Seam Metal Roof Panels: Formed with vertical ribs at panel edges and intermediate stiffening ribs symmetrically spaced between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels, engaging opposite edge of adjacent panels, and mechanically seaming panels together.

1. Basis of Design: CENTRIA, SRS3 Structural Standing Seam Metal Roof Panel System.

2. Metallic-Coated Steel Sheet: Aluminum-zinc alloy-coated steel sheet complying with ASTM A 792/A 792M, Class AZ50 (Class AZM150) coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.

a. Nominal Thickness: 0.036 inch (0.91 mm).
b. Surface: Smooth

3. Clips: Two-piece floating to accommodate thermal movement.

a. Material: 0.062-inch- (1.59-mm-) thick, stainless-steel sheet.

4. Panel Coverage: 18 inches (457 mm).

2.3 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Underlayment: Provide self-adhering, cold-applied, sheet underlayment, a minimum of 30 mils (0.76 mm) thick, consisting of slip-resistant, polyethylene-film top surface laminated to a layer of butyl or SBS-modified asphalt adhesive, with release-paper backing. Provide primer when recommended by underlayment manufacturer.

1. Thermal Stability: Stable after testing at 240 deg F (116 deg C); ASTM D 1970.
2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F (29 deg C); ASTM D 1970.
3. <Double click here to find, evaluate, and insert list of manufacturers and products.>

B. Slip Sheet: Manufacturer's recommended slip sheet, of type required for application.

2.4 RAIL-TYPE SNOW GUARDS

A. Seam-Mounted, Rail-Type Snow Guards:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Alpine SnowGuards, a division of Vermont Slate & Copper Services, Inc. “SnowMaxSnowMax Standing Seam Fence-Style Snow Guard. **Basis of Design**
b. LMCurbs.
c. Sno-Gem, Inc.

d. Snow Management Systems.
e. TRA SNOW & SUN, INC.
f. S-5

2. Description: Snow guard rails fabricated from metal pipes, bars, or extrusions, anchored to brackets and equipped with one rail with color-matching inserts of material and finish used for metal roofing.
3. Material and Finish: Aluminum; Custom finish to match metal roof.

2.5 MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Subframing and Furring: ASTM C 645; cold-formed, metallic-coated steel sheet, ASTM A 653/A 653M, G90 (Z275 hot-dip galvanized) coating designation or ASTM A 792/A 792M, Class AZ50 (Class AZM150) coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.

B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.

1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal panels.
2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers.
1. Finish flashing and trim to match metal roof panels.

D. Gutters: Formed from same material as roof panels, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum 96-inch- (2400-mm-) long sections, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual." Furnish gutter supports spaced a maximum of 36 inches (914 mm) o.c., fabricated from same metal as gutters. Provide wire ball strainers of compatible metal at outlets.

1. Size: As indicated on drawings.
2. Finish gutters to match metal panels.

E. Downspouts: Formed from same material as roof panels. Fabricate in 10-foot- (3-m-) long sections, complete with formed elbows and offsets, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual."

1. Finish colors at cast stone: Match cast stone.
2. Finish colors at metal panel system: Match metal panel
3. Size: As indicated on drawings

F. Panel Fasteners: Self-tapping screws designed to withstand design loads.

G. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.

1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
2. Joint Sealant: ASTM C 920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

2.6 FABRICATION

A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.

C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

D. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.

E. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
2. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
3. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
5. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.

a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal panel manufacturer for application, but not less than thickness of metal being secured.

2.7 FINISHES

A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are unacceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Steel Roof Panels and Accessories:

1. Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

a. Basis of Design: CENTRIA Duraguard Plus.

1) Color: #971 “Chromium Grey”

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.

1. Examine primary and secondary roof framing to verify that rafters, purlins, angles, channels, and other structural panel support members and anchorages have been installed within alignment tolerances required by metal roof panel manufacturer.
2. Examine solid roof sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal roof panel manufacturer.

a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

3.3 UNDERLAYMENT INSTALLATION

A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply at locations indicated, wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches (152 mm) staggered 24 inches (610 mm) between courses. Overlap side edges not less than 3-1/2 inches (90 mm). Extend underlayment into gutter trough. Roll laps with roller. Cover underlayment within 14 days.
   1. Apply over the roof area indicated below:

      a. Roof perimeter for a distance up from eaves of 36 inches (914 mm) beyond interior wall line.
      b. Around penetrating elements for a distance from element of 18 inches (460 mm).

B. Slip Sheet: Apply slip sheet over underlayment before installing metal roof panels.

C. Flashings: Install flashings to cover underlayment to comply with requirements specified in Section 076200 "Sheet Metal Flashing and Trim."

3.4 METAL PANEL INSTALLATION

A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install metal roof panels in one piece lengths from the ridge to eave. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.

   1. Shim or otherwise plumb substrates receiving metal panels.
   2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
   3. Install screw fasteners in predrilled holes.
   4. Locate and space fastenings in uniform vertical and horizontal alignment.
   5. Install flashing and trim as metal panel work proceeds.
   6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
   7. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
   8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.

B. Fasteners:

   1. Steel Panels: Use stainless-steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.

C. Anchor Clips: Anchor metal roof panels and other components of the Work securely in place, using manufacturer's approved fasteners according to manufacturers' written instructions.

D. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.

E. Standing-Seam Metal Roof Panel Installation: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended in writing by manufacturer.

1. Install clips to supports with self-tapping fasteners.
2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
3. Seamed Joint: Crimp standing seams with manufacturer-approved, motorized seamer tool so clip, metal roof panel, and factory-applied sealant are completely engaged.
4. Watertight Installation:

    a. Apply a continuous ribbon of sealant or tape to seal joints of metal panels, using sealant or tape as recommend in writing by manufacturer as needed to make panels watertight.
    b. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
    c. At panel splices, nest panels with minimum 6-inch (152-mm) end lap, sealed with sealant and fastened together by interlocking clamping plates.

F. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal roof panel manufacturers; or, if not indicated, types recommended by metal roof panel manufacturer.

G. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

1. Install exposed flashing and trim that is without buckling and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and achieve waterproof and weather-resistant performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (610 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

H. Gutters: Join sections with riveted and soldered or lapped and sealed joints. Attach gutters to eave with gutter hangers spaced not more than 36 inches (914 mm) o.c. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.

I. Downspouts: Join sections with telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch (25 mm) away from walls; locate fasteners at top and bottom and at approximately 60 inches (1524 mm) o.c. in between.

1. Provide elbows at base of downspouts to direct water away from building.
2. Connect downspouts to underground drainage system indicated.

J. Roof Curbs: Install flashing around bases where they meet metal roof panels.

K. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to metal roof panels as recommended by manufacturer.

3.5 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align metal panel units within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines as indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.6 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect metal roof panel installation, including accessories. Report results in writing.

B. Remove and replace applications of metal roof panels where tests and inspections indicate that they do not comply with specified requirements.

C. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.

D. Prepare test and inspection reports.

3.7 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

B. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07 41 13.16

SECTION 07 42 13.13 - FORMED METAL WALL PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Exposed-fastener, lap-seam aluminum metal wall panels.

B. Related Sections:
1. Section 074213.23 "Metal Composite Material Wall Panels" for metal-faced composite wall panels.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review methods and procedures related to metal panel installation, including manufacturer's written instructions.
3. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
4. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that affect metal panels.
5. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
6. Review temporary protection requirements for metal panel assembly during and after installation.
7. Review of procedures for repair of metal panels damaged after installation.
8. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.4 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable LEED Credits

1. MRc2
2. MRc4
3. MRc5
4. IEQc4.1

B. LEED Requirements

1. MRc2: CONSTRUCTION WASTE MANAGEMENT

No less than the specified portion of all construction waste from the Project shall be diverted from disposal in a landfill and/or incineration in with the Project Requirements for Construction Waste Management and Disposal. Refer to Specification Sections 017419 Construction Waste Management and Disposal and 013510 Sustainable Design Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

2. MRc4: Recycled Content Material

No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the Project Requirements for Recycled Content Materials. All materials counted towards the computations of the proportion of the Recycled Content Materials shall comply with the standard minimum percentages of post-consumer waste materials and for the minimum percentages of pre-consumer waste materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

3. MRc5: REGIONALLY MANUFACTURED HARVESTED MATERIALS

No less than the specified minimum proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the Project Site in accordance with the Project Requirements for Regionally Manufactured and/or Harvested Materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

4. IEQc4.1: Low Emitting Materials: Sealants and Adhesives

All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the Project Requirements for Low Emitting Materials – Sealants and Adhesives. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

B. Shop Drawings:

1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
2. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches (1:10).

C. Samples for Initial Selection: For each type of metal panel indicated with factory-applied finishes.

1. Include Samples of trim and accessories involving color selection.

D. Samples for Verification: For each type of exposed finish, prepared on Samples of size indicated below:

1. Metal Panels: 12 inches (305 mm) long by actual panel width. Include fasteners, closures, and other metal panel accessories.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each product, for tests performed by a qualified testing agency.

C. Field quality-control reports.

D. Sample Warranties: For special warranties.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal panels to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. UL-Certified, Portable Roll-Forming Equipment: UL-certified, portable roll-forming equipment capable of producing metal panels warranted by manufacturer to be the same as factory-formed products. Maintain UL certification of portable roll-forming equipment for duration of work.

C. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockup of typical metal panel assembly, including corner, supports, attachments, and accessories.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.

B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Retain strippable protective covering on metal panels during installation.

E. Copper Panels: Wear gloves when handling to prevent fingerprints and soiling of surface.

1.10 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

1.11 COORDINATION

A. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.12 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including rupturing, cracking, or puncturing.
b. Deterioration of metals and other materials beyond normal weathering.

2. Warranty Period: Two years from date of Substantial Completion.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.

b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592:

1. Wind Loads: As indicated on Drawings.
2. Other Design Loads: As indicated on Drawings.
3. Deflection Limits: For wind loads, no greater than 1/240 of the span.

B. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) when tested according to ASTM E 283 at the following test-pressure difference:

1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).

C. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 331 at the following test-pressure difference:

1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

E. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 EXPOSED-FASTENER, LAP-SEAM METAL WALL PANELS

A. General: Provide factory-formed metal panels designed to be field assembled by lapping side edges of adjacent panels and mechanically attaching panels to supports using exposed fasteners in side laps. Include accessories required for weathertight installation.

1. Aluminum Sheet: Coil-coated sheet, ASTM B 209 (ASTM B 209M), alloy as standard with manufacturer, with temper as required to suit forming operations and structural performance required.

B. Tapered-Rib-Profile, Exposed-Fastener Metal Wall Panels : Formed with raised, trapezoidal major ribs and intermediate stiffening ribs symmetrically spaced between major ribs.

1. Basis-of-Design: Centria Provile Series BR5-36.

a. Nominal Thickness: 0.040 inch (1.02 mm).
b. Surface: [**Smooth, flat**] [**Embossed**] finish.
c. Exterior Finish: Two-coat mica fluoropolymer.
d. Color: Centria Color 9946 Silversmith.

2.3 MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Subframing and Furring: ASTM C 645, cold-formed, metallic-coated steel sheet, ASTM A 653/A 653M, G90 (Z275 hot-dip galvanized) coating designation or ASTM A 792/A 792M, Class AZ50 (Class AZM150) aluminum-zinc-alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.

B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.

1. Closures: Provide closures at eaves and rakes, fabricated of same metal as metal panels.
2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.

D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.

E. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.

1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
2. Joint Sealant: ASTM C 920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and

remain weathertight; and as recommended in writing by metal panel manufacturer.

3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

2.4 FABRICATION

A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.

C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

D. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.

E. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
3. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
5. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.

a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.

2.5 FINISHES

A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable

variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Aluminum Panels and Accessories:

1. Mica Fluoropolymer: AAMA 621. Two-coat fluoropolymer finish with suspended mica flakes containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
2. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.

1. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal wall panel manufacturer.
2. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal wall panel manufacturer.

a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

3.3 METAL PANEL INSTALLATION

A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Shim or otherwise plumb substrates receiving metal panels.
2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
3. Install screw fasteners in predrilled holes.
4. Locate and space fastenings in uniform vertical and horizontal alignment.
5. Install flashing and trim as metal panel work proceeds.
6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
7. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.

B. Fasteners:

1. Aluminum Panels: Use aluminum or stainless-steel fasteners for surfaces exposed to the exterior; use aluminum or galvanized-steel fasteners for surfaces exposed to the interior.

C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.

D. Lap-Seam Metal Panels: Fasten metal panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.

1. Lap ribbed or fluted sheets one full rib. Apply panels and associated items true to line for neat and weathertight enclosure.
2. Provide metal-backed washers under heads of exposed fasteners bearing on weather side of metal panels.
3. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
4. Install screw fasteners with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.
5. Flash and seal panels with weather closures at perimeter of all openings.

E. Watertight Installation:

1. Apply a continuous ribbon of sealant or tape to seal lapped joints of metal panels, using sealant or tape as recommend by manufacturer on side laps of nesting-type panels; and elsewhere as needed to make panels watertight.
2. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
3. At panel splices, nest panels with minimum 6-inch (152-mm) end lap, sealed with sealant and fastened together by interlocking clamping plates.

F. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips,

and similar items. Provide types indicated by metal wall panel manufacturer; or, if not indicated, provide types recommended by metal panel manufacturer.

G. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that are permanently watertight.

1. Install exposed flashing and trim that is without buckling and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and achieve waterproof performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (610 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect completed metal wall panel installation, including accessories.

C. Remove and replace metal wall panels where tests and inspections indicate that they do not comply with specified requirements.

D. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.

E. Prepare test and inspection reports.

3.5 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

B. After metal panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

C. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074213.13

SECTION 07 42 13.19 - INSULATED METAL WALL PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Foamed-insulation-core metal wall panels.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, metal panel Installer, metal panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal panels, including installers of doors, windows, and louvers.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review methods and procedures related to metal panel installation, including manufacturer's written instructions.
4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
5. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that affect metal panels.
6. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
7. Review temporary protection requirements for metal panel assembly during and after installation.
8. Review procedures for repair of metal panels damaged after installation.
9. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.4 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable LEED Credits

1. MRc2
2. MRc4
3. MRc5
4. IEQc4.1

B. LEED Requirements

1. MRc2: CONSTRUCTION WASTE MANAGEMENT

No less than the specified portion of all construction waste from the Project shall be diverted from disposal in a landfill and/or incineration in with the Project Requirements for Construction Waste Management and Disposal. Refer to Specification Sections 017419 Construction Waste Management and Disposal and 013510 Sustainable Design Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

2. MRc4: Recycled Content Material

No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the Project Requirements for Recycled Content Materials. All materials counted towards the computations of the proportion of the Recycled Content Materials shall comply with the standard minimum percentages of post-consumer waste materials and for the minimum percentages of pre-consumer waste materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

3. MRc5: REGIONALLY MANUFACTURED HARVESTED MATERIALS

No less than the specified minimum proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the Project Site in accordance with the Project Requirements for Regionally Manufactured and/or Harvested Materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

4. IEQc4.1: Low Emitting Materials: Sealants and Adhesives

All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the Project Requirements for Low Emitting Materials – Sealants and Adhesives. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

B. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.

C. Shop Drawings:

1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
2. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches (1:10).

D. Samples for Initial Selection: For each type of metal panel indicated with factory-applied color finishes.

1. Include similar Samples of trim and accessories involving color selection.

E. Samples for Verification: For each type of exposed finish, prepared on Samples of size indicated below.

1. Metal Panels: 12 inches (305 mm) long by actual panel width. Include fasteners, closures, and other metal panel accessories.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each product, tests performed by a qualified testing agency.

C. Field quality-control reports.

D. Sample Warranties: For special warranties.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal panels to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockup of typical metal panel assembly, including corner, soffits, supports, attachments, and accessories.
2. Water-Spray Test: Conduct water-spray test of metal panel assembly mockup, testing for water penetration according to AAMA 501.2.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.

B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Retain strippable protective covering on metal panels during installation.

1.10 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

1.11 COORDINATION

A. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.12 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including rupturing, cracking, or puncturing.
b. Deterioration of metals and other materials beyond normal weathering.

2. Warranty Period: Two years from date of Substantial Completion.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 72:

1. Wind Loads: As indicated on Drawings.
2. Other Design Loads: As indicated on Drawings.
3. Deflection Limits: For wind loads, no greater than 1/240 of the span.

B. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) when tested according to ASTM E 283 at the following test-pressure difference:

1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).

C. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 331 at the following test-pressure difference:

1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

E. Fire-Test-Response Characteristics: Provide metal wall panels and system components with the following fire-test-response characteristics, as determined by testing identical panels and system components per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing agency.

1. Fire-Resistance Characteristics: Provide materials and construction tested for fire resistance per ASTM E 119.
2. Intermediate-Scale Multistory Fire Test: Tested mockup, representative of completed multistory wall assembly of which wall panel is a part, complies with NFPA 285 for test method and required fire-test-response characteristics of exterior non-load-bearing wall panel assemblies.
3. Radiant Heat Exposure: No ignition when tested according to NFPA 268.
4. Potential Heat: Acceptable level when tested according to NFPA 259.
5. Surface-Burning Characteristics: Provide wall panels with a flame-spread index of 25 or less and a smoke-developed index of 450 or less, per ASTM E 84.

2.2 FOAMED-INSULATION-CORE METAL WALL PANELS

A. General: Provide factory-formed and -assembled metal wall panels fabricated from two metal facing sheets and insulation core foamed in place during fabrication, and with joints between panels designed to form weathertight seals. Include accessories required for weathertight installation.

1. Insulation Core: Modified isocyanurate foam using a non-CFC blowing agent, with maximum flame-spread and smoke-developed indexes of 25 and 450, respectively.

a. Closed-Cell Content: 90 percent when tested according to ASTM D 6226.
b. Density: 2.7 lb/cu. ft. when tested according to ASTM D 1622.
c. Compressive Strength: Minimum 20 psi (140 kPa) when tested according to ASTM D 1621.
d. Shear Strength: 26 psi (179 kPa) when tested according to ASTM C 273/C 273M.

B. Concealed-Fastener, Foamed-Insulation-Core Metal Wall Panels: Formed with tongue-and-groove panel edges; designed for sequential installation by interlocking panel edges and mechanically attaching panels to supports using concealed clips or fasteners.

1. Basis of Design Product: Provide CENTRIA Architectural Systems “Formawall Dimension Series Insulated Core Metal Wall Panels”, or comparable product, subject to compliance with requirements.

2. Metallic-Coated Steel Sheet: Facings of zinc-coated (galvanized) steel sheet complying with ASTM A 653/A 653M, G90 (Z275) coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A 792/A 792M, Class AZ50 (Class AZM150) coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.

a. Nominal Thickness: [**0.030 inch (0.76 mm)**].
b. Surface: Smooth, flat.
c. Exterior Finish: Two-coat mica fluoropolymer.

1) Color: Match formed metal wall panels.

d. Interior Finish: 0.2 mil primer with 0.6 mil acrylic color coat.

1) Color: As selected by Architect from manufacturer's full range.

3. Panel Coverage: Custom widths indicated.
4. Panel Thickness: 2.5 inches (64 mm).
5. Thermal-Resistance Value (R-Value): R-17 according to ASTM C 1363.
6.

2.3 MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Subframing and Furring: ASTM C 645, cold-formed, metallic-coated steel sheet, ASTM A 653/A 653M, G90 (Z275 hot-dip galvanized) coating designation or ASTM A 792/A 792M, Class AZ50 (Class AZM150) aluminum-zinc-alloy

coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.

B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.

1. Closures: Provide closures at eaves and rakes, fabricated of same metal as metal panels.
2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.

D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.

E. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.

1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
2. Joint Sealant: ASTM C 920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

2.4 FABRICATION

A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

C. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.

D. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
2. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
3. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
5. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.

a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.

2.5 FINISHES

A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Steel Panels and Accessories:
1. Mica Fluoropolymer: AAMA 621. Two-coat fluoropolymer finish with suspended mica flakes containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
2. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.8 mil.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.

1. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal wall panel manufacturer.
2. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal wall panel manufacturer.

    a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

3.3 METAL PANEL INSTALLATION

A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Shim or otherwise plumb substrates receiving metal panels.
2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
3. Install screw fasteners in predrilled holes.
4. Locate and space fastenings in uniform vertical and horizontal alignment.
5. Install flashing and trim as metal panel work proceeds.
6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
7. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.

B. Fasteners:

1. Steel Panels: Use stainless-steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.

C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.

D. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weathertight performance of metal wall panel assemblies. Provide types of gaskets, fillers, and sealants indicated by metal panel manufacturer; or, if not indicated, provide types recommended by metal wall panel manufacturer.

1. Seal metal wall panel end laps with double beads of tape or sealant, full width of panel. Seal side joints where recommended by metal wall panel manufacturer.
2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

3.4 INSULATED METAL WALL PANEL INSTALLATION

A. General: Apply continuous ribbon of sealant to panel joint on concealed side of insulated metal wall panels as vapor seal; apply sealant to panel joint on exposed side of panels for weather seal.

1. Fasten foamed-insulation-core metal wall panels to supports with fasteners at each lapped joint at location and spacing and with fasteners recommended by manufacturer.
2. Apply panels and associated items true to line for neat and weathertight enclosure. Avoid "panel creep" or application not true to line.
3. Provide metal-backed washers under heads of exposed fasteners on weather side of insulated metal wall panels.
4. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
5. Provide sealant tape at lapped joints of insulated metal wall panels and between panels and protruding equipment, vents, and accessories.
6. Apply a continuous ribbon of sealant tape to panel side laps and elsewhere as needed to make panels weathertight.
7. Apply snap-on battens to exposed-fastener, insulated-core metal wall panel seams to conceal fasteners.

B. Foamed-Insulation-Core Metal Wall Panels: Fasten metal wall panels to supports with concealed clips at each joint at location and spacing and with fasteners recommended by manufacturer. Fully engage tongue and groove of adjacent panels.

1. Install clips to supports with self-tapping fasteners.

C. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal panel manufacturer; or, if not indicated, provide types recommended by metal panel manufacturer.

D. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level. Install work with laps, joints, and seams that are permanently watertight.

1. Install exposed flashing and trim that is without buckling and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to achieve waterproof performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (610 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Water-Spray Test: After installation, test area of assembly as directed by Architect for water penetration according to AAMA 501.2.

C. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect completed metal wall panel installation, including accessories.

D. Metal wall panels will be considered defective if they do not pass test and inspections.

E. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.

F. Prepare test and inspection reports.

3.6 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

B. After metal panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

C. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074213.19

SECTION 07 54 23 - THERMOPLASTIC POLYOLEFIN (TPO) ROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Adhered thermoplastic polyolefin (TPO) roofing system.
2. Vapor retarder.
3. Roof insulation.

B. Section includes the installation of insulation strips in ribs of roof deck. Insulation strips are furnished under Section 053100 "Steel Decking."

C. Related Requirements:

1. Division 06 Section " Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.
2. Division 07 Section "Sheet Metal Flashing and Trim" for metal roof penetration flashings, flashings, and counterflashings.
3. Division 07 Section "Joint Sealants" for joint sealants, joint fillers, and joint preparation.
4. Division 22 Section "Storm Drainage Piping Specialties" for roof drains.

1.3 DEFINITIONS

A. Roofing Terminology: Definitions in ASTM D 1079 and glossary in NRCA's "The NRCA Roofing and Waterproofing Manual" apply to work of this Section.

B. TPO: Thermoplastic polyolefin.

1.4 PREINSTALLATION MEETINGS

A. Preliminary Roofing Conference: Before starting roof deck construction, conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.

3. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review deck substrate requirements for conditions and finishes, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

B. Preinstallation Roofing Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

1.5 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable LEED Credits

1. SSc7.2
2. MRc2
3. MRc4
4. MRc5
5. IEQc4.1

B. LEED Requirements

1. SSc7.2:

   All roofing materials shall comply with the project requirements for Heat Island Effect, Roof. See Section 013510 Sustainable Design Requirements. Contractor shall provide LEED credit verification as per section 013300 Submittal Procedures.

2. MRc2: CONSTRUCTION WASTE MANAGEMENT

   No less than the specified portion of all construction waste from the Project shall be diverted from disposal in a landfill and/or incineration in with the Project Requirements for Construction Waste Management and Disposal. Refer to Specification Sections 017419 Construction Waste Management and Disposal and 013510 Sustainable Design Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

3. MRc4: Recycled Content Material

   No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the Project Requirements for Recycled Content Materials. All materials counted towards the computations of the proportion of the Recycled Content Materials shall comply with the standard minimum percentages of post-consumer waste materials and for the minimum percentages of pre-consumer waste materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

4. MRc5: REGIONALLY MANUFACTURED HARVESTED MATERIALS

   No less than the specified minimum proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the Project Site in accordance with the Project Requirements for Regionally Manufactured and/or Harvested Materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

5. IEQc4.1: Low Emitting Materials: Sealants and Adhesives

   All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the Project Requirements for Low Emitting Materials – Sealants and Adhesives. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

   1. Product Test Reports: For roof materials, documentation indicating that roof materials comply with Solar Reflectance Index requirements.
   2. Product Data: For adhesives and sealants, indicating VOC content.
   3. Laboratory Test Reports: For adhesives and sealants, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work, including:

   1. Base flashings and membrane terminations.

2. Tapered insulation, including slopes.

D. Samples for Verification: For the following products:

1. Sheet roofing, of color required.
2. Walkway pads or rolls, of color required.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and manufacturer.

B. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.

1. Submit evidence of compliance with performance requirements.

C. Product Test Reports: For components of roofing system, tests performed by manufacturer and witnessed by a qualified testing agency.

D. Research/Evaluation Reports: For components of roofing system, from ICC-ES.

E. Field quality-control reports.

F. Sample Warranties: For manufacturer's special warranties.

1.8 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roofing system to include in maintenance manuals.

1.9 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is FM Global approved for roofing system identical to that used for this Project.

B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.

1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

D. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.

1.11 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.12 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.

1. Special warranty includes roofing, base flashings, roof insulation, cover boards, substrate board, roofing accessories, and other components of roofing system.
2. Warranty Period: 10 years from date of Substantial Completion.

B. Special Project Warranty: Submit roofing Installer's warranty, on warranty form at end of this Section, signed by Installer, covering the Work of this Section, including all components of roofing system such as roofing, base flashing, roof insulation, fasteners, cover boards, substrate boards, vapor retarders, roof pavers, and walkway products, for the following warranty period:

1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following :

a. Carlisle SynTec Incorporated.
b. Custom Seal Roofing.
c. Firestone Building Products Company.
d. GAF Materials Corporation.
e. GenFlex Roofing Systems.
f. Johns Manville.
g. Mule-Hide Products Co., Inc.
h. Stevens Roofing Systems; Division of JPS Elastomerics.
i. Versico Incorporated.

B. Source Limitations: Obtain components including roof insulation for roofing system from same manufacturer as membrane roofing or manufacturer approved by membrane roofing manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. General Performance: Installed roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roofing and base flashings shall remain watertight.

1. Accelerated Weathering: Roofing system shall withstand 2000 hours of exposure when tested according to ASTM G 152, ASTM G 154, or ASTM G 155.
2. Impact Resistance: Roofing system shall resist impact damage when tested according to ASTM D 3746 or ASTM D 4272.

B. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roofing manufacturer based on testing and field experience.

C. FM Global Listing: Roofing, base flashings, and component materials shall comply with requirements in FM Global 4450 or FM Global 4470 as part of a built-up roofing system, and shall be listed in FM Global's "RoofNav" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Global markings.

1. Fire/Windstorm Classification: Class 1A-60.
2. Hail-Resistance Rating: MH.

D. Solar Reflectance Index: Not less than 78 when calculated according to ASTM E 1980, based on testing identical products by a qualified testing agency.

E. Energy Star Listing: Roofing system shall be listed on the DOE's ENERGY STAR "Roof Products Qualified Product List" for low-slope roof products.

F. Energy Performance: Roofing system shall have an initial solar reflectance of not less than 0.70 and an emissivity of not less than 0.75 when tested according to CRRC-1.

G. Exterior Fire-Test Exposure: ASTM E 108 or UL 790, Class A; for application and roof slopes indicated; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

H. Fire-Resistance Ratings: Comply with fire-resistance-rated assembly designs indicated. Identify products with appropriate markings of applicable testing agency.

2.3 TPO ROOFING

A. Fabric-Reinforced TPO Sheet: ASTM D 6878, internally fabric- or scrim-reinforced, uniform, flexible fabric-backed TPO sheet.

1. Thickness: 60 mils (1.5 mm), nominal.
2. Exposed Face Color: White.

2.4 AUXILIARY ROOFING MATERIALS

A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with roofing.

1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.
2. Adhesives and sealants shall comply with the following limits for VOC content:

    a. Plastic Foam Adhesives: 50 g/L.
    b. Gypsum Board and Panel Adhesives: 50 g/L.
    c. Multipurpose Construction Adhesives: 70 g/L.
    d. Fiberglass Adhesives: 80 g/L.
    e. Contact Adhesives: 80 g/L.
    f. PVC Welding Compounds: 510 g/L.
    g. Other Adhesives: 250 g/L.
    h. Single-Ply Roof Membrane Sealants: 450 g/L.
    i. Nonmembrane Roof Sealants: 300 g/L.
    j. Sealant Primers for Nonporous Substrates: 250 g/L.
    k. Sealant Primers for Porous Substrates: 775 g/L.

3. Adhesives and sealants shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

B. Sheet Flashing: Manufacturer's standard unreinforced TPO sheet flashing, 55 mils (1.4 mm) thick, minimum, of same color as TPO sheet.

C. Bonding Adhesive: Manufacturer's standard, water based.

D. Slip Sheet: Manufacturer's standard, of thickness required for application.

E. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch (25 by 3 mm) thick; with anchors.

F. Metal Battens: Manufacturer's standard, aluminum-zinc-alloy-coated or zinc-coated steel sheet, approximately 1 inch wide by 0.05 inch thick (25 mm wide by 1.3 mm thick), prepunched.

G. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Global 4470, designed for fastening roofing to substrate, and acceptable to roofing system manufacturer.

H. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.

2.5 VAPOR RETARDER

A. Laminated Sheet: Kraft paper, two layers, laminated with asphalt and edge reinforced with woven fiberglass yarn with maximum permeance rating of 0.50 perm (29 ng/Pa x s x sq. m) and with manufacturer's standard adhesive.

2.6 ROOF INSULATION

A. General: Preformed roof insulation boards manufactured or approved by TPO membrane roofing manufacturer, selected from manufacturer's standard sizes suitable

for application, of thicknesses indicated and that produce FM Approvals-approved roof insulation.

B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class I, Grade 3, felt or glass-fiber mat facer on both major surfaces.

C. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches (1:48) unless otherwise indicated.

D. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

2.7 INSULATION ACCESSORIES

A. General: Furnish roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with membrane roofing.

B. Bead-Applied Insulation Adhesive: Insulation manufacturer's recommended bead-applied, low-rise, one- or multicomponent urethane adhesive formulated to attach roof insulation to substrate or to another insulation layer.

C. Thermal Barrier Underlayment: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate, 1/4 inch (16 mm) thick.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

D. Georgia-Pacific Corporation; Dens Deck Board

E. Cover Board: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate, 5/8 inch (16 mm) thick, factory primed.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Georgia-Pacific Corporation; Dens Deck Prime .

2.8 WALKWAYS

A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway pads or rolls, approximately 3/16 inch (5 mm) thick and acceptable to roofing system manufacturer.

1. Color: White

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work:

1. Verify that roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.
2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
3. Verify that minimum concrete drying period recommended by roofing system manufacturer has passed.
4. Verify that concrete substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
5. Verify that concrete-curing compounds that will impair adhesion of roofing components to roof deck have been removed.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

C. Install insulation strips according to acoustical roof deck manufacturer's written instructions.

3.3 ROOFING INSTALLATION, GENERAL

A. Install roofing system according to roofing system manufacturer's written instructions.

B. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

C. Install roofing and auxiliary materials to tie in to existing roofing to maintain weathertightness of transition and to not void warranty for existing roofing system.

3.4 VAPOR-RETARDER INSTALLATION

A. Laminate Sheet: Loosely lay laminate-sheet vapor retarder in a single layer over area to receive vapor retarder, side and end lapping each sheet a minimum of 2 inches (50 mm) and 6 inches (150 mm), respectively. Continuously seal side and end laps with tape.

B. Completely seal vapor retarder at terminations, obstructions, and penetrations to prevent air movement into roofing system.

3.5 INSULATION INSTALLATION

A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.

B. Comply with roofing system and insulation manufacturer's written instructions for installing roof insulation.

C. Install tapered insulation under area of roofing to conform to slopes indicated.

D. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inches (68 mm) or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches (150 mm) in each direction.

1. Where installing composite and noncomposite insulation in two or more layers, install noncomposite board insulation for bottom layer and intermediate layers, if applicable, and install composite board insulation for top layer.

E. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.

F. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch (6 mm) with insulation.

1. Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.

G. Mechanically Fastened Insulation: Install each layer of insulation and secure to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.

1. Fasten insulation according to requirements in FM Global's "RoofNav" for specified Windstorm Resistance Classification.
2. Fasten insulation to resist uplift pressure at corners, perimeter, and field of roof.

H. Mechanically Fastened and Adhered Insulation: Install each layer of insulation to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.

1. Fasten first layer of insulation according to requirements in FM Global's "RoofNav" for specified Windstorm Resistance Classification.
2. Fasten first layer of insulation to resist uplift pressure at corners, perimeter, and field of roof.
3. Set each subsequent layer of insulation in a solid mopping of hot roofing asphalt, applied within plus or minus 25 deg F (14 deg C) of equiviscous temperature.
4. Set each subsequent layer of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.
5. Set each subsequent layer of insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.

I. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches (150 mm) in each direction. Loosely butt cover boards together.

1. Fasten cover boards according to requirements in FM Global's "RoofNav" for specified Windstorm Resistance Classification.
2. Fasten cover boards to resist uplift pressure at corners, perimeter, and field of roof.

J. Install slip sheet over insulation and immediately beneath roofing.

3.6 BASE FLASHING INSTALLATION

A. Install sheet flashings and preformed flashing accessories, and adhere to substrates according to roofing system manufacturer's written instructions.

B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate, and allow to partially dry. Do not apply to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.

E. Terminate and seal top of sheet flashings.

3.7 WALKWAY INSTALLATION

A. Flexible Walkways: Install walkway products in locations indicated. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

3.8 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to inspect substrate conditions, surface preparation, membrane application, flashings, protection, and drainage components, and to furnish reports to Architect.

1. Electric Field Vector Mapping (EFVM): Testing agency shall survey entire roof area for potential leaks using electric field vector mapping (EFVM).

B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.

C. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.

D. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.9 PROTECTING AND CLEANING

A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction does not affect or endanger roofing, inspect roofing for

deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

3.10 ROOFING INSTALLER'S WARRANTY

A. WHEREAS _____ of _____, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:

1. Owner: _____.
2. Address: _____.
3. Building Name/Type: _____.
4. Address: _____.
5. Area of Work: _____.
6. Acceptance Date: _____.
7. Warranty Period: 20 years.
8. Expiration Date: _____.

B. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,

C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period he will, at his own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.

D. This Warranty is made subject to the following terms and conditions:

1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:

    a. Lightning;
    b. Peak gust wind speed exceeding 90 mph (m/sec);
    c. Fire;
    d. Failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
    e. Faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
    f. Vapor condensation on bottom of roofing; and
    g. Activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.

2. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.
3. Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of work.
4. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of said alterations, but only to the extent said alterations affect work covered by this Warranty. If Owner engages Roofing Installer to perform said alterations, Warranty shall not become null and void unless Roofing Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.
5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.
6. Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.
7. This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

E. IN WITNESS THEREOF, this instrument has been duly executed this _____ day of _____, _____.

1. Authorized Signature: _____.
2. Name: _____.
3. Title: _____.
4.

END OF SECTION 07 54 23

SECTION 07 62 00 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Manufactured through-wall flashing with counterflashing.
2. Manufactured reglets with counterflashing.
3. Formed low-slope roof sheet metal fabrications.
4. Formed wall sheet metal fabrications.
5. Formed equipment support flashing.
6. Formed overhead-piping safety pans.
7.

B. Related Requirements:

1. Section 061053 "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.
2. Section 076200 “Standing-Seam Metal Roof Panels” Installation of sheet metal flashing trim integral with roofing, and gutters and downspouts
3. Section 075423 “Thermoplastic Polyolefin (TPO) Roofing” Installation of sheet metal flashing and trim integral with roofing.
4. Section 074213.23 “Metal Composite Material Wall Panels" for sheet metal flashing and trim integral with metal wall panels.
5. Section 077200 "Roof Accessories" for set-on-type curbs, equipment supports, roof hatches, vents, and other manufactured roof accessory units.

1.3 COORDINATION

A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.

B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.4 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable LEED Credits

1. SSc7.2
2. MRc2
3. MRc4

4. MRc5
5. IEQc4.1

B. SSc7.2 REDUCTION OF HEAT ISLANDS, ROOF SURFACES

1. All roofing materials shall comply with the project requirements for Heat Island Effect, Roof. See Section 018113 Sustainable Design Requirements.
2. Contractor shall provide LEED credit verification as per section 013300 Submittal Procedures.

C. MRc2: CONSTRUCTION WASTE MANAGEMENT

1. No less than the specified minimum proportion of all construction waste from the project shall be diverted from disposal in a landfill and/or incineration in accordance with the project requirements for Construction Waste Management. See Section 018113 Sustainable Design Requirements.
2. Contractor shall provide LEED credit verification as per section 013300 Submittal Procedures.

D. MRc4: Recycled Content Material

1. No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the project requirements for Recycled Content Materials. All materials counted toward the computation of the proportion of the Recycled Content Materials shall comply with the standard for the minimum percentages of post-consumer waste materials and for the minimum percentage of pre-consumer waste materials. See Section 018113 Sustainable Design Requirements.
2. Contractor shall provide LEED credit verification as per Section 013300 Submittal Procedures.

E. MRc5: REGIONALLY MANUFACTURED HARVESTED MATERIALS

1. No less than the specified proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the project site in accordance with the project requirements for Regionally Manufactured and/or Harvested Materials. See Section 018113 Sustainable Design Requirements.
2. Contractor shall provide LEED credit verification as per Section 013300 Submittal Procedures

F. IEQc4.1; Low-Emitting Materials – Sealants and Adhesives

1. All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the Project Requirements for Low Emitting Materials – Sealants and Adhesives. Refer to Specification Section 013510 Sustainable Project Requirements.
2. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.

B. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.

C. Shop Drawings: For sheet metal flashing and trim.

1. Include plans, elevations, sections, and attachment details.
2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work.
3. Include identification of material, thickness, weight, and finish for each item and location in Project.
4. Include details for forming, including profiles, shapes, seams, and dimensions.
5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
6. Include details of termination points and assemblies.
7. Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.
8. Include details of roof-penetration flashing.
9. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashings as applicable.
10. Include details of special conditions.
11. Include details of connections to adjoining work.
12. Detail formed flashing and trim at scale of not less than 1-1/2 inches per 12 inches (1:10).

D. Samples for Initial Selection: For each type of sheet metal and accessory indicated with factory-applied finishes.

E. Samples for Verification: For each type of exposed finish.

1. Sheet Metal Flashing: 12 inches (300 mm) long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
2. Trim, Metal Closures, Expansion Joints, Joint Intersections, and Miscellaneous Fabrications: 12 inches (300 mm) long and in required profile. Include fasteners and other exposed accessories.
3. Unit-Type Accessories and Miscellaneous Materials: Full-size Sample.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

B. Product Certificates: For each type of coping and roof edge flashing that is FM Approvals approved.

C. Product Test Reports: For each product, for tests performed by a qualified testing agency.

D. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For sheet metal flashing and trim, and its accessories, to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

1. For copings and roof edge flashings that are SPRI ES-1 tested and FM Approvals approved, shop shall be listed as able to fabricate required details as tested and approved.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

1.10 WARRANTY

A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

C. FM Approvals Listing: Manufacture and install copings and roof edge flashings that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, Class 1-60. Identify materials with name of fabricator and design approved by FM Approvals.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 SHEET METALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.

B. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304, dead soft, fully annealed.

1. Finish: 2D (dull, cold rolled).
2. Surface: Smooth, flat.

2.3 UNDERLAYMENT MATERIALS

A. Polyethylene Sheet: 6-mil- thick polyethylene sheet complying with ASTM D 4397.

B. Felt: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, nonperforated.

C. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.

1. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F.
2. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F.
3. Products: Subject to compliance with requirements, provide one of the following:

a. Carlisle Coatings & Waterproofing Inc.; CCW WIP 300HT.
b. Grace Construction Products, a unit of W. R. Grace & Co.; Ultra.
c. Henry Company; Blueskin PE200 HT.
d. Metal-Fab Manufacturing, LLC; MetShield.
e. Owens Corning; WeatherLock Metal High Temperature Underlayment.

D. Slip Sheet: Building paper, 3-lb/100 sq. ft. minimum, rosin sized.

2.4 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.

1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.

a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating.
b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.

2. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.

C. Solder:

1. For Stainless Steel: ASTM B 32, Grade Sn60, with an acid flux of type recommended by stainless-steel sheet manufacturer.

D. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.

E. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant; low modulus; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

F. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

G. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.

H. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.5 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, geometry, metal thickness, and other characteristics of item indicated. Fabricate items at the shop to greatest extent possible.

1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.

2. Obtain field measurements for accurate fit before shop fabrication.
3. Form sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces exposed to view.

B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

C. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

D. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant.

E. Expansion Provisions: Where lapped expansion provisions cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.

F. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

G. Fabricate cleats and attachment devices of sizes as recommended by SMACNA's "Architectural Sheet Metal Manual" and by FMG Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.

H. Seams: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.

I. Do not use graphite pencils to mark metal surfaces.

2.6 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Roof-Penetration Flashing: Fabricate from the following materials:

1. Stainless Steel: 0.019 inch thick.

B. Roof-Drain Flashing: Fabricate from the following materials:

1. Stainless Steel: 0.016 inch thick.

2.7 WALL SHEET METAL FABRICATIONS

A. Through-Wall Flashing: Fabricate continuous flashings in minimum 96-inch- long, but not exceeding 12-foot- long, sections, under copings, at shelf angles, and where indicated. Fabricate discontinuous lintel, sill, and similar flashings to extend 6 inches beyond each side of wall openings. Form with 2-inch- high, end dams where flashing is discontinuous. Fabricate from the following materials:
1. Stainless Steel: 0.016 inch thick.

2.8 MISCELLANEOUS SHEET METAL FABRICATIONS

A. Equipment Support Flashing: Fabricate from the following materials:

1. Stainless Steel: 0.019 inch thick.

B. Overhead-Piping Safety Pans: Fabricate from the following materials:

1. Stainless Steel: 0.025 inch thick.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of the Work.

1. Verify compliance with requirements for installation tolerances of substrates.
2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

B. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

A. General: Install underlayment as indicated on Drawings.

B. Polyethylene Sheet: Install polyethylene sheet with adhesive for anchorage to minimize use of mechanical fasteners under sheet metal flashing and trim. Apply in shingle fashion to shed water, with lapped and taped joints of not less than 2 inches.

C. Felt Underlayment: Install felt underlayment with adhesive for temporary anchorage to minimize use of mechanical fasteners under sheet metal flashing and trim. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches.

D. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Apply primer if required by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer rather than nails for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps with roller. Cover underlayment within 14 days.

3.3 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners,

solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

1. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
3. Space cleats not more than 12 inches apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.
4. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.
5. Install sealant tape where indicated.
6. Torch cutting of sheet metal flashing and trim is not permitted.
7. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by SMACNA.

1. Coat back side of uncoated aluminum and stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim will contact wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet or install a course of polyethylene sheet.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.

D. Fastener Sizes: Use fasteners of sizes that will penetrate metal decking not less than recommended by fastener manufacturer to achieve maximum pull-out resistance .

E. Seal joints as shown and as required for watertight construction.

1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
2. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."

F. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets to be soldered to a width of 1-1/2 inches, except reduce pre-tinning where pre-tinned surface would show in completed Work.

1. Do not solder metallic-coated steel and aluminum sheet.
2. Pre-tinning is not required for zinc-tin alloy-coated stainless steel and zinc-tin alloy-coated copper.

3. Do not use torches for soldering. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
4. Stainless-Steel Soldering: Tin edges of uncoated sheets using solder recommended for stainless steel and acid flux. Promptly remove acid flux residue from metal after tinning and soldering. Comply with solder manufacturer's recommended methods for cleaning and neutralization.
5. Copper Soldering: Tin edges of uncoated copper sheets using solder for copper.

3.4 ROOF FLASHING INSTALLATION

A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

B. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending a minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten.

C. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints a minimum of 4 inches and bed with sealant. Secure in a waterproof manner by means of anchor and washer at 36-inch centers.

D. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric sealant and clamp flashing to pipes that penetrate roof.

3.5 WALL FLASHING INSTALLATION

A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to SMACNA recommendations and as indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

B. Reglets: Installation of reglets is specified in Division 03 Section "Cast-in-Place Concrete" and Division 04 Section "Unit Masonry."

C. Opening Flashings in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings.

3.6 MISCELLANEOUS FLASHING INSTALLATION

A. Overhead-Piping Safety Pans: Suspend pans independent from structure above as indicated on Drawings. Pipe and install drain line to plumbing waste or drainage system.

B. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.

3.7 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

B. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

3.8 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder.

C. Clean off excess sealants.

D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of installation, remove unused materials and clean finished surfaces. Maintain in a clean condition during construction.

E. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures

END OF SECTION 07 62 00

SECTION 07 71 00 - ROOF SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Copings.
2. Roof-edge specialties.
3. Roof-edge drainage systems.
4. Reglets and counterflashings.

B. Related Requirements:

1. Division 06 Section "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.
2. Division 07 Section “Composite Wall Panels” for copings provided as part of composite wall panel system.
3. Division 07 Section "Sheet Metal Flashing and Trim" for custom- and site-fabricated sheet metal flashing and trim.
4. Division 07 Section "Roof Accessories" for set-on-type curbs, equipment supports, roof hatches, vents, and other manufactured roof accessory units.
5. Division 07 Section "Joint Sealants" for field-applied sealants between roof specialties and adjacent materials.
6. Division 07 Section “Standing-seam Metal Roof Panels” for Gutters and Downspouts.

1.3 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable LEED Credits

1. MRc2
2. MRc4
3. MRc5
4. IEQc4.1

B. LEED Requirements

1. MRc2: CONSTRUCTION WASTE MANAGEMENT

No less than the specified portion of all construction waste from the Project shall be diverted from disposal in a landfill and/or incineration in with the Project Requirements for Construction Waste Management and Disposal. Refer to Specification Sections 017419 Construction Waste Management and Disposal

and 013510 Sustainable Design Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

2. MRc4: Recycled Content Material

   No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the Project Requirements for Recycled Content Materials. All materials counted towards the computations of the proportion of the Recycled Content Materials shall comply with the standard minimum percentages of post-consumer waste materials and for the minimum percentages of pre-consumer waste materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

3. MRc5: REGIONALLY MANUFACTURED HARVESTED MATERIALS

   No less than the specified minimum proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the Project Site in accordance with the Project Requirements for Regionally Manufactured and/or Harvested Materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

4. IEQc4.1: Low Emitting Materials: Sealants and Adhesives

   All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the Project Requirements for Low Emitting Materials – Sealants and Adhesives. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Sustainable Design Submittals:

   1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.

C. Shop Drawings: For roof specialties.

   1. Include plans, elevations, expansion-joint locations, keyed details, and attachments to other work. Distinguish between plant- and field-assembled work.
   2. Include details for expansion and contraction; locations of expansion joints, including direction of expansion and contraction.
   3. Indicate profile and pattern of seams and layout of fasteners, cleats, clips, and other attachments.
   4. Detail termination points and assemblies, including fixed points.
   5. Include details of special conditions.

D. Samples: For each type of roof specialty and for each color and texture specified.

E. Samples for Initial Selection: For each type of roof specialty indicated with factory-applied color finishes.

F. Samples for Verification:

1. Include Samples of each type of roof specialty to verify finish and color selection, in manufacturer's standard sizes.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer.

B. Product Certificates: For each type of roof specialty.

C. Product Test Reports: For copings and roof-edge flashings, for tests performed by a qualified testing agency.

D. Sample Warranty: For manufacturer's special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roofing specialties to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer offering products meeting requirements that are FM Approvals listed for specified class and SPRI ES-1 tested to specified design pressure.

B. Source Limitations: Obtain roof specialties approved by manufacturer providing roofing-system warranty

C. DELIVERY, STORAGE, AND HANDLING

D. Do not store roof specialties in contact with other materials that might cause staining, denting, or other surface damage. Store roof specialties away from uncured concrete and masonry.

E. Protect strippable protective covering on roof specialties from exposure to sunlight and high humidity, except to extent necessary for the period of roof-specialty installation.

1.8 FIELD CONDITIONS

A. Field Measurements: Verify profiles and tolerances of roof-specialty substrates by field measurements before fabrication, and indicate measurements on Shop Drawings.

B. Coordination: Coordinate roof specialties with flashing, trim, and construction of parapets, roof deck, roof and wall panels, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.9 WARRANTY

A. Special Warranty on Painted Finishes: Manufacturer agrees to repair finish or replace roof specialties that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Roof specialties shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

B. FM Approvals' Listing: Manufacture and install copings roof-edge specialties that are listed in FM Approvals' "RoofNav" and approved for windstorm classification. Identify materials with FM Approvals' markings.

C. SPRI Wind Design Standard: Manufacture and install copings roof-edge specialties tested according to SPRI ES-1 and capable of resisting the following design pressures:

1. Design Pressure: As indicated on Drawings.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of thermal movements. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 EXPOSED METALS

A. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, with temper to suit forming operations and performance required.

1. Surface: Smooth, flat finish.

2. Exposed Coil-Coated Finishes: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

    a. Three-Coat Fluoropolymer: AAMA 620. System consisting of primer, fluoropolymer color coat, and clear fluoropolymer topcoat, with both color coat and clear topcoat containing not less than 70 percent PVDF resin by weight.
    b. Concealed Surface: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

B. Aluminum Extrusions: ASTM B 221, alloy and temper recommended by manufacturer for type of use and finish indicated, finished as follows:

1. Exposed High-Performance Organic Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

    a. Three-Coat Fluoropolymer: AAMA 2605. System consisting of primer, fluoropolymer color coat, and clear fluoropolymer topcoat, with both color coat and clear topcoat containing not less than 70 percent PVDF resin by weight.

2.3 CONCEALED METALS

A. Aluminum Sheet: ASTM B 209, alloy and temper recommended by manufacturer for type of use and structural performance indicated, mill finished.

B. Aluminum Extrusions: ASTM B 221, alloy and temper recommended by manufacturer for type of use and structural performance indicated, mill finished.

C. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304.

D. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 coating designation.

2.4 UNDERLAYMENT MATERIALS

A. Felt: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, nonperforated.

B. Slip Sheet: Building paper, 3-lb/100 sq. ft. minimum, rosin sized.

2.5 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.

B. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to meet performance requirements. Furnish the following unless otherwise indicated:

1. Exposed Penetrating Fasteners: Gasketed screws with hex washer heads matching color of sheet metal.
2. Fasteners for Aluminum: Aluminum or Series 300 stainless steel.
3. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.

C. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant of type, grade, class, and use classifications required by roofing-specialty manufacturer for each application.

D. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

E. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.6 COPINGS

A. Copings: Manufactured coping system consisting of formed-metal coping cap in section lengths not exceeding 12 feet , concealed anchorage; corner units, end cap units, and concealed splice plates with same finish as coping caps.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following :

    a. Architectural Products Company.
    b. ATAS International, Inc.
    c. Castle Metal Products.
    d. Cheney Flashing Company.
    e. Hickman Company, W. P.
    f. Johns Manville.
    g. Merchant & Evans, Inc.
    h. Metal-Era, Inc.
    i. Metal-Fab Manufacturing, LLC.
    j. MM Systems Corporation.
    k. National Sheet Metal Systems, Inc.
    l. Perimeter Systems; a division of Southern Aluminum Finishing Company, Inc.
    m. Petersen Aluminum Corporation.

2. Coping-Cap Material: Formed aluminum, 0.063 inch thick minimu, and as required to meet performance requirements.

    a. Finish: Three-coat fluoropolymer
    b. Colors:
        1) Color 1- Custom color to match the metal wall panel
        2) Color 2- Architect to select form manufacturer’s standard colors to match precast
        3) Color 3- Architect to select form manufacturer’s standard colors to match SUI building coping

3. Corners: Factory mitered and mechanically clinched and sealed watertight.
4. Coping-Cap Attachment Method: Snap-on , fabricated from coping-cap material.
5. Snap-on-Coping Anchor Plates: Concealed, galvanized-steel sheet, 12 inches wide, with integral cleats.

2.7 ROOF-EDGE FLASHINGS

A. Canted Roof-Edge Fascia and Gravel Stop : Manufactured, two-piece, roof-edge fascia consisting of snap-on metal fascia cover in section lengths not exceeding 12 feet and a continuous formed galvanized-steel sheet cant, 0.028 inch thick, minimum, with extended vertical leg terminating in a drip-edge cleat. Provide matching corner units.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following :

    a. Architectural Products Company.
    b. ATAS International, Inc.
    c. Castle Metal Products.
    d. Cheney Flashing Company.
    e. Hickman Company, W. P.
    f. Johns Manville.
    g. Merchant & Evans, Inc.
    h. Metal-Era, Inc.
    i. Metal-Fab Manufacturing, LLC.
    j. MM Systems Corporation.
    k. National Sheet Metal Systems, Inc.
    l. Petersen Aluminum Corporation.

2. Fascia Cover: Fabricated from the following exposed metal:

    a. Formed Aluminum: 0.063 inch thick minimum and as required to meet performance requirements.
    b. Extruded Aluminum: 0.080 inch thick.

3. Corners: Factory mitered and mechanically clinched and sealed watertight.
4. Splice Plates: Concealed, of same material, finish, and shape as fascia cover.

B. Roof-Edge Fascia: Manufactured, two-piece, roof-edge fascia consisting of snap-on metal fascia cover in section lengths not exceeding 12 feet and a continuous formed- or extruded-aluminum anchor bar with integral drip-edge cleat to engage fascia cover. Provide matching corner units.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Hickman Company, W. P.
    b. Johns Manville.
    c. Metal-Era, Inc.
    d. Metal-Fab Manufacturing, LLC.
    e. National Sheet Metal Systems, Inc.
    f. Perimeter Systems; a division of Southern Aluminum Finishing Company, Inc.

2. Fascia Cover: Fabricated from the following exposed metal:

    a. Formed Aluminum: 0.063 inch thick minimum and as required to meet performance requirements.

3. Corners: Factory mitered and mechanically clinched and sealed watertight.
4. Splice Plates: Concealed, of same material, finish, and shape as fascia cover.

C. Aluminum Finish: Three-coat fluoropolymer.

1. Color: Match copings

2.8 ROOF-EDGE DRAINAGE SYSTEMS

A. Parapet Scuppers: Manufactured with closure flange trim to exterior, 4-inch- (100-mm-) wide wall flanges to interior, and base extending 4 inches (100 mm) beyond cant or tapered strip into field of roof.

1. Fabricate from the following exposed metal:

a. Stainless Steel: 24 Gauge.

2. Size: as indicated on drawings

B. Conductor Heads: Manufactured conductor heads, each with flanged back and stiffened top edge and of dimensions and shape indicated, complete with outlet tube that nests into upper end of downspout, exterior flange trim, and built-in overflow.

1. Fabricate from the following exposed metal:

a. Formed Aluminum: 0.032 inch (0.81 mm) thick.

2. Size: as indicated on drawings

a. Colors: Architect selected form manufacturer's stand colors

1) Metal panel – match metal panel
2) Brick – match brick

C. Splash Pans: Fabricate from the following exposed metal:

1. Formed Aluminum: 0.040 inch (1.02 mm) thick.
2. Size: as indicated on drawings

D. Aluminum Finish: Two-coat fluoropolymer.

1. Color: As indicated on drawings.

2.9 REGLETS AND COUNTERFLASHINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following :

1. Castle Metal Products.
2. Cheney Flashing Company.
3. Fry Reglet Corporation.
4. Heckmann Building Products Inc.
5. Hickman Company, W. P.
6. Keystone Flashing Company, Inc.
7. Metal-Era, Inc.
8. Metal-Fab Manufacturing, LLC.

9. MM Systems Corporation.
10. National Sheet Metal Systems, Inc.

B. Reglets: Manufactured units formed to provide secure interlocking of separate reglet and counterflashing pieces, from the following exposed metal:

1. Stainless Steel: 0.025 inch thick.
2. Corners: Factory mitered and continuously welded.
3. Surface-Mounted Type: Provide reglets with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.
4. Concrete Type, Embedded: Provide temporary closure tape to keep reglet free of concrete materials, special fasteners for attaching reglet to concrete forms, and guides to ensure alignment of reglet section ends.
5. Masonry Type, Embedded: Provide reglets with offset top flange for embedment in masonry mortar joint.
6. Multiuse Type, Embedded: For multiuse embedment in cast-in-place concrete and masonry mortar joints.

C. Counterflashings: Manufactured units of heights to overlap top edges of base flashings by 4 inches and in lengths not exceeding 12 feet designed to snap into reglets or through-wall-flashing receiver and compress against base flashings with joints lapped, from the following exposed metal:

1. Formed Aluminum: 0.032 inch thick.
2. Stainless Steel: thick.

D. Accessories:

1. Flexible-Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where reglet is provided separate from metal counterflashing.
2. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing lower edge.

E. Aluminum Finish: Three-coat fluoropolymer.

1. Color: As indicated on drawings.

F. Stainless-Steel Finish: No. 2B (bright, cold rolled, unpolished).

2.10 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.

B. Examine walls, roof edges, and parapets for suitable conditions for roof specialties.

C. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

A. Felt Underlayment: Install with adhesive for temporary anchorage to minimize use of mechanical fasteners under roof specialties. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches.

B. Self-Adhering Sheet Underlayment: Install wrinkle free. Apply primer if required by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer rather than nails for installing underlayment at low temperatures. Apply in shingle fashion to shed water. Overlap edges not less than 3-1/2 inches. Roll laps with roller. Cover underlayment within 14 days.

C. Polyethylene Sheet: Install with adhesive for temporary anchorage to minimize use of mechanical fasteners under roof specialties. Apply in shingle fashion to shed water, with lapped and taped joints of not less than 2 inches.

D. Slip Sheet: Install with tape or adhesive for temporary anchorage to minimize use of mechanical fasteners under roof specialties. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches.

3.3 INSTALLATION, GENERAL

A. General: Install roof specialties according to manufacturer's written instructions. Anchor roof specialties securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete roof-specialty systems.

1. Install roof specialties level, plumb, true to line and elevation; with limited oil-canning and without warping, jogs in alignment, buckling, or tool marks.
2. Provide uniform, neat seams with minimum exposure of solder and sealant.
3. Install roof specialties to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.
4. Torch cutting of roof specialties is not permitted.
5. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces

with bituminous coating or by other permanent separation as recommended by manufacturer.

1. Coat concealed side of uncoated aluminum and stainless-steel roof specialties with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of self-adhering, high-temperature sheet underlayment or polyethylene sheet.
3. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof specialties for waterproof performance.

C. Expansion Provisions: Allow for thermal expansion of exposed roof specialties.

1. Space movement joints at a maximum of 12 feet with no joints within 18 inches of corners or intersections unless otherwise shown on Drawings.
2. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures.

D. Fastener Sizes: Use fasteners of sizes that will penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.

E. Seal joints with elastomeric sealant as required by roofing-specialty manufacturer.

F. Seal joints as required for watertight construction. Place sealant to be completely concealed in joint. Do not install sealants at temperatures below 40 deg F.

G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets to be soldered to a width of 1-1/2 inches except reduce pre-tinning where pre-tinned surface would show in completed Work. Tin edges of uncoated copper sheets using solder for copper. Do not use torches for soldering. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.

3.4 COPING INSTALLATION

A. Install cleats, anchor plates, and other anchoring and attachment accessories and devices with concealed fasteners.

B. Anchor copings to meet performance requirements.

1. Interlock face and back leg drip edges of snap-on coping cap into cleated anchor plates anchored to substrate at manufacturer's required spacing that meets performance requirements .

3.5 ROOF-EDGE FLASHING INSTALLATION

A. Install cleats, cants, and other anchoring and attachment accessories and devices with concealed fasteners.

B. Anchor roof edgings with manufacturer's required devices, fasteners, and fastener spacing to meet performance requirements.

3.6 ROOF-EDGE DRAINAGE-SYSTEM INSTALLATION

A. General: Install components to produce a complete roof-edge drainage system according to manufacturer's written instructions. Coordinate installation of roof perimeter flashing with installation of roof-edge drainage system.

B. Downspouts: Join sections with manufacturer's standard telescoping joints. Provide hangers with fasteners designed to hold downspouts securely to walls and 1 inch (25 mm) away from walls; locate fasteners at top and bottom and at approximately 60 inches (1500 mm) o.c.

1. Provide elbows at base of downspout to direct water away from building.
2. Connect downspouts to underground drainage system indicated.

C. Splash Pans: Install where downspouts discharge on low-slope roofs . Set in elastomeric sealant.

D. Parapet Scuppers: Install scuppers through parapet where indicated. Continuously support scupper, set to correct elevation, and seal flanges to interior wall face, over cants or tapered edge strips, and under roofing membrane.

1. Anchor scupper closure trim flange to exterior wall and seal or solder to scupper.
2. Loosely lock front edge of scupper with conductor head.
3. Seal or solder exterior wall scupper flanges into back of conductor head.

E. Conductor Heads: Anchor securely to wall with elevation of conductor top edge 1 inch (25 mm) below scupper discharge.

3.7 REGLET AND COUNTERFLASHING INSTALLATION

A. General: Coordinate installation of reglets and counterflashings with installation of base flashings.

B. Embedded Reglets: See Division 03 Section "Cast-in-Place Concrete" and Division 04 Section "Unit Masonry" for installation of reglets.

C. Counterflashings: Insert counterflashings into reglets or other indicated receivers; ensure that counterflashings overlap 4 inches over top edge of base flashings. Lap counterflashing joints a minimum of 4 inches and bed with elastomeric sealant. Fit counterflashings tightly to base flashings.

3.8 CLEANING AND PROTECTION

A. Clean and neutralize flux materials. Clean off excess solder and sealants.

B. Remove temporary protective coverings and strippable films as roof specialties are installed. On completion of installation, clean finished surfaces including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain roof specialties in a clean condition during construction.

C. Replace roof specialties that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 07 71 00

SECTION 07 72 00 - ROOF ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Roof curbs.
2. Equipment supports.
3. Roof hatches and safety cages.
4. Pipe and duct supports.
5. Pipe portals.
6. Rooftop fall protection system.

B. Related Sections:

1. Section 055000 "Metal Fabrications" for metal vertical ladders, ships' ladders, and stairs for access to roof hatches.
2. Section 07413.16 “Standing-sem metal roof panels” for snow guards.
3. Section 076200 "Sheet Metal Flashing and Trim" for shop- and field-formed metal flashing, roof-drainage systems, roof expansion-joint covers, and miscellaneous sheet metal trim and accessories.
4. Section 077100 "Roof Specialties" for manufactured fasciae, copings, gravel stops,, and counterflashing.
5. Section 077129 "Manufactured Roof Expansion Joints" for manufactured roof expansion-joint covers.
6. Section 086300 "Metal-Framed Skylights" for single- and double-glazed domed skylights with curb frame.
7. Section 230548 "Vibration and Seismic Controls for HVAC" for special curbs designed to accommodate seismic and vibration controls.
8. Section 233423 "HVAC Power Ventilators" for power roof-mounted ventilators.
9. Section 237413 "Packaged, Outdoor, Central-Station Air-Handling Units" for standard curbs specified with rooftop units.

1.3 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable LEED Credits

1. MRc2
2. MRc4
3. MRc5
4. IEQc4.1

B. LEED Requirements

1. MRc2: CONSTRUCTION WASTE MANAGEMENT

   No less than the specified portion of all construction waste from the Project shall be diverted from disposal in a landfill and/or incineration in with the Project Requirements for Construction Waste Management and Disposal. Refer to Specification Sections 017419 Construction Waste Management and Disposal and 013510 Sustainable Design Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

2. MRc4: Recycled Content Material

   No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the Project Requirements for Recycled Content Materials. All materials counted towards the computations of the proportion of the Recycled Content Materials shall comply with the standard minimum percentages of post-consumer waste materials and for the minimum percentages of pre-consumer waste materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

3. MRc5: REGIONALLY MANUFACTURED HARVESTED MATERIALS

   No less than the specified minimum proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the Project Site in accordance with the Project Requirements for Regionally Manufactured and/or Harvested Materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

4. IEQc4.1: Low Emitting Materials: Sealants and Adhesives

   All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the Project Requirements for Low Emitting Materials – Sealants and Adhesives. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

1.4 COORDINATION

A. Coordinate layout and installation of roof accessories with roofing membrane and base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.

B. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of roof accessory.

   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For roof accessories.

1. Include plans, elevations, keyed details, and attachments to other work. Indicate dimensions, loadings, and special conditions. Distinguish between plant- and field-assembled work.

C. Samples: For each exposed product and for each color and texture specified, prepared on Samples of size to adequately show color.

D. Delegated-Design Submittal: For equipment supports indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Detail mounting, securing, and flashing of roof-mounted items to roof structure. Indicate coordinating requirements with roof membrane system.
2. Wind-Restraint Details: Detail fabrication and attachment of wind restraints. Show anchorage details and indicate quantity, diameter, and depth of penetration of anchors.
3. Roof fall protection system: Design and detail fabrication and attachment of complete fall protection system for roof areas as indicated, including retractable or horizontal lifeline systems and ladder protection, in compliance with ANSI/ASSE Z359.2-2007 and OSHA load requirements. Include analysis of anchorage system and applied loads to structure by qualified fall protection engineer.

1.6 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Roof plans, drawn to scale, and coordinating penetrations and roof-mounted items. Show the following:

1. Size and location of roof accessories specified in this Section.
2. Method of attaching roof accessories to roof or building structure.
3. Other roof-mounted items including mechanical and electrical equipment, ductwork, piping, and conduit.
4. Required clearances.

B. Sample Warranties: For manufacturer's special warranties.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For roof accessories to include in operation and maintenance manuals.

1.8 WARRANTY

A. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finishes or replace roof accessories that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Roof accessories shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

B. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design equipment supports to comply with wind performance requirements, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

C. Wind-Restraint Performance: As indicated on Drawings.

2.2 ROOF CURBS

A. Roof Curbs: Internally reinforced roof-curb units with integral spring-type vibration isolators and capable of supporting superimposed live and dead loads, including equipment loads and other construction indicated on Drawings; with welded or mechanically fastened and sealed corner joints, stepped integral metal cant raised the thickness of roof insulation, and integrally formed deck-mounting flange at perimeter bottom.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following :

a. AES Industries, Inc.
b. Curbs Plus, Inc.
c. Custom Solution Roof and Metal Products.
d. Greenheck Fan Corporation.
e. LM Curbs.
f. Metallic Products Corp.
g. Milcor Inc.; Commercial Products Group of Hart & Cooley, Inc.
h. Pate Company (The).
i. Roof Products, Inc.
j. Safe Air of Illinois.
k. Thybar Corporation.
l. Vent Products Co., Inc.

B. Size: Coordinate dimensions with roughing-in information or Shop Drawings of equipment to be supported.

C. Loads: As indicated.

D. Material: Aluminum-zinc alloy-coated steel sheet, 0.079 inch thick.

1. Finish: Two-coat fluoropolymer .
2. Color: As selected by Architect from manufacturer's full range .

E. Material: Aluminum sheet, 0.090 inch thick.

1. Finish: Two-coat fluoropolymer .
2. Color: As selected by Architect from manufacturer's full range .

F. Material: Stainless-steel sheet, 0.078 inch thick.

1. Finish: Manufacturer's standard .

G. Construction:

1. Insulation: Factory insulated with 1-1/2-inch- thick glass-fiber board insulation.
2. Liner: Same material as curb, of manufacturer's standard thickness and finish.
3. Factory-installed wood nailer at top of curb, continuous around curb perimeter.
4. On ribbed or fluted metal roofs, form deck-mounting flange at perimeter bottom to conform to roof profile.
5. Fabricate curbs to minimum height of 12 inches unless otherwise indicated.
6. Top Surface: Level around perimeter with roof slope accommodated by sloping the deck-mounting flange.
7. Sloping Roofs: Where roof slope exceeds 1:48, fabricate curb with perimeter curb height tapered to accommodate roof slope so that top surface of perimeter curb is level. Equip unit with water diverter or cricket on side that obstructs water flow.

2.3 Security Grille: Provide where indicated.

2.4 EQUIPMENT SUPPORTS

A. Equipment Supports: Internally reinforced metal equipment supports capable of supporting superimposed live and dead loads, including equipment loads and other construction indicated on Drawings; with welded or mechanically fastened and sealed corner joints, stepped integral metal cant raised the thickness of roof insulation, and integrally formed deck-mounting flange at perimeter bottom.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following :

a. AES Industries, Inc.
b. Curbs Plus, Inc.
c. Custom Solution Roof and Metal Products.
d. Greenheck Fan Corporation.
e. LM Curbs.
f. Milcor Inc.; Commercial Products Group of Hart & Cooley, Inc.
g. Pate Company (The).
h. Roof Products, Inc.
i. Thybar Corporation.

j. Vent Products Co., Inc.

B. Size: Coordinate dimensions with roughing-in information or Shop Drawings of equipment to be supported.

C. Loads: As indicated.

D. Material: Aluminum-zinc alloy-coated steel sheet, 0.079 inch thick.

1. Finish: Two-coat fluoropolymer .
2. Color: As selected by Architect from manufacturer's full range .

E. Material: Aluminum sheet, 0.090 inch thick.

1. Finish: Two-coat fluoropolymer .
2. Color: As selected by Architect from manufacturer's full range .

F. Material: Stainless-steel sheet, 0.078 inch thick.

1. Finish: Manufacturer's standard .

G. Construction:

1. Insulation: Factory insulated with 1-1/2-inch- thick glass-fiber board insulation.
2. Liner: Same material as equipment support, of manufacturer's standard thickness and finish.
3. Factory-installed continuous wood nailers 5-1/2 inches wide at tops of equipment supports.
4. Metal Counterflashing: Manufacturer's standard, removable, fabricated of same metal and finish as equipment support.
5. On ribbed or fluted metal roofs, form deck-mounting flange at perimeter bottom to conform to roof profile.
6. Fabricate equipment supports to minimum height of 12 inches unless otherwise indicated.
7. Sloping Roofs: Where roof slope exceeds 1:48, fabricate each support with height to accommodate roof slope so that tops of supports are level with each other. Equip supports with water diverters or crickets on sides that obstruct water flow.
8. Security Grille: Provide where indicated.
9.

2.5 ROOF HATCH

A. Roof Hatches: Metal high-security roof-hatch units with lids and insulated double-walled curbs, welded or mechanically fastened and sealed corner joints, continuous lid-to-curb counterflashing and weathertight perimeter gasketing, stepped integral metal cant raised the thickness of roof insulation, and integrally formed deck-mounting flange at perimeter bottom.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Bilco “Security Series ” access hatch with high security detention lock option or comparable product by one of the following:

a. AES Industries, Inc.

b. Babcock-Davis.
c. Bristolite Skylights.
d. Custom Solution Roof and Metal Products.
e. Dur-Red Products.
f. Hi Pro International, Inc.
g. J. L. Industries, Inc.
h. Metallic Products Corp.
i. Milcor Inc.; Commercial Products Group of Hart & Cooley, Inc.
j. Naturalite Skylight Systems; Vistawall Group (The).
k. Nystrom.
l. O'Keeffe's Inc.
m. Pate Company (The).
n. Precision Ladders, LLC.

B. Type and Size: Single-leaf lid, 36 by 36 inches.

C. Loads: Minimum 40-lbf/sq. ft. external live load and 20-lbf/sq. ft. internal uplift load.

D. Hatch Material: Aluminum-zinc alloy-coated steel sheet, 0.1875 inch thick.

1. Finish: Two-coat fluoropolymer .
2. Color: As selected by Architect from manufacturer's full range .

E. Construction:

1. Insulation: Polyisocyanurate board, two inches thick.
2. Hatch Lid: Opaque, insulated, and double walled, with manufacturer's standard metal liner of same material and finish as outer metal lid.
3. Curb Liner: Manufacturer's standard, of same material and finish as metal curb.
4. Fabricate curbs to minimum height of 12 inches unless otherwise indicated.

F. Hardware: High security detention stainless-steel latch assembly, interior and exterior hasps, guide arm assembly, lifting mechanism bracket, hinge pins, hold-open arm assembly, lock strike, springs, sprint tubes, lifting mechanism support shoes.

G. Hinges: Heavy-duty manganese bronze.

H. Safety Railing System: Roof-hatch manufacturer's standard system including rails, clamps, fasteners, safety barrier at railing opening, and accessories required for a complete installation; attached to roof hatch and complying with 29 CFR 1910.23 requirements and authorities having jurisdiction.

1. Height: 42 inches above finished roof deck.
2. Posts and Rails: Galvanized-steel pipe, 1-1/4 inches in diameter or galvanized-steel tube, 1-5/8 inches in diameter.
3. Flat Bar: Galvanized steel, 2 inches high by 3/8 inch thick.
4. Maximum Opening Size: System constructed to prevent passage of a sphere 21 inches in diameter.
5. Chain Passway Barrier: Galvanized proof coil chain with quick link on fixed end.
6. Self-Latching Gate: Fabricated of same materials and rail spacing as safety railing system. Provide manufacturer's standard hinges and self-latching mechanism.
7. Post and Rail Tops and Ends: Weather resistant, closed or plugged with prefabricated end fittings.

8. Provide weep holes or another means to drain entrapped water in hollow sections of handrail and railing members.
9. Fabricate joints exposed to weather to be watertight.
10. Fasteners: Manufacturer's standard, finished to match railing system.
11. Finish: Manufacturer's standard .

    a. Color: As selected by Architect from manufacturer's full range .

I. Ladder-Assist Post: Roof-hatch manufacturer's standard device for attachment to roof-access ladder.

1. Operation: Post locks in place on full extension; release mechanism returns post to closed position.
2. Height: 42 inches above finished roof deck.
3. Material: Aluminum.
4. Post: 1-5/8-inch- diameter pipe.
5. Finish: Manufacturer's standard baked enamel or powder coat .

    a. Color: As selected by Architect from manufacturer's full range

2.6 PIPE SUPPORTS

A. Pipe Supports: Adjustable-height, extruded-aluminum tube, filled with urethane insulation; 2 inches in diameter; with aluminum baseplate, EPDM base seal, manufacturer's recommended hardware for mounting to structure or structural roof deck as indicated, and extruded-aluminum carrier assemblies; suitable for quantity of pipe runs and sizes.

1. Manufacturers: available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Thaler Metal USA Inc.

2. Pipe Support Height: As indicated on Drawings.
3. Roller Assembly: With stainless-steel roller, sized for supported pipes.
4. Pipe Support Flashing: Manufacturer's standard insulated sleeve flashing with integral base flange; aluminum sheet, 0.063 inch thick .
5. Finish: Manufacturer's standard .

B. Light-Duty Pipe Supports: Extruded-aluminum base assembly and Type 304 stainless-steel roller assembly for pipe sizes indicated, including manufacturer's recommended load-distributing baseplate.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Thaler Metal USA Inc.

2. Finish: Manufacturer's standard .

2.7 PREFORMED FLASHING SLEEVES

A. Exhaust Vent Flashing: Double-walled metal flashing sleeve or boot, insulation filled, with integral deck flange, 12 inches high, with removable metal hood and slotted or perforated metal collar.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Custom Solution Roof and Metal Products.
b. Thaler Metal USA Inc.

2. Metal: Stainless steel sheet, .0.31 inch (0.79 mm) 22 ga. Type 304.
3. Diameter: As indicated .
4. Finish: Manufacturer's standard .

B. Vent Stack Flashing: Metal flashing sleeve, uninsulated, with integral deck flange.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Custom Solution Roof and Metal Products.
b. Milcor Inc.; Commercial Products Group of Hart & Cooley, Inc.
c. Thaler Metal USA Inc.

2. Metal: Stainless steel sheet, .0.31 inch (0.79 mm) 22 ga. Type 304..
3. Height: 13 inches.
4. Diameter: As indicated .
5. Finish: Manufacturer's standard .

2.8 ROOFTOP FALL PROTECTION SYSTEM

A. Certified active fall protection system, including horizontal lifelines and ladder protection.

1. Allow continuous mobility along edges indicated to receive fall protection system.
2. Include all end-user equipment, including harnesses and lanyards, as part of system.

2.9 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
1.

2.10 METAL MATERIALS

A. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 coating designation and mill phosphatized for field painting where indicated.

1. Mill-Phosphatized Finish: Manufacturer's standard for field painting.
2. Factory Prime Coating: Where field painting is indicated, apply pretreatment and white or light-colored, factory-applied, baked-on epoxy primer coat, with a minimum dry film thickness of 0.2 mil.
3. Exposed Coil-Coated Finish: Prepainted by the coil-coating process to comply with ASTM A 755/A 755M. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

    a. Two-Coat Fluoropolymer Finish: AAMA 621. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight.

4. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester-backer finish consisting of prime coat and wash coat, with a minimum total dry film thickness of 0.5 mil (0.013 mm).

B. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, AZ50 coated.

1. Factory Prime Coating: Where field painting is indicated, apply pretreatment and white or light-colored, factory-applied, baked-on epoxy primer coat, with a minimum dry film thickness of 0.2 mil.
2. Exposed Coil-Coated Finish: Prepainted by the coil-coating process to comply with ASTM A 755/A 755M. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

    a. Two-Coat Fluoropolymer Finish: AAMA 621. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight.

3. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester-backer finish consisting of prime coat and wash coat, with a minimum total dry film thickness of 0.5 mil (0.013 mm).

C. Aluminum Sheet: ASTM B 209, manufacturer's standard alloy for finish required, with temper to suit forming operations and performance required.

1. Exposed Coil-Coated Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

    a. Two-Coat Fluoropolymer Finish: AAMA 620. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight.

2. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester-backer finish consisting of prime coat and wash coat, with a minimum total dry film thickness of 0.5 mil (0.013 mm).

D. Aluminum Extrusions and Tubes: ASTM B 221, manufacturer's standard alloy and temper for type of use, finished to match assembly where used, otherwise mill finished.

E. Stainless-Steel Sheet and Shapes: ASTM A 240/A 240M or ASTM A 666, Type 304.

F. Steel Shapes: ASTM A 36/A 36M, hot-dip galvanized according to ASTM A 123/A 123M unless otherwise indicated.

G. Steel Tube: ASTM A 500, round tube.

H. Galvanized-Steel Tube: ASTM A 500, round tube, hot-dip galvanized according to ASTM A 123/A 123M.

I. Steel Pipe: ASTM A 53/A 53M, galvanized.

2.11 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.

B. Glass-Fiber Board Insulation: ASTM C 726, thickness as indicated.

C. Polyisocyanurate Board Insulation: ASTM C 1289, thickness as indicated.

D. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for aboveground use, acceptable to authorities having jurisdiction, containing no arsenic or chromium, and complying with AWPA C2; not less than 1-1/2 inches thick.

E. Security Grilles: 3/4-inch diameter, ASTM A 1011/A 1011M steel bars spaced 6 inches o.c. in one direction and 12 inches o.c. in the other; factory finished as follows:

1. Surface Preparation: Remove mill scale and rust, if any, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or SSPC-SP 8, "Pickling."
2. Factory Priming for Field-Painted Finish: Apply shop primer specified below immediately after surface preparation and pretreatment.
3. Shop Primer: Manufacturer's or fabricator's standard, fast-curing, lead- and chromate-free, universal primer; selected for resistance to normal atmospheric corrosion, for compatibility with substrate and field-applied finish paint system indicated, and for capability to provide a sound foundation for field-applied topcoats under prolonged exposure.

F. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.

G. Underlayment:

1. Felt: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, nonperforated.
2. Polyethylene Sheet: 6-mil- thick polyethylene sheet complying with ASTM D 4397.
3. Slip Sheet: Building paper, 3-lb/100 sq. ft. minimum, rosin sized.

H. Fasteners: Roof accessory manufacturer's recommended fasteners suitable for application and metals being fastened. Match finish of exposed fasteners with finish of

material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners. Furnish the following unless otherwise indicated:

1. Fasteners for Zinc-Coated or Aluminum-Zinc Alloy-Coated Steel: Series 300 stainless steel or hot-dip zinc-coated steel according to ASTM A 153/A 153M or ASTM F 2329.
2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
3. Fasteners for Copper Sheet: Copper, hardware bronze, or passivated Series 300 stainless steel.
4. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.

I. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, PVC, or silicone or a flat design of foam rubber, sponge neoprene, or cork.

J. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant as recommended by roof accessory manufacturer for installation indicated; low modulus; of type, grade, class, and use classifications required to seal joints and remain watertight.

K. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for expansion joints with limited movement.

L. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.12 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.

B. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

C. Verify dimensions of roof openings for roof accessories.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install roof accessories according to manufacturer's written instructions.

1. Install roof accessories level; plumb; true to line and elevation; and without warping, jogs in alignment, buckling, or tool marks.
2. Anchor roof accessories securely in place so they are capable of resisting indicated loads.
3. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.
4. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.

B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

1. Coat concealed side of uncoated aluminum roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing roof accessories directly on cementitious or wood substrates, install a course of underlayment and cover with manufacturer's recommended slip sheet.
3. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof accessories for waterproof performance.

C. Roof Curb Installation: Install each roof curb so top surface is level.

D. Equipment Support Installation: Install equipment supports so top surfaces are level with each other.

E. Roof-Hatch Installation:

1. Verify that roof hatch operates properly. Clean, lubricate, and adjust operating mechanism and hardware.
2. Attach safety railing system to roof-hatch curb.
3. Attach ladder-assist post according to manufacturer's written instructions.

F. Heat and Smoke Vent Installation:

1. Install heat and smoke vent so top perimeter surfaces are level.
2. Install and test heat and smoke vents and their components for proper operation according to NFPA 204.

G. Pipe Support Installation: Comply with MSS SP-58 and MSS SP-89. Install supports and attachments as required to properly support piping. Arrange for grouping of parallel runs of horizontal piping, and support together.

1. Pipes of Various Sizes: Space supports for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.

H. Preformed Flashing-Sleeve and Flashing Pipe Portal Installation: Secure flashing sleeve to roof membrane according to flashing-sleeve manufacturer's written instructions; flash sleeve flange to surrounding roof membrane according to roof membrane manufacturer's instructions.

I. Security Grilles: Weld bar intersections and, using tamper-resistant bolts, attach the ends of bars to structural frame or primary curb walls.

J. Seal joints with elastomeric or butyl sealant as required by roof accessory manufacturer.

3.3 REPAIR AND CLEANING

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing according to ASTM A 780/A 780M.

B. Touch up factory-primed surfaces with compatible primer ready for field painting according to Section 099113 "Exterior Painting."

C. Clean exposed surfaces according to manufacturer's written instructions.

D. Clean off excess sealants.

E. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

3.4 DEMONSTRATION AND TRAINING

A. For rooftop fall protection system, provide demonstration and training of Owner’s personnel as system-authorized users.

END OF SECTION 07 72 00

SECTION 07 81 00 - APPLIED FIREPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes sprayed fire-resistive materials.

B. Related Requirements:

1. Section 078123 "Intumescent Fireproofing" for mastic and intumescent fire-resistive coatings.

1.3 DEFINITIONS

A. SFRM: Sprayed fire-resistive materials.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review products, design ratings, restrained and unrestrained conditions, densities, thicknesses, bond strengths, and other performance requirements.

1.5 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable LEED Credits

1. MRc2
2. MRc4
3. MRc5
4. IEQc4.1

B. LEED Requirements

1. MRc2: CONSTRUCTION WASTE MANAGEMENT

No less than the specified portion of all construction waste from the Project shall be diverted from disposal in a landfill and/or incineration in with the Project Requirements for Construction Waste Management and Disposal. Refer to Specification Sections 017419 Construction Waste Management and Disposal and 013510 Sustainable Design Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

2. MRc4: Recycled Content Material

   No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the Project Requirements for Recycled Content Materials. All materials counted towards the computations of the proportion of the Recycled Content Materials shall comply with the standard minimum percentages of post-consumer waste materials and for the minimum percentages of pre-consumer waste materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

3. MRc5: REGIONALLY MANUFACTURED HARVESTED MATERIALS

   No less than the specified minimum proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the Project Site in accordance with the Project Requirements for Regionally Manufactured and/or Harvested Materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

4. IEQc4.1: Low Emitting Materials: Sealants and Adhesives

   All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the Project Requirements for Low Emitting Materials – Sealants and Adhesives. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

   1. Product Data: For paints and coatings, indicating VOC content.
   2. Laboratory Test Reports: For paints and coatings, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: Framing plans or schedules, or both, indicating the following:

   1. Extent of fireproofing for each construction and fire-resistance rating.
   2. Applicable fire-resistance design designations of a qualified testing and inspecting agency acceptable to authorities having jurisdiction.
   3. Minimum fireproofing thicknesses needed to achieve required fire-resistance rating of each structural component and assembly.
   4. Treatment of fireproofing after application.

D. Samples: For each exposed product and for each color and texture specified, 4 inches (102 mm) square in size.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and testing agency.

B. Product Certificates: For each type of fireproofing.

C. Evaluation Reports: For fireproofing, from ICC-ES.

D. Preconstruction Test Reports: For fireproofing.

E. Field quality-control reports.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: A firm or individual certified, licensed, or otherwise qualified by fireproofing manufacturer as experienced and with sufficient trained staff to install manufacturer's products according to specified requirements.

B. Mockups: Build mockups to set quality standards for materials and execution.

1. Build mockup of each type of fireproofing and different substrate and as shown on Drawings.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Do not apply fireproofing when ambient or substrate temperature is 44 deg F (7 deg C) or lower unless temporary protection and heat are provided to maintain temperature at or above this level for 24 hours before, during, and for 24 hours after product application.

B. Ventilation: Ventilate building spaces during and after application of fireproofing, providing complete air exchanges according to manufacturer's written instructions. Use natural means or, if they are inadequate, forced-air circulation until fireproofing dries thoroughly.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Assemblies: Provide fireproofing, including auxiliary materials, according to requirements of each fire-resistance design and manufacturer's written instructions.

B. Source Limitations: Obtain fireproofing for each fire-resistance design from single source.

C. Fire-Resistance Design: Indicated on Drawings, tested according to Insert requirement; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Steel members are to be considered unrestrained unless specifically noted otherwise.

D. VOC Content: For field applications, coatings shall comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:

1. Flat Paints and Coatings: 50 g/L.
2. Nonflat Paints and Coatings: 150 g/L.
3. Primers, Sealers, and Undercoaters: 200 g/L.

E. Asbestos: Provide products containing no detectable asbestos.

2.2 SPRAYED FIRE-RESISTIVE MATERIALS

A. Sprayed Fire-Resistive Material: Manufacturer's standard, factory-mixed, lightweight, dry formulation, complying with indicated fire-resistance design, and mixed with water at Project site to form a slurry or mortar before conveyance and application or conveyed in a dry state and mixed with atomized water at place of application.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Carboline Company; a subsidiary of RPM International.
b. Grace Construction Products; W.R. Grace & Co. -- Conn.
c. Isolatek International.
d. Pyrok, Inc.
e. Schundler Company (The).

2. Physical Properties:

a. Bond Strength: Minimum 150-lbf/sq. ft. (7.18-kPa) cohesive and adhesive strength based on field testing according to ASTM E 736.
b. Density: Not less than 15 lb/cu. ft. (240 kg/cu. m) as specified in the approved fire-resistance design, according to ASTM E 605.
c. Thickness: As required for fire-resistance design indicated, measured according to requirements of fire-resistance design.
d. Combustion Characteristics: When tested in accordance with ASTM E 136 shall be noncombustible.
e. Surface-Burning Characteristics: When tested in accordance with ASTM E84 or CAN4-S102, the material shall exhibit the following surface burning characteristics:

1) Flame Spread Index 10 or less
2) Smoke Developed 10 or less

f. Compressive Strength: When tested in accordance with ASTM E761, the material shall not deform more than 10 percent when subjected to a crushing force of 750 psf (35.9 kPa).
g. Corrosion Resistance: No evidence of corrosion according to ASTM E 937.

h. Deflection: No cracking, spalling, or delamination according to ASTM E 759.
i. Effect of Impact on Bonding: No cracking, spalling, or delamination according to ASTM E 760.
j. Air Erosion: Maximum weight loss of 0.025 g/sq. ft. (0.270 g/sq. m) in 24 hours according to ASTM E 859.
k. Fungal Resistance: When tested in accordance with ASTM G21, the material shall show resistance to mold growth for a minimum period of 28

3. Finish: Spray-textured finish. Apply separate, colored topcoat after finishing.

a. Color: As selected by Architect from manufacturer's full range.

2.3 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that are compatible with fireproofing and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in fire-resistance designs indicated.

B. Substrate Primers: Primers approved by fireproofing manufacturer and complying with one or both of the following requirements:

1. Primer and substrate are identical to those tested in required fire-resistance design by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
2. Primer's bond strength in required fire-resistance design complies with specified bond strength for fireproofing and with requirements in UL's "Fire Resistance Directory" or in the listings of another qualified testing agency acceptable to authorities having jurisdiction, based on a series of bond tests according to ASTM E 736.

C. Bonding Agent: Product approved by fireproofing manufacturer and complying with requirements in UL's "Fire Resistance Directory" or in the listings of another qualified testing agency acceptable to authorities having jurisdiction.

D. Metal Lath: Expanded metal lath fabricated from material of weight, configuration, and finish required, according to fire-resistance designs indicated and fireproofing manufacturer's written instructions. Include clips, lathing accessories, corner beads, and other anchorage devices required to attach lath to substrates and to receive fireproofing.

E. Reinforcing Fabric: Glass- or carbon-fiber fabric of type, weight, and form required to comply with fire-resistance designs indicated; approved and provided by fireproofing manufacturer.

F. Reinforcing Mesh: Metallic mesh reinforcement of type, weight, and form required to comply with fire-resistance design indicated; approved and provided by fireproofing manufacturer. Include pins and attachment.

G. Sealer: Transparent-drying, water-dispersible, tinted protective coating recommended in writing by fireproofing manufacturer for each fire-resistance design.

H. Topcoat: Suitable for application over applied fireproofing; of type recommended in writing by fireproofing manufacturer for each fire-resistance design.

1. Cement-Based Topcoat: Factory-mixed, cementitious hard-coat formulation for trowel or spray application over SFRM.

2. Water-Based Permeable Topcoat: Factory-mixed formulation for brush, roller, or spray application over applied SFRM. Provide application at a rate of 30 sq. ft./gal. (0.75 sq. m/L).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrates and other conditions affecting performance of the Work and according to each fire-resistance design.

1. Verify that substrates are free of dirt, oil, grease, release agents, rolling compounds, mill scale, loose scale, incompatible primers, paints, and encapsulants, or other foreign substances capable of impairing bond of fireproofing with substrates under conditions of normal use or fire exposure.
2. Verify that objects penetrating fireproofing, including clips, hangers, support sleeves, and similar items, are securely attached to substrates.
3. Verify that substrates receiving fireproofing are not obstructed by ducts, piping, equipment, or other suspended construction that will interfere with fireproofing application.

B. Verify that concrete work on steel deck is complete before beginning fireproofing work.

C. Verify that roof construction, installation of rooftop HVAC equipment, and other related work are complete before beginning fireproofing work.

D. Conduct tests according to fireproofing manufacturer's written instructions to verify that substrates are free of substances capable of interfering with bond.

E. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Cover other work subject to damage from fallout or overspray of fireproofing materials during application.

B. Clean substrates of substances that could impair bond of fireproofing.

C. Prime substrates where included in fire-resistance design and where recommended in writing by fireproofing manufacturer unless compatible shop primer has been applied and is in satisfactory condition to receive fireproofing.

D. For applications visible on completion of Project, repair substrates to remove surface imperfections that could affect uniformity of texture and thickness in finished surface of

fireproofing. Remove minor projections and fill voids that would telegraph through fire-resistive products after application.

3.3 APPLICATION

A. Construct fireproofing assemblies that are identical to fire-resistance design indicated and products as specified, tested, and substantiated by test reports; for thickness, primers, sealers, topcoats, finishing, and other materials and procedures affecting fireproofing work.

B. Comply with fireproofing manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to mix, convey, and apply fireproofing; as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.

C. Coordinate application of fireproofing with other construction to minimize need to cut or remove fireproofing.

1. Do not begin applying fireproofing until clips, hangers, supports, sleeves, and other items penetrating fireproofing are in place.
2. Defer installing ducts, piping, and other items that would interfere with applying fireproofing until application of fireproofing is completed.

D. Metal Decks:

1. Do not apply fireproofing to underside of metal deck substrates until concrete topping, if any, is completed.
2. Do not apply fireproofing to underside of metal roof deck until roofing is completed; prohibit roof traffic during application and drying of fireproofing.

E. Install auxiliary materials as required, as detailed, and according to fire-resistance design and fireproofing manufacturer's written instructions for conditions of exposure and intended use. For auxiliary materials, use attachment and anchorage devices of type recommended in writing by fireproofing manufacturer.

F. Spray apply fireproofing to maximum extent possible. After the spraying operation in each area, complete the coverage by trowel application or other placement method recommended in writing by fireproofing manufacturer.

G. Extend fireproofing in full thickness over entire area of each substrate to be protected.

H. Install body of fireproofing in a single course unless otherwise recommended in writing by fireproofing manufacturer.

I. For applications over encapsulant materials, including lockdown (post-removal) encapsulants, apply fireproofing that differs in color from that of encapsulant over which it is applied.

J. Where sealers are used, apply products that are tinted to differentiate them from fireproofing over which they are applied.

K. Provide a uniform finish complying with description indicated for each type of fireproofing material and matching finish approved for required mockups.

L. Cure fireproofing according to fireproofing manufacturer's written instructions.

M. Do not install enclosing or concealing construction until after fireproofing has been applied, inspected, and tested and corrections have been made to deficient applications.

N. Finishes: Where indicated, apply fireproofing to produce the following finishes:

1. Manufacturer's Standard Finishes: Finish according to manufacturer's written instructions for each finish selected.
2. Spray-Textured Finish: Finish left as spray applied with no further treatment.
3. Rolled, Spray-Textured Finish: Even finish produced by rolling spray-applied finish with a damp paint roller to remove drippings and excessive roughness.
4. Skip-Troweled Finish: Even leveled surface produced by troweling spray-applied finish to smooth out the texture and neaten edges.
5. Skip-Troweled Finish with Corner Beads: Even, leveled surface produced by troweling spray-applied finish to smooth out the texture, eliminate surface markings, and square off edges.

3.4 FIELD QUALITY CONTROL

A. Special Inspections: Engage a qualified special inspector to perform the following special inspections:

1. Test and inspect as required by the IBC, Subsection 1705.13, "Sprayed Fire-Resistant Materials."

B. Perform the tests and inspections of completed Work in successive stages. Do not proceed with application of fireproofing for the next area until test results for previously completed applications of fireproofing show compliance with requirements. Tested values must equal or exceed values as specified and as indicated and required for approved fire-resistance design.

C. Fireproofing will be considered defective if it does not pass tests and inspections.

1. Remove and replace fireproofing that does not pass tests and inspections, and retest.
2. Apply additional fireproofing, per manufacturer's written instructions, where test results indicate insufficient thickness, and retest.

D. Prepare test and inspection reports.

3.5 CLEANING, PROTECTING, AND REPAIRING

A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.

B. Protect fireproofing, according to advice of manufacturer and Installer, from damage resulting from construction operations or other causes, so fireproofing is without damage or deterioration at time of Substantial Completion.

C. As installation of other construction proceeds, inspect fireproofing and repair damaged areas and fireproofing removed due to work of other trades.

D. Repair fireproofing damaged by other work before concealing it with other construction.

E. Repair fireproofing by reapplying it using same method as original installation or using manufacturer's recommended trowel-applied product.

END OF SECTION 07 81 00

SECTION 07 81 23 - INTUMESCENT FIREPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes mastic and intumescent fire-resistive coatings.

B. Related Requirements:

1. Section 078100 "Applied Fireproofing" for sprayed fire-resistive materials (SFRM).

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review products, design ratings, restrained and unrestrained conditions, thicknesses, and other performance requirements.

1.4 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable LEED Credits

1. MRc2
2. MRc4
3. MRc5
4. IEQc4.1

B. LEED Requirements

1. MRc2: CONSTRUCTION WASTE MANAGEMENT

   No less than the specified portion of all construction waste from the Project shall be diverted from disposal in a landfill and/or incineration in with the Project Requirements for Construction Waste Management and Disposal. Refer to Specification Sections 017419 Construction Waste Management and Disposal and 013510 Sustainable Design Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

2. MRc4: Recycled Content Material

   No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the

Project Requirements for Recycled Content Materials. All materials counted towards the computations of the proportion of the Recycled Content Materials shall comply with the standard minimum percentages of post-consumer waste materials and for the minimum percentages of pre-consumer waste materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

3. MRc5: REGIONALLY MANUFACTURED HARVESTED MATERIALS

   No less than the specified minimum proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the Project Site in accordance with the Project Requirements for Regionally Manufactured and/or Harvested Materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

4. IEQc4.1: Low Emitting Materials: Sealants and Adhesives

   All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the Project Requirements for Low Emitting Materials – Sealants and Adhesives. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

   1. Product Data: For paints and coatings, indicating VOC content.
   2. Laboratory Test Reports: For paints and coatings, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: Framing plans or schedules, or both, indicating the following:

   1. Extent of fireproofing for each construction and fire-resistance rating.
   2. Applicable fire-resistance design designations of a qualified testing and inspecting agency acceptable to authorities having jurisdiction.
   3. Minimum fireproofing thicknesses needed to achieve required fire-resistance rating of each structural component and assembly.
   4. Treatment of fireproofing after application.

D. Samples: For each exposed product and for each color and texture specified, 4 inches (102 mm) square in size.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and testing agency.

B. Product Certificates: For each type of fireproofing.

C. Evaluation Reports: For fireproofing, from ICC-ES.

D. Field quality-control reports.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A firm or individual certified, licensed, or otherwise qualified by fireproofing manufacturer as experienced and with sufficient trained staff to install manufacturer's products according to specified requirements.

B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for materials and execution.

1. Build mockup of each type of fireproofing and different substrate and each required finish as shown on Drawings.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not apply fireproofing when ambient or substrate temperature is 50 deg F (10 deg C) or lower unless temporary protection and heat are provided to maintain temperature at or above this level for 24 hours before, during, and for 24 hours after product application.

B. Ventilation: Ventilate building spaces during and after application of fireproofing, providing complete air exchanges according to manufacturer's written instructions. Use natural means or, if they are inadequate, forced-air circulation until fireproofing dries thoroughly.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Assemblies: Provide fireproofing, including auxiliary materials, according to requirements of each fire-resistance design and manufacturer's written instructions.

B. Source Limitations: Obtain fireproofing for each fire-resistance design from single source.

C. Fire-Resistance Design: Indicated on Drawings, tested according to ASTM E 119 or UL 263; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Steel members are to be considered unrestrained unless specifically noted otherwise.

D. VOC Content: For field applications, coatings shall comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:

1. Flat Paints and Coatings: 50 g/L.
2. Nonflat Paints and Coatings: 150 g/L.
3. Primers, Sealers, and Undercoaters: 200 g/L.

E. Low-Emitting Materials: Coatings shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

F. Asbestos: Provide products containing no detectable asbestos.

2.2 MASTIC AND INTUMESCENT FIRE-RESISTIVE COATINGS

A. Mastic and Intumescent Fire-Resistive Coating: Manufacturer's standard, factory-mixed formulation or factory-mixed, multicomponent system consisting of intumescent base coat and topcoat, and complying with indicated fire-resistance design.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Isolatek International; CAFCO SprayFilm WB 5 or a comparable product by one of the following:

    a. Albi Manufacturing; a division of StanChem, Inc.
    b. Carboline Company; a subsidiary of RPM International.
    c. Hilti, Inc.
    d. International Protective Coatings.

2. Application: Designated for "interior general purpose" use by a qualified testing agency acceptable to authorities having jurisdiction.
3. Thickness: As required for fire-resistance design indicated, measured according to requirements of fire-resistance design.
4. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

    a. Flame-Spread Index: 25 or less.
    b. Smoke-Developed Index: 50 or less.

5. Hardness: Not less than 65, Type D durometer, according to ASTM D 2240.
6. Finish: As selected by Architect from manufacturer's standard finishes.

    a. Color and Gloss: As selected by Architect from manufacturer's full range.

2.3 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that are compatible with fireproofing and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in fire-resistance designs indicated.

B. Substrate Primers: Primers approved by fireproofing manufacturer and complying with required fire-resistance design by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

C. Reinforcing Fabric: Glass- or carbon-fiber fabric of type, weight, and form required to comply with fire-resistance designs indicated; approved and provided by fireproofing manufacturer.

D. Reinforcing Mesh: Metallic mesh reinforcement of type, weight, and form required to comply with fire-resistance design indicated; approved and provided by fireproofing manufacturer. Include pins and attachment.

E. Topcoat: Suitable for application over applied fireproofing; of type recommended in writing by fireproofing manufacturer for each fire-resistance design.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrates and other conditions affecting performance of the Work and according to each fire-resistance design.

1. Verify that substrates are free of dirt, oil, grease, release agents, rolling compounds, mill scale, loose scale, incompatible primers, paints, and encapsulants, or other foreign substances capable of impairing bond of fireproofing with substrates under conditions of normal use or fire exposure.
2. Verify that objects penetrating fireproofing, including clips, hangers, support sleeves, and similar items, are securely attached to substrates.
3. Verify that substrates receiving fireproofing are not obstructed by ducts, piping, equipment, or other suspended construction that will interfere with fireproofing application.

B. Conduct tests according to fireproofing manufacturer's written instructions to verify that substrates are free of substances capable of interfering with bond.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Cover other work subject to damage from fallout or overspray of fireproofing materials during application.

B. Clean substrates of substances that could impair bond of fireproofing.

C. Prime substrates where included in fire-resistance design and where recommended in writing by fireproofing manufacturer unless compatible shop primer has been applied and is in satisfactory condition to receive fireproofing.

D. For applications visible on completion of Project, repair substrates to remove surface imperfections that could affect uniformity of texture and thickness in finished surface of fireproofing. Remove minor projections and fill voids that would telegraph through fire-resistive products after application.

3.3 APPLICATION

A. Construct fireproofing assemblies that are identical to fire-resistance design indicated and products as specified, tested, and substantiated by test reports; for thickness, primers, topcoats, finishing, and other materials and procedures affecting fireproofing work.

B. Comply with fireproofing manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to mix, convey, and apply fireproofing; as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.

C. Coordinate application of fireproofing with other construction to minimize need to cut or remove fireproofing.

1. Do not begin applying fireproofing until clips, hangers, supports, sleeves, and other items penetrating fireproofing are in place.
2. Defer installing ducts, piping, and other items that would interfere with applying fireproofing until application of fireproofing is completed.

D. Install auxiliary materials as required, as detailed, and according to fire-resistance design and fireproofing manufacturer's written instructions for conditions of exposure and intended use. For auxiliary materials, use attachment and anchorage devices of type recommended in writing by fireproofing manufacturer.

E. Spray apply fireproofing to maximum extent possible. After the spraying operation in each area, complete the coverage by trowel application or other placement method recommended in writing by fireproofing manufacturer.

F. Extend fireproofing in full thickness over entire area of each substrate to be protected.

G. Install body of fireproofing in a single course unless otherwise recommended in writing by fireproofing manufacturer.

H. Provide a uniform finish complying with description indicated for each type of fireproofing material and matching finish approved for required mockups.

I. Cure fireproofing according to fireproofing manufacturer's written instructions.

J. Do not install enclosing or concealing construction until after fireproofing has been applied, inspected, and tested and corrections have been made to deficient applications.

K. Finishes: Where indicated, apply fireproofing to produce the following finishes:

1. Manufacturer's Standard Finishes: Finish according to manufacturer's written instructions for each finish selected.
2. Spray-Textured Finish: Finish left as spray applied with no further treatment.

3. Rolled, Spray-Textured Finish: Even finish produced by rolling spray-applied finish with a damp paint roller to remove drippings and excessive roughness.

3.4 FIELD QUALITY CONTROL

A. Special Inspections: Engage a qualified special inspector to perform the following special inspections:

1. Test and inspect as required by the IBC, Subsection 1705.14, "Mastic and Intumescent Fire-Resistant Coatings."

B. Perform the tests and inspections of completed Work in successive stages. Do not proceed with application of fireproofing for the next area until test results for previously completed applications of fireproofing show compliance with requirements. Tested values must equal or exceed values as specified and as indicated and required for approved fire-resistance design.

C. Fireproofing will be considered defective if it does not pass tests and inspections.

1. Remove and replace fireproofing that does not pass tests and inspections, and retest.
2. Apply additional fireproofing, per manufacturer's written instructions, where test results indicate insufficient thickness, and retest.

D. Prepare test and inspection reports.

3.5 CLEANING, PROTECTING, AND REPAIRING

A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.

B. Protect fireproofing, according to advice of manufacturer and Installer, from damage resulting from construction operations or other causes, so fireproofing is without damage or deterioration at time of Substantial Completion.

C. As installation of other construction proceeds, inspect fireproofing and repair damaged areas and fireproofing removed due to work of other trades.

D. Repair fireproofing damaged by other work before concealing it with other construction.

E. Repair fireproofing by reapplying it using same method as original installation or using manufacturer's recommended trowel-applied product.

END OF SECTION 07 81 23

SECTION 07 84 13 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Penetrations in fire-resistance-rated walls.
2. Penetrations in horizontal assemblies.
3. Penetrations in smoke barriers.

B. Related Requirements:

1. Section 078443 "Joint Firestopping" for joints in or between fire-resistance-rated construction, at exterior curtain-wall/floor intersections, and in smoke barriers.

1.3 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable LEED Credits

1. MRc2
2. MRc4
3. MRc5
4. IEQc4.1

B. LEED Requirements

1. MRc2: CONSTRUCTION WASTE MANAGEMENT

   No less than the specified portion of all construction waste from the Project shall be diverted from disposal in a landfill and/or incineration in with the Project Requirements for Construction Waste Management and Disposal. Refer to Specification Sections 017419 Construction Waste Management and Disposal and 013510 Sustainable Design Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

2. MRc4: Recycled Content Material

   No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the Project Requirements for Recycled Content Materials. All materials counted towards the computations of the proportion of the Recycled Content Materials shall comply with the standard minimum percentages of post-consumer waste materials and for the minimum percentages of pre-consumer waste materials.

Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

3. MRc5: REGIONALLY MANUFACTURED HARVESTED MATERIALS

   No less than the specified minimum proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the Project Site in accordance with the Project Requirements for Regionally Manufactured and/or Harvested Materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

4. IEQc4.1: Low Emitting Materials: Sealants and Adhesives

   All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the Project Requirements for Low Emitting Materials – Sealants and Adhesives. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Product Schedule: For each penetration firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing and inspecting agency.

   1. Engineering Judgments: Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping system, submit illustration, with modifications marked, approved by penetration firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly. Obtain approval of authorities having jurisdiction prior to submittal.

1.5 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each penetration firestopping system, for tests performed by a qualified testing agency.

1.6 CLOSEOUT SUBMITTALS

A. Installer Certificates: From Installer indicating that penetration firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not install penetration firestopping system when ambient or substrate temperatures are outside limits permitted by penetration firestopping system manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.

B. Install and cure penetration firestopping materials per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.9 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping systems can be installed according to specified firestopping system design.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping systems.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics:

1. Perform penetration firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
2. Test per testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements:

a. Penetration firestopping systems shall bear classification marking of a qualified testing agency.

1) UL in its "Fire Resistance Directory."
2) Intertek Group in its "Directory of Listed Building Products."
3) FM Global in its "Building Materials Approval Guide."

2.2 PENETRATION FIRESTOPPING SYSTEMS

A. Penetration Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. 3M Fire Protection Products.
    b. A/D Fire Protection Systems Inc.
    c. Hilti, Inc.
    d. Tremco, Inc.

B. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).

1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.

C. Penetrations in Horizontal Assemblies: Penetration firestopping systems with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).

1. F-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated.
2. T-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
3. W-Rating: Provide penetration firestopping systems showing no evidence of water leakage when tested according to UL 1479.

D. Penetrations in Smoke Barriers: Penetration firestopping systems with ratings determined per UL 1479, based on testing at a positive pressure differential of 0.30-inch wg (74.7 Pa).

1. L-Rating: Not exceeding 5.0 cfm/sq. ft. (0.025 cu. m/s per sq. m) of penetration opening at and no more than 50-cfm (0.024-cu. m/s) cumulative total for any 100 sq. ft. (9.3 sq. m) at both ambient and elevated temperatures.

E. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, per ASTM E 84.

1. Sealant shall have a VOC content of 250 g/L or less.
2. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

F. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping system manufacturer and approved by qualified testing and inspecting agency for conditions indicated.

1. Permanent forming/damming/backing materials.
2. Substrate primers.
3. Collars.
4. Steel sleeves.

2.3 FILL MATERIALS

A. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer sleeve lined with an intumescent strip, a flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.

B. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.

C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced intumescent elastomeric sheet bonded to galvanized-steel sheet.

E. Intumescent Putties: Nonhardening, water-resistant, intumescent putties containing no solvents or inorganic fibers.

F. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.

G. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.

H. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.

I. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

J. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants.

2.4 MIXING

A. Penetration Firestopping Materials: For those products requiring mixing before application, comply with penetration firestopping system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Before installing penetration firestopping systems, clean out openings immediately to comply with manufacturer's written instructions and with the following requirements:

1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping materials.
2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping materials. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

3.3 INSTALLATION

A. General: Install penetration firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications.

B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.

C. Install fill materials by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories and penetrating items to achieve required fire-resistance ratings.
2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Wall Identification: Permanently label walls containing penetration firestopping systems with the words "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS," using lettering not less than 3 inches (76 mm) high and with minimum 0.375-inch (9.5-mm) strokes.

1. Locate in accessible concealed floor, or floor-ceiling, at 15 feet (4.57 m) from end of wall and at intervals not exceeding 30 feet (9.14 m).

3.5 FIELD QUALITY CONTROL

A. Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E 2174.

B. Where deficiencies are found or penetration firestopping system is damaged or removed because of testing, repair or replace penetration firestopping system to comply with requirements.

C. Proceed with enclosing penetration firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping system manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping material and install new materials to produce systems complying with specified requirements.

END OF SECTION 07 84 13

SECTION 07 84 43 - JOINT FIRESTOPPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Joints in or between fire-resistance-rated constructions.
2. Joints in smoke barriers.

B. Related Requirements:

1. Section 078413 "Penetration Firestopping" for penetrations in fire-resistance-rated walls, horizontal assemblies, and smoke barriers and for wall identification.
2. Section 079500 "Expansion Control" for fire-resistive architectural joint systems.
3. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
4. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable LEED Credits

1. MRc2
2. MRc4
3. MRc5
4. IEQc4.1

B. LEED Requirements

1. MRc2: CONSTRUCTION WASTE MANAGEMENT

   No less than the specified portion of all construction waste from the Project shall be diverted from disposal in a landfill and/or incineration in with the Project Requirements for Construction Waste Management and Disposal. Refer to Specification Sections 017419 Construction Waste Management and Disposal and 013510 Sustainable Design Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

2. MRc4: Recycled Content Material

   No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the

Project Requirements for Recycled Content Materials. All materials counted towards the computations of the proportion of the Recycled Content Materials shall comply with the standard minimum percentages of post-consumer waste materials and for the minimum percentages of pre-consumer waste materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

3. MRc5: REGIONALLY MANUFACTURED HARVESTED MATERIALS

   No less than the specified minimum proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the Project Site in accordance with the Project Requirements for Regionally Manufactured and/or Harvested Materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

4. IEQc4.1: Low Emitting Materials: Sealants and Adhesives

   All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the Project Requirements for Low Emitting Materials – Sealants and Adhesives. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

   1. Product Data: For sealants, indicating VOC content.
   2. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.

C. Product Schedule: For each joint firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing agency.

   1. Engineering Judgments: Where Project conditions require modification to a qualified testing agency's illustration for a particular joint firestopping system condition, submit illustration, with modifications marked, approved by joint firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for fire-resistive joint systems.

C. Product Test Reports: For each joint firestopping system, for tests performed by a qualified testing agency.

1.6 CLOSEOUT SUBMITTALS

A. Installer Certificates: From Installer indicating that joint firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with UL's "Qualified Firestop Contractor Program Requirements."

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not install joint firestopping systems when ambient or substrate temperatures are outside limits permitted by joint firestopping system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Install and cure joint firestopping systems per manufacturer's written instructions using natural means of ventilation or, where this is inadequate, forced-air circulation.

1.9 COORDINATION

A. Coordinate construction of joints to ensure that joint firestopping systems can be installed according to specified firestopping system design.

B. Coordinate sizing of joints to accommodate joint firestopping systems.

C. Notify Owner's testing agency at least seven days in advance of fire-resistive joint system installations; confirm dates and times on day preceding each series of installations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics:

1. Perform joint firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
2. Test per testing standards referenced in "Joint Firestopping Systems" Article. Provide rated systems complying with the following requirements:

a. Joint firestopping systems shall bear classification marking of a qualified testing agency.

1) UL in its "Fire Resistance Directory."

2.2 JOINT FIRESTOPPING SYSTEMS

A. Joint Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which joint firestopping systems are installed. Joint firestopping systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.

B. Joints in or between Fire-Resistance-Rated Construction: Provide joint firestopping systems with ratings determined per ASTM E 1966 or UL 2079.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following :

a. A/D Fire Protection Systems Inc.
b. CEMCO.
c. Hilti, Inc.
d. Nelson Firestop Products.
e. NUCO Inc.
f. Passive Fire Protection Partners.
g. RectorSeal Corporation; FlameSafe.
h. Specified Technologies Inc.
i. 3M Fire Protection Products.
j. Tremco, Inc.; Tremco Fire Protection Systems Group.

2. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of the wall, floor, or roof in or between which it is installed.

C. Joints in Smoke Barriers: Provide fire-resistive joint systems with ratings determined per UL 2079 based on testing at a positive pressure differential of 0.30-inch wg (74.7 Pa).

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following :

a. A/D Fire Protection Systems Inc.
b. Hilti, Inc.
c. Nelson Firestop Products.
d. NUCO Inc.
e. Passive Fire Protection Partners.
f. RectorSeal Corporation; FlameSafe.
g. Specified Technologies Inc.
h. 3M Fire Protection Products.
i. Tremco, Inc.; Tremco Fire Protection Systems Group.

2. L-Rating: Not exceeding 5.0 cfm/ft. (0.00775 cu. m/s x m) of joint at both ambient and elevated temperatures.

D. Exposed Fire-Resistive Joint Systems: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

E. VOC Content: Provide fire-resistive joint systems that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Architectural Sealants: 250 g/L.

2. Sealant Primers for Nonporous Substrates: 250 g/L.
3. Sealant Primers for Porous Substrates: 775 g/L.

F. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials, that are needed to install elastomeric fill materials and to maintain ratings required. Use only components specified by joint firestopping system manufacturer and approved by the qualified testing agency for conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Before installing fire-resistive joint systems, clean joints immediately to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:

1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of elastomeric fill materials or compromise fire-resistive rating.
2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with elastomeric fill materials. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Prime substrates where recommended in writing by joint firestopping system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

3.3 INSTALLATION

A. General: Install fire-resistive joint systems to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming materials and other accessories of types required to support elastomeric fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing elastomeric fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of fire-resistive joint system.

C. Install elastomeric fill materials for fire-resistive joint systems by proven techniques to produce the following results:

1. Elastomeric fill voids and cavities formed by joints and forming materials as required to achieve fire-resistance ratings indicated.
2. Apply elastomeric fill materials so they contact and adhere to substrates formed by joints.
3. For elastomeric fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Joint Identification: Identify joint firestopping systems with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of joint edge so labels are visible to anyone seeking to remove or joint firestopping system. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

1. The words "Warning - Joint Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Designation of applicable testing agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

3.5 FIELD QUALITY CONTROL

A. Inspecting Agency: Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E 2393.

B. Where deficiencies are found or joint firestopping systems are damaged or removed due to testing, repair or replace joint firestopping systems so they comply with requirements.

C. Proceed with enclosing joint firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

A. Clean off excess elastomeric fill materials adjacent to joints as the Work progresses by methods and with cleaning materials that are approved in writing by joint firestopping system manufacturers and that do not damage materials in which joints occur.

B. Provide final protection and maintain conditions during and after installation that ensure joint firestopping systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated fire-resistive joint systems immediately and install new materials to produce fire-resistive joint systems complying with specified requirements.

3.7 JOINT FIRESTOPPING SYSTEM SCHEDULE

A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHBN or Category XHDG.

B. Floor-to-Floor, Fire-Resistive Joint Systems:

1. UL-Classified Systems: FF-S-0000-0999.
2. Assembly Rating: 2 hours.
3. Nominal Joint Width: As indicated.
4. Movement Capabilities: Class I - 15% percent compression or extension.
5. L-Rating at Ambient: Less than 1 cfm/ft..
6. L-Rating at 400 deg F: Less than 1 cfm/ft..
7. W-Rating: No leakage of water at completion of water leakage testing.

C. Wall-to-Wall, Fire-Resistive Joint Systems:

1. UL-Classified Systems: WW-S-0000-0999.
2. Assembly Rating: 2 hours.
3. Nominal Joint Width: As indicated.
4. Movement Capabilities: Class II - 15% percent compression or extension.
5. L-Rating at Ambient: Less than 1 cfm/ft..
6. L-Rating at 400 deg F: Less than 1 cfm/ft..

D. Floor-to-Wall, Fire-Resistive Joint Systems:

1. UL-Classified Systems: FW-D-0000-0999.
2. Assembly Rating: 2 hours.
3. Nominal Joint Width: As indicated.
4. Movement Capabilities: Class II - 10% percent compression or extension.
5. L-Rating at Ambient: Less than 1 cfm/ft..
6. L-Rating at 400 deg F: Less than 1 cfm/ft..

E. Head-of-Wall, Fire-Resistive Joint Systems:

1. UL-Classified Systems: HW-D-0000-0999.
2. Assembly Rating: 2 hours.
3. Nominal Joint Width: As indicated.
4. Movement Capabilities: Class III – 100% percent compression or extension.
5. L-Rating at Ambient: Less than 1 cfm/ft..
6. L-Rating at 400 deg F: Less than 1 cfm/ft..

F. Bottom-of-Wall, Fire-Resistive Joint Systems:

1. UL-Classified Systems: BW-S-0000-0999.
2. Assembly Rating: 2 hours.
3. Nominal Joint Width: As indicated.
4. L-Rating at Ambient: Less than 1 cfm/ft..
5. L-Rating at 400 deg F: Less than 1 cfm/ft..

G. Wall-to-Wall, Fire-Resistive Joint Systems Intended for Use as Corner Guards:

1. UL-Classified Systems: CG-D-0000-0999.
2. Assembly Rating: 1 hour.
3. Nominal Joint Width: As indicated.

4. Movement Capabilities: Class II – 10% percent compression or extension.
5. L-Rating at Ambient: Less than 1 cfm/ft..
6. L-Rating at 400 deg F: Less than 1 cfm/ft..

H. Perimeter Fire-Resistive Joint Systems:

1. UL-Classified Perimeter Fire-Containment Systems: CW-D-2000-2999.
2. Integrity Rating: 2 hours.
3. Insulation Rating: 1/4 hour.
4. Linear Opening Width: 8 inches, maximum.
5. Movement Capabilities: Class II - 5% percent compression or extension.
6. L-Rating at Ambient Temperature: Less than 1 cfm/ft..
7. L-Rating at 400 deg F: Less than 1 cfm/ft..

I.

END OF SECTION 07 84 43

SECTION 07 92 00 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Silicone joint sealants.
2. Urethane joint sealants.
3. Mildew-resistant joint sealants.
4. Latex joint sealants.

B. Related Requirements:

1. Division 04 Section "Unit Masonry" for masonry control and expansion joint fillers and gaskets.
2. Division 07 Section "Fire-Resistive Joint Systems" for sealing joints in fire-resistance-rated construction.
3. Division 07 section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
4. Division 08 Section "Glazing" for glazing sealants.
5. Division 09 Section "Gypsum Board" for sealing perimeter joints.
6. Division 09 Section "Tiling" for sealing tile joints.
7. Division 09 Section "Acoustical Panel Ceilings" for sealing edge moldings at perimeters with acoustical sealant.

1.3 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable LEED Credits

1. MRc2
2. MRc4
3. MRc5
4. IEQc4.1

B. LEED Requirements

1. MRc2: CONSTRUCTION WASTE MANAGEMENT

No less than the specified portion of all construction waste from the Project shall be diverted from disposal in a landfill and/or incineration in with the Project Requirements for Construction Waste Management and Disposal. Refer to Specification Sections 017419 Construction Waste Management and Disposal

and 013510 Sustainable Design Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

2. MRc4: Recycled Content Material

   No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the Project Requirements for Recycled Content Materials. All materials counted towards the computations of the proportion of the Recycled Content Materials shall comply with the standard minimum percentages of post-consumer waste materials and for the minimum percentages of pre-consumer waste materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

3. MRc5: REGIONALLY MANUFACTURED HARVESTED MATERIALS

   No less than the specified minimum proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the Project Site in accordance with the Project Requirements for Regionally Manufactured and/or Harvested Materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

4. IEQc4.1: Low Emitting Materials: Sealants and Adhesives

   All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the Project Requirements for Low Emitting Materials – Sealants and Adhesives. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

1.4 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product.

B. Sustainable Design Submittals:

   1. Product Data: For sealants, indicating VOC content.
   2. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.

C. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

D. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- (13-mm-) wide joints formed between two 6-inch- (150-mm-) long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

E. Joint-Sealant Schedule: Include the following information:

   1. Joint-sealant application, joint location, and designation.
   2. Joint-sealant manufacturer and product name.

3. Joint-sealant formulation.
4. Joint-sealant color.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Product Test Reports: For each kind of joint sealant, for tests performed by a qualified testing agency.

C. Preconstruction Laboratory Test Schedule: Include the following information for each joint sealant and substrate material to be tested:

1. Joint-sealant location and designation.
2. Manufacturer and product name.
3. Type of substrate material.
4. Proposed test.
5. Number of samples required.

D. Preconstruction Laboratory Test Reports: From sealant manufacturer, indicating the following:

1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
2. Interpretation of test results and written recommendations for primers and substrate preparation are needed for adhesion.

E. Preconstruction Field-Adhesion-Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" Article.

F. Field-Adhesion-Test Reports: For each sealant application tested.

G. Sample Warranties: For special warranties.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

B. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.

C. Product Testing: Test joint sealants using a qualified testing agency.

1. Testing Agency Qualifications: Qualified according to ASTM C 1021 to conduct the testing indicated.

D. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

1.7 PRECONSTRUCTION TESTING

A. Preconstruction Laboratory Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.

1. Adhesion Testing: Use ASTM C 794 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
2. Compatibility Testing: Use ASTM C 1087 to determine sealant compatibility when in contact with glazing and gasket materials.
3. Stain Testing: Use ASTM C 1248 to determine stain potential of sealant when in contact with masonry substrates.
4. Submit manufacturer's recommended number of pieces of each type of material, including joint substrates, joint-sealant backings, and miscellaneous materials.
5. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
6. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures, including use of specially formulated primers.
7. Testing will not be required if joint-sealant manufacturers submit data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, staining of, and compatibility with joint substrates and other materials matching those submitted.

B. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates as follows:

1. Locate test joints where indicated on Project or, if not indicated, as directed by Architect.
2. Conduct field tests for each kind of sealant and joint substrate.
3. Notify Architect seven days in advance of dates and times when test joints will be erected.
4. Arrange for tests to take place with joint-sealant manufacturer's technical representative present.

    a. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1.1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

        1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

5. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

1.8 FIELD CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F (5 deg C).
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.9 WARRANTY

A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:

1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
2. Disintegration of joint substrates from causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. VOC Content: Sealants and sealant primers shall comply with the following:

1. Architectural sealants shall have a VOC content of 250 g/L or less.
2. Sealants and sealant primers for nonporous substrates shall have a VOC content of 250 g/L or less.
3. Sealants and sealant primers for nonporous substrates shall have a VOC content of 775 g/L or less.

C. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 SILICONE JOINT SEALANTS

A. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use NT.

B. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 50, for Use NT.

C. Multicomponent, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type M, Grade NS, Class 50, for Use NT.See Editing Instruction No. 1 in the Evaluations for cautions about naming manufacturers and products. See Division 01 Section "Product Requirements."Mildew-Resistant

2.3 URETHANE JOINT SEALANTS

A. Immersible, Single-Component, Nonsag, Traffic-Grade, Urethane Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Uses T and I.

2.4 MILDEW-RESISTANT JOINT SEALANTS

A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.

B. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.

2.5 LATEX JOINT SEALANTS

A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.

2.6 JOINT-SEALANT BACKING

A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin) or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.7 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:

    a. Concrete.
    b. Masonry.
    c. Unglazed surfaces of ceramic tile.
    d. Exterior insulation and finish systems.

3. Remove laitance and form-release agents from concrete.
4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:

    a. Metal.

b. Glass.
c. Porcelain enamel.
d. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.
4. Provide flush joint profile at according to Figure 8B in ASTM C 1193.

5. Provide recessed joint configuration of recess depth and at according to Figure 8C in ASTM C 1193.

    a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

3.4 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test completed and cured sealant joints as follows:

    a. Perform 10 tests for the first 1000 feet (300 m) of joint length for each kind of sealant and joint substrate.
    b. Perform one test for each 1000 feet (300 m) of joint length thereafter or one test per each floor per elevation.

2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

    a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

3. Inspect tested joints and report on the following:

    a. Whether sealants filled joint cavities and are free of voids.
    b. Whether sealant dimensions and configurations comply with specified requirements.
    c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion complies with sealant manufacturer's field-adhesion hand-pull test criteria.

4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant material, sealant configuration, and sealant dimensions.
5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

B. Evaluation of Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.6 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.7 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces.

1. Joint Locations:

a. Isolation and contraction joints in cast-in-place concrete slabs.
b. Joints between plant-precast architectural concrete paving units.
c. Tile control and expansion joints.
d. Joints between different materials listed above.
e. Other joints as indicated.

2. Silicone Joint Sealant: Single component, nonsag, traffic grade, neutral curing .
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors .

B. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces subject to water immersion.

1. Joint Locations:

a. Joints in exterior recreation areas.
b. Other joints as indicated.

2. Urethane Joint Sealant: Immersible, single component, nonsag, traffic grade .
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

C. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Locations:

a. Construction joints in cast-in-place concrete.
b. Joints between plant-precast architectural concrete units.
c. Control and expansion joints in unit masonry.
d. Joints in exterior insulation and finish systems.
e. Joints between metal panels.

f. Joints between different materials listed above.
g. Perimeter joints between materials listed above and frames of doors, windows and louvers.
h. Control and expansion joints in ceilings and other overhead surfaces.
i. Other joints as indicated.

2. Silicone Joint Sealant: Single component, nonsag, neutral curing, Class 100/50**.**
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors .

D. Joint-Sealant Application: Interior joints in horizontal traffic surfaces.

1. Joint Locations:

a. Isolation joints in cast-in-place concrete slabs.
b. Control and expansion joints in tile flooring.
c. Other joints as indicated.

2. Silicone Joint Sealant: Single component, nonsag, traffic grade, neutral curing .
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors .

E. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Locations:

a. Control and expansion joints on exposed interior surfaces of exterior walls.
b. Perimeter joints of exterior openings where indicated.
c. Tile control and expansion joints.
d. Vertical joints on exposed surfaces of concrete and interior unit masonry walls and partitions.
e. Perimeter joints between interior wall surfaces and frames of interior doors windows and elevator entrances.
f. Other joints as indicated.

2. Joint Sealant: Acrylic based .
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors .

F. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Sealant Location:

a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
b. Tile control and expansion joints where indicated.
c. Other joints as indicated.

2. Joint Sealant: Mildew resistant, single component, nonsag, neutral curing, Silicone .
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors .

G. Joint-Sealant Application: Interior acoustical joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Location:

   a. Acoustical joints where indicated.
   b. Other joints as indicated.

2. Joint Sealant: Acoustical .
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range .

END OF SECTION 079200

SECTION 07 92 22 – SECURITY JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Security Joint Sealant.
   2. Security Gap Filler.

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Division 3 Section “Cast-in-place Concrete”
   2. Division 4 Section “Unit Masonry Assemblies”
   3. Division 8 Section “Steel Doors and Frames”
   4. Division 11 for Detention Equipment
   5. Division 15 for Mechanical
   6. Division 16 for Electrical
   7. Division 17 for Security Electronics

1.3 SUBMITTALS

A. Product Data: For each joint sealant product indicated.
   1. Certification by joint sealant manufacturer that sealants plus the primers and cleaners required for sealant installation comply with local regulations controlling use of volatile organic compounds.

B. Certificates by Manufacturer: That products supplied complies with performance requirements specified and are suitable for the use indicated.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who has completed joint sealant applications similar in material, design, and extent to that indicated for Project that have resulted in construction with a record of successful in-service performance.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multi-component materials.

B. Store and handle materials in compliance with manufacturer's recommendations to prevent their deterioration or damage due to moisture, high or low temperatures,

contaminants, or other causes.

1.6 PROJECT CONDITIONS

A. Environmental Conditions: Do not proceed with installation of joint sealants under the following conditions:
   1. When ambient and substrate temperature conditions are outside the limits permitted by joint sealant manufacturer.
   2. When ambient and substrate temperature conditions are outside the limits permitted by joint sealant manufacturer or below 40 deg F (4.4 deg C).
   3. When joint substrates are wet.

B. Joint Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than allowed by joint sealant manufacturer for application indicated.

C. Joint Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with their adhesion are removed from joint substrates.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Compatibility: Provide joint sealants, joint fillers, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

B. Colors: Provide color of exposed joint sealants to comply with the following:
   1. Provide selections made by Architect from manufacturer's full range of standard colors for products of type indicated.

2.2 SECURITY JOINT SEALANT

A. Product/Manufacturer:
   1. SikaFlex –2c NS TG/Sika Corp.
   2. Dyna Flex/Pecora Corp.
   3. Sonolastic Ultra/BASF

2.3 SECURITY EPOXY RESIN GAP FILLER (LOW-MOD GEL)

A. Product/Manufacturer:
   1. Sika-Dur 23/Sika Corp.
   2. DynaPoxy/Pecora Corp.
   3. Concresive Paste LPL/BASF

B. Materials
   1. Epoxy resin adhesive binder:
      a. Component “A” shall be a modified epoxy resin of the epichlorohydrin bisphenol A type containing suitable viscosity control agents. It shall not

contain butyl glycidyl ether.
b. Component “B” shall be a blend of aliphatic amines containing suitable viscosity control agents, pigments and accelerators.
c. The ratio of Component “A”: Component “B” shall be 1:1 by volume.
d. The material shall not contain asbestos.

C. Performance Criteria
1. Properties of the mixed epoxy resin adhesive:
a. Pot Life: 45-65 minutes
b. Tack-Free Time to Touch (20 mil thickness): 1.5-2.5 hours
c. Consistency (½ in. thick) : non-sag
d. Color: gray
2. Properties of the mixed epoxy resin adhesive:
a. Compressive Properties (ASTM D-695) at 28 days
b. Compressive Strength: 4400 psi min
c. Modulus of Elasticity: 1.5 x 105 psi min
d. Tensile Properties (ASTM D-638) at 14 days
1) Tensile Strength: 1725 psi min
2) Elongation at Break: 5.5% min
3) Modulus of Elasticity: 2.7 x 105 psi min
e. Flexural Properties (ASTM D-790) at 14 days
1) Flexural Strength (Modulus of Rupture): 4100 psi min.
2) Tangent Modulus of Elasticity in Bending: 4.0 x 105 psi min
f. Shear Strength (ASTM D-732) at 14 days: 2600 psi min
g. Total Water Absorption (ASTM D-570) at 7 days: .5% max. (2 hour boil)
h. Bond Strength (ASTM C-882) Hardened Concrete to Hardened Concrete
1) 2 day (Dry cure): 2200 psi min
2) 14 day (moist cure): 1500 psi min
i. Deflection Temperature (ASTM D-648) at 14 days: 87F min (fiber stress loading = 66 psi)
j. The epoxy resin adhesive shall conform to ASTM C-881 and AASHTO M 235-90.
k. The epoxy resin adhesive binder shall be approved by the United States Department of Agriculture.
3. Properties of the epoxy resin mortar (epoxy resin/aggregate* =1/1 by loose volume):
a. Compressive Properties (ASTM D-695) at 28 days
1) Compressive Strength: 6100 psi min.
2) Modulus of Elasticity: L 3.4 x 105 psi min.
b. Tensile Properties (ASTM D-638) at 14 days
1) Tensile Strength: 2050 psi min.
2) Elongation at Break: 0.85% min.
3) Modulus of Elasticity: 5.2 x 105 psi min.
c. Flexural Properties (ASTM D-790) at 14 days
1) Flexural Strength (Modulus of Rupture): 3300 psi min.
2) Tangent Modulus of Elasticity in Bending: 5.8 x 105 psi min.
d. Shear Strength (ASTM D-732) at days: 2800 psi min.
e. Aggregate used shall conform to ASTM C-190.

2.4 JOINT SEALANT BACKING

A. General: Provide sealant backings of material that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin) as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

2.5 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming in any way joint substrates and adjacent nonporous surfaces, and formulated to promote optimum adhesion of sealants with joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 LOCATIONS

A. Provide security joint sealants and security gap filler work as required under the General, Mechanical, and Electrical Sections. See security matrix at the end of this Section.

3.2 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint sealant performance. Do not proceed with installation of joint sealants until unsatisfactory conditions have been corrected.

3.3 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with recommendations of joint sealant manufacturer and the following requirements:
   1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
   2. Clean concrete, masonry, unglazed surfaces of ceramic tile, and similar porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints

with oil-free compressed air.

3. Remove laitance and form release agents from concrete.
4. Clean metal, glass, porcelain enamel, glazed surfaces of ceramic tile, and other nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.

B. Joint Priming: Prime joint substrates where indicated or where recommended by joint sealant manufacturer based on preconstruction joint sealant-substrate tests or prior experience. Apply primer to comply with joint sealant manufacturer's recommendations. Confine primers to areas of joint sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.4 INSTALLATION OF JOINT SEALANTS

A. Comply with joint sealant manufacturer's printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.

3.5 CLEANING

A. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.

3.6 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so that and installations with repaired areas are indistinguishable from original work.

3.7 SEALANT MATRIX

LOCATIONS	INTAKE, CELL PODS, DAYROOMS MEDICAL, EXERCISE AND CIRCULATION	DORMITORY AND PROGRAM AREAS	ADMIN. AND STAFF AREAS
DETENTION HOLLOW METAL FRAMES	SGF	SGF	SGF
ARCH. DOOR & WINDOW FRAMES	SJS	LJS	LJS
MECH. GRILLES/ DIFFUSERS	SGF	SJS	LJS
SECURITY SINKS, SHOWERS	SGF	SJS	LJS
WATER CLOSETS & LAVITORIES	SGF	SJS	LJS
SPRINKLER HEADS/ PLUMBING	SGF	SJS	LJS
SECURITY LIGHT FIXTURES	SGF	SJS	LJS
EXPOSED CONDUIT /RACEWAYS	SGF	SJS	SJS
SWITCH/OUTLET	SJS	SJS	LJS
INMATE DURESS PLATES	SJS	SJS	LJS
MICS. DETENTION EQUIP. (MIRRORS)	SGF	SGF	SGF
INTERIOR MASONRY UNITS AT BASE	SGF	SGF	SGF
WALL AND CEILING JOINT	SJS	SJS	LJS
INTERCOM CALLSTATIONS	SJS	SJS	LJS

A. LJS/Latex Joint Sealants (See Specification Section 079200 for Joints Sealants).
B. SJS/Security Joint Sealant.
C. SGF/Security Gap Filler.

END OF SECTION 079222

SECTION 07 95 00 - EXPANSION CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Interior expansion control systems.
2. Exterior wall expansion control systems.

B. Related Requirements:

1. Section 077129 "Manufactured Roof Expansion Joints" for factory-fabricated roof expansion control.
2. Section 078443 "Joint Firestopping" for liquid-applied joint sealants in fire-resistive building joints.
3. Section 079200 "Joint Sealants" for liquid-applied joint sealants and for elastomeric sealants without metal frames.

1.3 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable LEED Credits

1. MRc2
2. MRc4
3. MRc5
4. IEQc4.1

B. LEED Requirements

1. MRc2: CONSTRUCTION WASTE MANAGEMENT

   No less than the specified portion of all construction waste from the Project shall be diverted from disposal in a landfill and/or incineration in with the Project Requirements for Construction Waste Management and Disposal. Refer to Specification Sections 017419 Construction Waste Management and Disposal and 013510 Sustainable Design Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

2. MRc4: Recycled Content Material

   No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the Project Requirements for Recycled Content Materials. All materials counted

towards the computations of the proportion of the Recycled Content Materials shall comply with the standard minimum percentages of post-consumer waste materials and for the minimum percentages of pre-consumer waste materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

3. MRc5: REGIONALLY MANUFACTURED HARVESTED MATERIALS

   No less than the specified minimum proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the Project Site in accordance with the Project Requirements for Regionally Manufactured and/or Harvested Materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

4. IEQc4.1: Low Emitting Materials: Sealants and Adhesives

   All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the Project Requirements for Low Emitting Materials – Sealants and Adhesives. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

1.4 ACTION SUBMITTALS

A. Shop Drawings: For each expansion control system specified. Include plans, elevations, sections, details, splices, blockout requirement, attachments to other work, and line diagrams showing entire route of each expansion control system. Where expansion control systems change planes, provide isometric or clearly detailed drawing depicting how components interconnect.

B. Samples: For each exposed expansion control system and for each color and texture specified, full width by 6 inches (150 mm) long in size.

C. Samples for Initial Selection: For each type of expansion control system indicated.

   1. Include manufacturer's color charts showing the full range of colors and finishes available for each exposed metal and elastomeric seal material.

D. Samples for Verification: For each type of expansion control system indicated, full width by 6 inches (150 mm) long in size.

E. Product Schedule: Prepared by or under the supervision of the supplier. Include the following information in tabular form:

   1. Manufacturer and model number for each expansion control system.
   2. Expansion control system location cross-referenced to Drawings.
   3. Nominal joint width.
   4. Movement capability.
   5. Classification as thermal or seismic.
   6. Materials, colors, and finishes.
   7. Product options.
   8. Fire-resistance ratings.

1.5 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each fire barrier provided as part of an expansion control system, for tests performed by a qualified testing agency.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. General: Provide expansion control systems of design, basic profile, materials, and operation indicated. Provide units with capability to accommodate variations in adjacent surfaces.

1. Furnish units in longest practicable lengths to minimize field splicing. Install with hairline mitered corners where expansion control systems change direction or abut other materials.
2. Include factory-fabricated closure materials and transition pieces, T-joints, corners, curbs, cross-connections, and other accessories as required to provide continuous expansion control systems.

B. Coordination: Coordinate installation of exterior wall and soffit expansion control systems with roof expansion control systems to ensure that wall transitions are watertight. Roof expansion joint assemblies are specified elsewhere.

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Resistance Ratings: Where indicated, provide expansion control systems with fire barriers identical to those of systems tested for fire resistance per UL 2079 or ASTM E 1966 by a testing and inspecting agency acceptable to authorities having jurisdiction.

1. Hose Stream Test: Wall-to-wall and wall-to-ceiling systems shall be subjected to hose stream testing.

B. Seismic Performance: Expansion control systems shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the system will remain in place without separation of any parts when subjected to the seismic forces specified and the system will be fully operational after the seismic event."

2.3 INTERIOR EXPANSION CONTROL SYSTEMS

A. Source Limitations: Obtain expansion control systems from single source from single manufacturer.

B. Basis-of-Design Product: Subject to compliance with requirements, provide Balco, Inc; as indicated or a comparable product by one of the following:

1. EMSEAL Joint Systems, Ltd.
2. RJ Watson, Inc.
3. Tremco Incorporated.
4. Watson Bowman Acme Corp.

C. Floor-to-Floor:

1. Basis-of-Design Product: Balco NBS Stainless floor to floor.
2. Design Criteria:
   a. Minimum Joint Width: As indicated on Drawings.

3. Type: Center plate.

   a. Cover-Plate Design: Serrated.
   b. Metal: Stainless steel.

      1) Finish: Manufacturer's standard.

D. Floor-to-Wall:

1. Basis-of-Design Product: Balco NBSL Stainless floor to wall.
2. Design Criteria:

   a. Nominal Joint Width: As indicated on Drawings As scheduled.

3. Type: Cover plate.

   a. Cover-Plate Design: Serrated.

   b. Metal: Stainless steel.

      1) Finish: Manufacturer's standard.

E. Wall-to-Wall:

1. Design Criteria:

   a. Nominal Joint Width: As indicated on Drawings.

2. Type: Cover plate.

   a. Metal: Stainless steel.

      1) Finish: Manufacturer's standard.

F. Wall Corner:

1. Design Criteria:

   a. Nominal Joint Width: As indicated on Drawings.

2. Type: Cover plate.

   a. Metal: Stainless steel.

1) Finish: Manufacturer's standard.

2.4 EXTERIOR WALL EXPANSION CONTROL SYSTEMS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Balco, Inc; BCSW or a comparable product by one of the following:

1. EMSEAL Joint Systems, Ltd.
2. RJ Watson, Inc.
3. Tremco Incorporated.
4. Watson Bowman Acme Corp.

B. Source Limitations: Obtain expansion control systems from single source from single manufacturer.

C. Wall-to-Wall:

1. Design Criteria:

a. Nominal Joint Width: As indicated on Drawings.

2.5 MATERIALS

A. Stainless Steel: ASTM A 240/A 240M or ASTM A 666, Type 304 for plates, sheet, and strips.

1. Remove tool and die marks and stretch lines or blend into finish.

B. Elastomeric Seals: ASTM E 1783; preformed elastomeric membranes or extrusions to be installed in metal frames.

C. Compression Seals: ASTM E 1612; preformed elastomeric extrusions having an internal baffle system and designed to function under compression.

D. Cellular Foam Seals: Extruded, compressible foam designed to function under compression.

E. Fire Barriers: Any material or material combination, when fire tested after cycling, designated to resist the passage of flame and hot gases through a movement joint and to meet performance criteria for required fire-resistance rating.

F. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

G. Accessories: Manufacturer's standard anchors, clips, fasteners, set screws, spacers, and other accessories compatible with material in contact, as indicated or required for complete installations.

2.6 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.7 STAINLESS-STEEL FINISHES

A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.

1. Run grain of directional finishes with long dimension of each piece.
2. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
3. Directional Satin Finish: No. 4.

C. Bright, Cold-Rolled, Unpolished Finish: No. 2B.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces where expansion control systems will be installed for installation tolerances and other conditions affecting performance of work.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to expansion control system manufacturer's written instructions.

B. Coordinate and furnish anchorages, setting drawings, and instructions for installing expansion control systems. Provide fasteners of metal, type, and size to suit type of construction indicated and to provide for secure attachment of expansion control systems.

C. Cast-In Frames: Coordinate and furnish frames to be cast into concrete.

3.3 INSTALLATION

A. Comply with manufacturer's written instructions for storing, handling, and installing expansion control systems and materials unless more stringent requirements are indicated.

B. Metal Frames: Perform cutting, drilling, and fitting required to install expansion control systems.

1. Install in true alignment and proper relationship to joints and adjoining finished surfaces measured from established lines and levels.
2. Adjust for differences between actual structural gap and nominal design gap due to ambient temperature at time of installation. Notify Architect where discrepancies occur that will affect proper expansion control system installation and performance.
3. Cut and fit ends to accommodate thermal expansion and contraction of metal without buckling of frames.
4. Repair or grout blockout as required for continuous frame support using nonmetallic, shrinkage-resistant grout.
5. Install frames in continuous contact with adjacent surfaces.

    a. Shimming is not permitted.

6. Locate anchors at interval recommended by manufacturer, but not less than 3 inches (75 mm) from each end and not more than 24 inches (600 mm) o.c.

C. Seals in Metal Frames: Install elastomeric seals and membranes in frames to comply with manufacturer's written instructions. Install with minimum number of end joints.

1. Provide in continuous lengths for straight sections.
2. Seal transitions according to manufacturer's written instructions. Vulcanize or heat-weld field-spliced joints as recommended by manufacturer.
3. Installation: Mechanically lock seals into frames or adhere to frames with adhesive or pressure-sensitive tape as recommended by manufacturer.

D. Compression Seals: Apply adhesive or lubricant adhesive as recommended by manufacturer before installing compression seals.

E. Foam Seals: Install with adhesive recommended by manufacturer.

F. Epoxy-Bonded Seals: Pressurize seal for time period and to pressure recommended by manufacturer. Do not overpressurize.

G. Terminate exposed ends of expansion control systems with field- or factory-fabricated termination devices.

H. Fire-Resistance-Rated Assemblies: Coordinate installation of expansion control system materials and associated work so complete assemblies comply with assembly performance requirements.

1. Fire Barriers: Install fire barriers to provide continuous, uninterrupted fire resistance throughout length of joint, including transitions and field splices.

3.4 PROTECTION

A. Do not remove protective covering until finish work in adjacent areas is complete. When protective covering is removed, clean exposed metal surfaces to comply with manufacturer's written instructions.

B. Protect the installation from damage by work of other Sections. Where necessary due to heavy construction traffic, remove and properly store cover plates or seals and install temporary protection over expansion control systems. Reinstall cover plates or seals prior to Substantial Completion of the Work.

END OF SECTION 07 95 00

Set No._____

Project Manual
for
Construction of the

BCDC YOUTH DETENTION CENTER

at the
Baltimore City Detention Center
in the
Division of Pretrial Detention and Services (DPDS)

STATE OF MARYLAND
CONTRACT NO.: DPSCS KT-000-150-C01

5 FEBRUARY 2015

Department of Public Safety & Correctional Services
Stephen T. Moyer Secretary
David Bezanson, Assistant Secretary

Board of Public Works
Lawrence J. Hogan, Jr.,Governor
Peter Franchot, Comptroller
Nancy K. Kopp, Treasurer

Architect (A Joint Venture): **PSA-Dewberry + Penza Bailey Architects**

Joint Venture Prime / Contract Office
Penza Bailey Architects
401 Woodbourne Avenue
Baltimore, MD 21212

Joint Venture Prime / Security
PSA-Dewberry
401 SW Water Street #701
Peoria, IL 61602

Civil / Geotechnical / Environmental Engineer
EBA Engineering, Inc.
4813 Seton Drive
Baltimore, MD 21215

Structural Engineer
Hope Furrer Associates, Inc.
501 Fairmount Ave. Suite 205
Towson, MD 21286

Surveyor
Dewberry & Davis, LLC
3106 Lord Baltimore Drive
Baltimore, MD 21244

Mechanical / Plumbing / Elect. / IT / Telecom / MATV-CATV Fire Protection Engineer
Sidhu Associates, Inc.
11350 McCormick Drive #1000
Hunt Valley, MD 21031

Food Service / Laundry Consultant
R&R Designer, Inc.
5300 Holmes Run Parkway
Suite 1006
Alexandria, VA 22304

Landscape Architect
P.E.L.A. Design, Inc.
7400 York Road, Suite 403
Towson, MD 21204

Cost Estimator
Lewicki Estimating Services, Inc.
13600 Old Chatwood Place
Chantilly, VA 20151

Sustainability Consultant
TerraLogos Eco Architecture
2901 E. Baltimore Street, #300
Baltimore, MD 21224

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volume 3 of 6

Bid documents are available only online from eMaryland Marketplace (eMM). Those are the only official documents to be used by Bidders for this Invitation for Bid (IFB). The Bidders shall print on their own stationary the required documents for submitting their bid (as Construction BID Form, Bid Proposal Affidavit, BID Bond, etc.) and submit to the Owner (DPSCS, Division of Capital Construction and Facilities Maintenance) in a sealed envelope which clearly indicates that it contains a sealed bid for this project with the bid due date and the name and address of the Bidder.

Minority Business Enterprises (MBEs) are encouraged to participate and respond to this request for Bid.

CONFORMED DOCUMENT 3 APRIL 2015: This project manual contains sections revised during bidding, and is published for the Contractor's convenience for use during construction. It does not replace the Contract Documents, which comprise the Bid Documents plus revisions issued as Addenda.

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DIVISION 00 – BIDDING AND CONTRACT REQUIREMENTS

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DIVISION 03 - CONCRETE

DIVISION 04 – MASONRY

DIVISION 05 – METALS

DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

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DIVISION 08 - OPENINGS

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DIVISION 10 - SPECIALTIES

DIVISION 11 - EQUIPMENT

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DIVISION 22 – PLUMBING

DIVISION 23 - HEATING VENTILATING AND AIR CONDITIONING

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DIVISION 27 - COMMUNICATIONS

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VOLUME 6

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SECTION 08 11 13 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes hollow-metal work.

B. Related Requirements:

1. Division 04 Section "Unit Masonry" for embedding anchors for hollow metal work into masonry construction.
2. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
3. Division 08 Section "Detention Doors and Frames" for hollow metal doors and frames for detention facilities.
4. Division 08 Section "Door Hardware" for door hardware for hollow metal doors.
5. Division 09 Section "High-Performance Coatings" for field painting hollow metal doors and frames.
6. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.
7. Division 26 Sections for electrical connections including conduit and wiring for door controls and operators.

1.3 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

1.4 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable LEED Credits

1. MRc2
2. MRc4
3. MRc5
4. IEQc4.1

B. LEED Requirements

1. MRc2: CONSTRUCTION WASTE MANAGEMENT

No less than the specified portion of all construction waste from the Project shall be diverted from disposal in a landfill and/or incineration in with the Project

Requirements for Construction Waste Management and Disposal. Refer to Specification Sections 017419 Construction Waste Management and Disposal and 013510 Sustainable Design Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

2. MRc4: Recycled Content Material

   No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the Project Requirements for Recycled Content Materials. All materials counted towards the computations of the proportion of the Recycled Content Materials shall comply with the standard minimum percentages of post-consumer waste materials and for the minimum percentages of pre-consumer waste materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

3. MRc5: REGIONALLY MANUFACTURED HARVESTED MATERIALS

   No less than the specified minimum proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the Project Site in accordance with the Project Requirements for Regionally Manufactured and/or Harvested Materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

4. IEQc4.1: Low Emitting Materials: Sealants and Adhesives

   All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the Project Requirements for Low Emitting Materials – Sealants and Adhesives. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

1.5 COORDINATION

A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.

   1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, and finishes.

B. Shop Drawings: Include the following:

   1. Elevations of each door type.
   2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.

3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of anchorages, joints, field splices, and connections.
7. Details of accessories.
8. Details of moldings, removable stops, and glazing.
9. Details of conduit and preparations for power, signal, and control systems.

C. Samples for Initial Selection: For units with factory-applied color finishes.

D. Samples for Verification:

1. For each type of exposed finish required, prepared on Samples of not less than 3 by 5 inches (75 by 127 mm).
2. For "Doors" and "Frames" subparagraphs below, prepare Samples approximately 12 by 12 inches (305 by 305 mm) to demonstrate compliance with requirements for quality of materials and construction:

   a. Doors: Show vertical-edge, top, and bottom construction; core construction; and hinge and other applied hardware reinforcement. Include separate section showing glazing if applicable.
   b. Frames: Show profile, corner joint, floor and wall anchors, and silencers. Include separate section showing fixed hollow-metal panels and glazing if applicable.

E. Schedule: Provide a schedule of hollow-metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final Door Hardware Schedule.

1.7 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each type of hollow-metal door and frame assembly, for tests performed by a qualified testing agency.

B. Oversize Construction Certification: For assemblies required to be fire rated and exceeding limitations of labeled assemblies.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow-metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.

1. Provide additional protection to prevent damage to factory-finished units.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow-metal work vertically under cover at Project site with head up. Place on minimum 4-inch- (102-mm-) high wood blocking. Provide minimum 1/4-inch (6-mm) space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Amweld International, LLC.
2. Ceco Door; ASSA ABLOY.
3. Curries Company; ASSA ABLOY.
4. Fleming Door Products Ltd.; Assa Abloy Group Company.
5. Republic Doors and Frames.
6. Steelcraft; an Allegion brand.

B. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.

2.2 REGULATORY REQUIREMENTS

A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

1. Smoke- and Draft-Control Assemblies: Provide an assembly with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.

B. Fire-Rated, Borrowed-Lite Assemblies: Complying with NFPA 80 and listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9.

2.3 MATERIALS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

C. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

D. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.

E. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z (12G) coating designation; mill phosphatized.

1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.

F. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

G. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.

H. Grout: ASTM C 476, except with a maximum slump of 4 inches (102 mm), as measured according to ASTM C 143/C 143M.

I. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

J. Glazing: Comply with requirements in Section 088000 "Glazing."

K. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mil (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.4 STANDARD HOLLOW METAL DOORS

A. General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8.

1. Design: Flush panel .
2. Core Construction: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core.

    a. Fire Door Core: As required to provide fire-protection ratings indicated.
    b. Thermal-Rated (Insulated) Doors: Where indicated, provide doors fabricated with thermal-resistance value (R-value) of not less than 6.0 deg F x h x sq. ft./Btu (1.057 K x sq. m/W) when tested according to ASTM C 1363.

        1) Locations: Exterior doors and interior doors where indicated.

3. Vertical Edges for Single-Acting Doors: Beveled edge .

    a. Beveled Edge: 1/8 inch in 2 inches (3 mm in 50 mm).

4. Vertical Edges for Double-Acting Doors: Round vertical edges with 2-1/8-inch (54-mm) radius.
5. Top and Bottom Edges: Closed with flush or inverted 0.042-inch- (1.0-mm-) thick, end closures or channels of same material as face sheets.
6. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."
7. Moldings for Glazed Lites in Doors: Minimum 0.032 inch (0.8 mm) thick, fabricated from same material as door face sheet in which they are installed.
8. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch (16 mm) high unless otherwise indicated.

9. Loose Stops for Glazed Lites in Frames: Minimum 0.032 inch (0.8 mm) thick, fabricated from same material as frames in which they are installed.
10. Terminated Stops: Where indicated on interior door frames, terminate stops 6 inches (152 mm) above finish floor with a 45 -degree angle cut, and close open end of stop with steel sheet closure. Cover opening in extension of frame with welded-steel filler plate, with welds ground smooth and flush with frame.

    a. Provide terminated stops where indicated .

B. Exterior Doors: Face sheets fabricated from metallic-coated steel sheet. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

1. Level 4 and Physical Performance Level A (Maximum Duty), Model 1 (Full Flush).

C. Interior Doors: Face sheets fabricated from cold-rolled steel sheet unless metallic-coated sheet is indicated. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

1. Level 4 and Physical Performance Level A (Maximum Duty), Model 1 (Full Flush).

D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

E. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

1. Vertical Edges for Single-Acting Doors: Beveled 1/8 inch in 2 inches (3 mm in 50 mm).
2. Moldings for Glazed Lites in Doors: 0.038-inch- (0.95-mm-) thick stainless steel.
3. Loose Stops for Glazed Lites in Doors: 0.038-inch- (0.95-mm-) thick stainless steel.
4. Top and Bottom Channels: Closed with continuous channels, 0.062-inch- (1.59-mm-) thick stainless steel .

    a. Spot welded to both face sheets.

5. Hardware Reinforcement: Fabricate according to ANSI/NAAMM-HMMA 866 with reinforcing plates from stainless steel.
6. Electrical Hardware Enclosures: Provide enclosures and junction boxes within doors for electrically operated door hardware, interconnected with UL-approved, 1/2-inch- (12.7-mm-) diameter conduit and connectors.

    a. Where indicated for installation of wiring, provide access plates to junction boxes, fabricate from same material and thickness as face sheet and fasten with at least four security fasteners spaced not more than 6 inches (152 mm) o.c.

F. Performance: Level A, ANSI A250.4.

2.5 STANDARD HOLLOW METAL FRAMES

A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

B. Exterior Frames: Fabricated from metallic-coated steel sheet.

1. Fabricate frames with mitered or coped corners.
2. Fabricate frames as full profile welded unless otherwise indicated.
3. Frames for Level 4 Steel Doors: 0.067-inch- (1.7-mm-) thick steel sheet.

C. Interior Frames: Fabricated from cold-rolled steel sheet unless metallic-coated sheet is indicated.

1. Fabricate frames with mitered or coped corners.
2. Fabricate frames as full profile welded unless otherwise indicated.
3. Fabricate knocked-down, drywall slip-on frames for in-place gypsum board partitions.
4. Frames for Level 4 Steel Doors: 0.067-inch- (1.7-mm-) thick steel sheet.
5. Frames for Wood Doors: 0.053-inch- (1.3-mm-) thick steel sheet.
6. Frames for Borrowed Lights: Same as adjacent door frame.

D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as frames.

E. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch (1.0 mm) thick, wire anchors not less than 0.177 inch (4.5 mm) thick.
2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch (1.0 mm) thick.
3. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 1/2-inch diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.

F. Floor Anchors: Formed from same material as frames, not less than 0.042 inch (1.0 mm) thick, and as follows:

1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch (50-mm) height adjustment. Terminate bottom of frames at finish floor surface.

G. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

H. Ceiling Struts: Minimum 1/4-inch-thick by 1-inch- (6.4-mm-thick by 25.4-mm-) wide steel.

I. Grout Guards: Formed from same material as frames, not less than 0.016 inch (0.4 mm) thick.

2.6 ACCESSORIES

A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

B. Grout Guards: Formed from same material as frames, not less than 0.016 inch (0.4 mm) thick.

2.7 FABRICATION

A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117 .

C. Standard Hollow Metal Doors:

1. Exterior Doors: Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
2. Glazed Lites: Factory cut openings in doors.
3. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch (19 mm) beyond edge of door on which astragal is mounted.

D. Standard Hollow Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
2. Sidelight Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
3. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
4. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
5. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
6. Jamb Anchors: Provide number and spacing of anchors as follows:

a. Masonry Type: Locate anchors not more than 18 inches (457 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c. and as follows:

1) Two anchors per jamb up to 60 inches (1524 mm) high.
2) Three anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
3) Four anchors per jamb from 90 to 120 inches (2286 to 3048 mm) high.

4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches (610 mm) or fraction thereof above 120 inches (3048 mm) high.

b. Compression Type: Not less than two anchors in each jamb.
c. Postinstalled Expansion Type: Locate anchors not more than 6 inches (152 mm) from top and bottom of frame. Space anchors not more than 26 inches (660 mm) o.c.

7. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Keep holes clear during construction.

a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

8. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.
9. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."

a. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8 .
b. Reinforce doors and frames to receive nontemplated, mortised and surface-mounted door hardware.
c. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
d. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

10. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.

a. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow metal work.
b. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
c. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
d. Provide loose stops and moldings on inside of hollow metal work.
e. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.

11. Head Reinforcement: For frames more than 48 inches (1219 mm) wide, provide continuous head reinforcement for full width of opening, welded to back of frame at head.
12. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Provide plastic plugs to keep holes clear during construction.

a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

13. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.

a. Terminated Stops: Where indicated for interior door frames, terminate stops 6 inches (152 mm) above finish floor with a 45-degree angle cut, and close open end of stop with stainless-steel sheet closure. Cover opening in extension of frame with welded-stainless-steel filler plate, with welds ground smooth and flush with frame.

14. Hardware Preparation: Factory prepare stainless-steel frames to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping, according to the Door Hardware Schedule and templates furnished as specified in Section 087100 "Door Hardware."

a. Reinforce frames to receive nontemplated mortised and surface-mounted door hardware.
b. Locate hardware as indicated, or if not indicated, according to HMMA 831, "Recommended Hardware Locations for Custom Hollow Metal Doors and Frames."

15. Plaster Guards: Weld guards to frame at back of hardware mortises and mounting holes in frames to be grouted.

E. Tolerances: Fabricate frames to tolerances indicated in ANSI/NAAMM-HMMA 866.

2.8 STEEL FINISHES

A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

C. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Install hollow-metal work plumb, rigid, properly aligned, and securely fastened in place. Comply with Drawings and manufacturer's written instructions.

B. Hollow-Metal Frames: Install hollow-metal frames for doors, transoms, sidelites, borrowed lites, and other openings, of size and profile indicated. Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.

1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.

    a. At fire-rated openings, install frames according to NFPA 80.
    b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
    c. Install frames with removable stops located on secure side of opening.
    d. Install door silencers in frames before grouting.
    e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
    f. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
    g. Field apply bituminous coating to backs of frames that will be filled with grout containing antifreezing agents.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.

    a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.

3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
4. Concrete Walls: Solidly fill space between frames and concrete with mineral-fiber insulation.
5. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.

6. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:

    a. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
    c. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
    d. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.

C. Hollow-Metal Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Steel Doors:

    a. Between Door and Frame Jambs and Head: 1/8 inch (3.2 mm) plus or minus 1/32 inch (0.8 mm).
    b. Between Edges of Pairs of Doors: 1/8 inch (3.2 mm) to 1/4 inch (6.3 mm) plus or minus 1/32 inch (0.8 mm).
    c. At Bottom of Door: 3/4 inch (19.1 mm) plus or minus 1/32 inch (0.8 mm).
    d. Between Door Face and Stop: 1/16 inch (1.6 mm) to 1/8 inch (3.2 mm) plus or minus 1/32 inch (0.8 mm).

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
3. Smoke-Control Doors: Install doors and gaskets according to NFPA 105.

D. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with hollow-metal manufacturer's written instructions.

1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches (230 mm) o.c. and not more than 2 inches (51 mm) o.c. from each corner.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow-metal work immediately after installation.

C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

D. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION 08 11 13

SECTION 08 14 16 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Solid-core doors with PVC free-clad faces and stainless steel edges

B. Related Requirements:

1. Division 08 Section "Glazing" for glass view panels in flush wood doors.
2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable LEED Credits

1. MRc2
2. MRc4
3. MRc5
4. MRc7
5. IEQc4.1
6. IEQc4.2
7. IEQc4.4

B. LEED Requirements

1. MRc2: CONSTRUCTION WASTE MANAGEMENT

   No less than the specified portion of all construction waste from the Project shall be diverted from disposal in a landfill and/or incineration in with the Project Requirements for Construction Waste Management and Disposal. Refer to Specification Sections 017419 Construction Waste Management and Disposal and 013510 Sustainable Design Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

2. MRc4: Recycled Content Material

   No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the Project Requirements for Recycled Content Materials. All materials counted towards the computations of the proportion of the Recycled Content Materials

shall comply with the standard minimum percentages of post-consumer waste materials and for the minimum percentages of pre-consumer waste materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

3. MRc5: REGIONALLY MANUFACTURED HARVESTED MATERIALS

   No less than the specified minimum proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the Project Site in accordance with the Project Requirements for Regionally Manufactured and/or Harvested Materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

4. MRc7: Certified Wood

   No less than the specified proportion of the building (permanently installed wood-based materials and products and all wood-based materials and products in construction) shall be certified by the Forest Stewardship Council (FSC) in accordance with the Project Requirements. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

5. IEQc4.1: Low Emitting Materials: Sealants and Adhesives

   All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the Project Requirements for Low Emitting Materials – Sealants and Adhesives. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

6. IEQc4.2: Low Emitting Materials: Paints and Coatings

   All paints and coatings in the building interior shall comply with the Project Requirements for Low Emitting Materials – Paints and Coatings. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

7. IEQc4.4: Low-emitting Materials – Composite Wood and Agrifiber Products

   All composite wood and agrifiber products installed in the building interior and all laminating adhesives used to fabricate on-site and/or off-site shall comply with the Project Requirements for Low-Emitting Materials – Composite Wood and Agrifiber Products. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of door. Include details of core and edge construction, louvers, and trim for openings. Include factory-finishing specifications.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and the following:

1. Dimensions and locations of blocking.
2. Dimensions and locations of mortises and holes for hardware.
3. Dimensions and locations of cutouts.
4. Undercuts.
5. Requirements for veneer matching.
6. Doors to be factory finished and finish requirements.
7. Fire-protection ratings for fire-rated doors.

C. Samples for Verification:

1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches (200 by 250 mm), for each material and finish**.**
2. Plastic laminate, 6 inches (150 mm) square, for each color, texture, and pattern selected.
3. Corner sections of doors, approximately 8 by 10 inches (200 by 250 mm), with door faces and edges representing actual materials to be used.

    a. Provide Samples for each species of veneer and solid lumber required.
    b. Provide Samples for each color, texture, and pattern of plastic laminate required.
    c. Finish veneer-faced door Samples with same materials proposed for factory-finished doors.

4. Louver blade and frame sections, 6 inches (150 mm) long, for each material and finish specified.
5. Frames for light openings, 6 inches (150 mm) long, for each material, type, and finish required.

1.5 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For special warranty.

B. Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.

B. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package doors individually in [plastic bags or cardboard cartons] [cardboard cartons and wrap bundles of doors in plastic sheeting].

C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during remainder of construction period.

1.9 WARRANTY

A. A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Warping (bow, cup, or twist) more than 1/4 inch (6.4 mm) in a 42-by-84-inch (1067-by-2134-mm) section.
b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch (0.25 mm in a 76.2-mm) span.

2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
3. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers of PVC free-Clad Flush Wood Doors: Provide the following

1. Construction Specialties, Inc., Acrovyn Door Systems.

A. Source Limitations: Obtain PVC free-clad flush wood doors from single manufacturer.

2.2 DOOR CONSTRUCTION, GENERAL

A. Low-Emitting Materials: Provide doors made with adhesives and composite wood products that do not contain urea formaldehyde.

B. WDMA I.S.1-A Performance Grade: Extra Heavy Duty .

C. Structural-Composite-Lumber-Core Doors:

1. Structural Composite Lumber: WDMA I.S.10.

a. Screw Withdrawal, Face: 700 lbf (3100 N).

b. Screw Withdrawal, Edge: 400 lbf (1780 N).

D. Fire-Protection-Rated Doors: Provide core specified or mineral core as needed to provide fire-protection rating indicated.

1. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.
2. Pairs: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.

E. Mineral-Core Doors:

1. Core: Noncombustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire-protection rating indicated.
2. Blocking: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated as needed to eliminate through-bolting hardware.
3. Edge Construction: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.

2.3 PVC free-CAD FLUSH WOOD DOORS

A. Interior Solid-Core Doors

1. Faces: Impact-resistant PVC free finish, integral base color.

a. Wear Index: Abrasion-resistance testing 28,000 cycles per ASTM D 4060-90.
b. Impact Resistance: 86 inch-pounds per ASTM D 4226.
c. Chemical Resistance Testing per ASTM D 1308-93.
d. Resistance to Fungi: Zero fungal growth per ASTM G-21-96.
e. Resistance to Bacteria: Zero bacterial growth per ASTM G-22-96.

2. Edge Guards: Field-replaceable 20 GA #4 finish stainless steel.
3. Core: Structural composite lumber.
4. Color: #376 Northern Oak.

2.4 LIGHT FRAMES

A. Metal Frames for Light Openings: Manufacturer's standard frame formed of 0.048-inch-(1.2-mm-) thick, cold-rolled steel sheet; with baked-enamel- or powder-coated finish.

1. Fire-Rated Doors: approved for use in doors of fire-protection rating indicated

2.5 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.

1. Comply with NFPA 80 requirements for fire-rated doors.

B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, BHMA-156.115-W, and hardware templates.

1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
2. Metal Astragals: Factory machine astragals and formed-steel edges for hardware for pairs of fire-rated doors.

C. Openings: Factory cut and trim openings through doors.

1. Light Openings: Trim openings with moldings of material and profile indicated.
2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 088000 "Glazing."
3. Louvers: Factory install louvers in prepared openings.

2.6 FACTORY FINISHING

A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.

B. Factory finish doors.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and installed door frames, with Installer present, before hanging doors.

1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
2. Reject doors with defects.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Hardware: For installation, see Section 087100 "Door Hardware."

B. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.

1. Install fire-rated doors according to NFPA 80.
2. Install smoke- and draft-control doors according to NFPA 105.

C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 08 14 16

SECTION 08 31 13 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes access doors and frames for walls and ceilings.

B. Related Requirements:

1. Division 07 Section "Roof Accessories" for roof hatches.
2. Division 07 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
3. Division 09 Section “High Performance Coatings” for field-painting access doors and frames.
4. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.
5. Division 11 Section "Security Access Doors and Frames" for access doors and frames for security applications.
6. Division 23 Section "Air Duct Accessories" for heating and air-conditioning duct access doors.

1.3 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable LEED Credits

1. MRc2
2. MRc4
3. MRc5
4. MRc7
5. IEQc4.1

B. LEED Requirements

1. MRc2: CONSTRUCTION WASTE MANAGEMENT

   No less than the specified portion of all construction waste from the Project shall be diverted from disposal in a landfill and/or incineration in with the Project Requirements for Construction Waste Management and Disposal. Refer to Specification Sections 017419 Construction Waste Management and Disposal and 013510 Sustainable Design Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

2. MRc4: Recycled Content Material

No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the Project Requirements for Recycled Content Materials. All materials counted towards the computations of the proportion of the Recycled Content Materials shall comply with the standard minimum percentages of post-consumer waste materials and for the minimum percentages of pre-consumer waste materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

3. MRc5: REGIONALLY MANUFACTURED HARVESTED MATERIALS

   No less than the specified minimum proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the Project Site in accordance with the Project Requirements for Regionally Manufactured and/or Harvested Materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

4. MRc7: CERTIFIED WOOD

   No less than the specified proportion of the building (permanently installed wood-based materials and products and all wood-based materials and products in construction) shall be certified by the Forest Stewardship Council (FSC) in accordance with the Project Requirements. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

5. IEQc4.1: Low Emitting Materials: Sealants and Adhesives

   All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the Project Requirements for Low Emitting Materials – Sealants and Adhesives. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

   1. Include construction details, fire ratings where required materials, individual components and profiles, and finishes.

B. Shop Drawings:

   1. Include plans, elevations, sections, head, sill and jamb details, and attachments to other work. Plans shall indicate locations all access doors and type.

      a. Identify the locations of all fire rated access doors.

   2. Detail fabrication and installation of access doors and frames for each type of substrate.
   3. Product information for all hardware.
   4. Samples: For each door face material, at least 3 by 5 inches in size, in specified finish.

C. Product Schedule: Provide complete access door and frame schedule, including types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 that are identical to access door and frame assemblies tested for fire-test-response characteristics according to the following test method and that are listed and labeled by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. NFPA 252 or UL 10B for fire-rated access door assemblies installed vertically.
2. NFPA 288 for fire-rated access door assemblies installed horizontally.

2.2 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Access Panel Solutions.
2. Acudor Products, Inc.
3. Babcock-Davis.
4. Cendrex Inc.
5. Elmdor/Stoneman Manufacturing Co.; Div. of Acorn Engineering Co.
6. Jensen Industries; Div. of Broan-Nutone, LLC.
7. J. L. Industries, Inc.; Div. of Activar Construction Products Group.
8. Karp Associates, Inc.
9. Larsen's Manufacturing Company.

B. Medium-Security Flush Access Doors :

1. Assembly Description: Fabricate door to fit flush to frame. Provide manufacturer's standard-width exposed flange, proportional to door size. Provide self-latching door with automatic closer, lock and interior latch release
2. Locations: Wall and ceiling.
3. Door Size: Refer to drawings.
4. Metallic-Coated Steel Sheet for Door: Nominal 0.108 inch, 12 gage .
    a. Finish: Factory primed.
5. Stainless-Steel Sheet for Door: Nominal 0.109 inch, 12 gage .
    a. Finish: No. 4.
6. Frame Material: Same material, thickness, and finish as door .
7. Hinges: Manufacturer's standard security hinge.
8. Hardware: Detention mortise deadlock with tamper-resistant lock.

C. Fire-Rated, Flush Access Doors with exposed flanges.

1. Assembly Description: Fabricate door to fit flush to frame, with a core of mineral-fiber insulation enclosed in sheet metal. Provide self-latching door with automatic closer, lock and interior latch release. Provide manufacturer's standard-width exposed flange, proportional to door size.

2. Locations: Wall and ceiling.
3. Fire-Resistance Rating: Not less than that of adjacent construction. Coordinate with Code Rated drawings, (See drawing index under “GENERAL”)
4. Metallic-Coated Steel Sheet for Door: Nominal 0.108 inch, 12 gage.
   a. Finish: Factory primed.
5. Hardware: Detention mortise deadlock with tamper-resistant lock.

2.3 MATERIALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A 879/A 879M, with cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.

C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

D. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 304. Remove tool and die marks and stretch lines, or blend into finish.

E. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063.

F. Aluminum Sheet: ASTM B 209 (ASTM B 209M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

G. Frame Anchors: Same material as door face.

H. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

2.4 FABRICATION

A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.

B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish mounting holes, attachment devices and fasteners of type required to secure access doors to types of supports indicated.

1. For concealed flanges with drywall bead, provide edge trim for gypsum panels securely attached to perimeter of frames.
2. For concealed flanges with plaster bead for full-bed plaster applications, provide zinc-coated expanded-metal lath and exposed casing bead welded to perimeter of frames.

D. Latch and Lock Hardware:

1. Quantity: Furnish number of latches and locks required to hold doors tightly closed.
2. Keys: Furnish two keys per lock and key all locks alike.
3. Mortise Cylinder Preparation: Where indicated, prepare door panel to accept cylinder specified in Section 08 71 00 "Door Hardware."

E. Aluminum: After fabrication, apply manufacturer's standard protective coating on aluminum that will come in contact with concrete.

2.5 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Painted Finishes: Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

1. Factory Primed: Apply manufacturer's standard, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.
2. Factory Finished: Apply manufacturer's standard baked-enamel or powder-coat finish immediately after cleaning and pretreating, with minimum dry-film thickness of 1 mil (0.025 mm) for topcoat.

    a. Color: As selected by Architect from full range of industry colors.

E. Stainless-Steel Finishes:

1. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
2. Polished Finish: No. 4 finish. Grind and polish surfaces to produce uniform finish, free of cross scratches.

    a. Run grain of directional finishes with long dimension of each piece.
    b. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

3. Bright, Cold-Rolled, Unpolished Finish: No. 2B.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's written instructions for installing access doors and frames.

3.3 ADJUSTING

A. Adjust doors and hardware, after installation, for proper operation.

END OF SECTION 08 31 13

SECTION 08 33 23 - OVERHEAD COILING DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Service doors.

B. Related Sections:
   1. Division 05 Section "Metal Fabrications" for miscellaneous steel supports.
   2. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
   3. Division 11 Sections “Detention Hardware” for cylinders.
   4. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.
   5. Division 26 Sections for electrical service and connections for powered operators and accessories.
   6. Division 28 Section ”PLC/GUI Control System Hardware” for operational controls between the main control center and door.
   7. Division 28 Section ”PLC/GUI Control System software” for operational controls between the main control center and door.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design overhead coiling doors, including comprehensive engineering analysis by a qualified professional engineer licensed in the State of Maryland, using performance requirements and design criteria indicated.

B. Structural Performance, Exterior Doors: Exterior overhead coiling doors shall withstand the wind loads, the effects of gravity loads, and loads and stresses within limits and under conditions indicated according to SEI/ASCE 7.
   1. Wind Loads: As indicated on Drawings .
   2. Deflection Limits: Design overhead coiling doors to withstand design wind load without evidencing permanent deformation or disengagement of door components.

C. Operability under Wind Load: Design overhead coiling doors to remain operable under uniform pressure (velocity pressure) of 20 lbf/sq. ft. wind load, acting inward and outward.

D. Seismic Performance: Overhead coiling doors shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
2. Seismic Component Importance Factor: 1.5 .

E. Operation Cycles: Provide overhead coiling door components and operators capable of operating for not less than number of cycles indicated for each door. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.

1. Design door components and operator to operate for not less than 30,000 cycles.

1.4 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable LEED Credits

1. MRc2
2. MRc4
3. MRc5
4. IEQc4.1

B. LEED Requirements

1. MRc2: CONSTRUCTION WASTE MANAGEMENT

No less than the specified portion of all construction waste from the Project shall be diverted from disposal in a landfill and/or incineration in with the Project Requirements for Construction Waste Management and Disposal. Refer to Specification Sections 017419 Construction Waste Management and Disposal and 013510 Sustainable Design Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

2. MRc4: Recycled Content Material

No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the Project Requirements for Recycled Content Materials. All materials counted towards the computations of the proportion of the Recycled Content Materials shall comply with the standard minimum percentages of post-consumer waste materials and for the minimum percentages of pre-consumer waste materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

3. MRc5: REGIONALLY MANUFACTURED HARVESTED MATERIALS

No less than the specified minimum proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the Project Site in accordance with the Project Requirements for Regionally Manufactured and/or Harvested Materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

4. IEQc4.1: Low Emitting Materials: Sealants and Adhesives

All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the Project Requirements for Low Emitting Materials – Sealants and Adhesives. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

1.5 SUBMITTALS

A. Product Data: For each type and size of overhead coiling door and accessory. Include the following:

1. Construction details, material descriptions, dimensions of individual components, profiles for slats, and finishes.
2. Rated capacities, operating characteristics, electrical characteristics, and furnished accessories.
3. For fire-rated doors, description of fire-release system including testing and resetting instructions.

B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Show locations of replaceable fusible links.
3. Provide verification that doors comply with fire rated assembly as relocated.
4. Wiring Diagrams: For power, signal, and control wiring.
5. Provide diagrams detailing the complete interface between the door and specified security hardware and software for full operation.
6. Provide manufacturer's product data for all detailed hardware.
7. Weatherstripping: Submit weatherstripping type, material, and location.

C. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.

1. Curtain Slats: 12 inches long
2. Bottom Bar: 6 inches long.
3. Guides: 6 inches long.
4. Brackets: 6 inches square.
5. Hood: 6 inches square.

D. Delegated-Design Submittal: For overhead coiling doors indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer, Licensed in the State of Maryland, responsible for their preparation.

1. Detail fabrication and assembly of seismic restraints.
2. Summary of forces and loads on walls and jambs.

E. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.

F. Seismic Qualification Certificates: For overhead coiling doors**,** accessories, and components, from manufacturer.

G. Maintenance Data: For overhead coiling doors to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for both installation and maintenance of units required for this Project.

B. Source Limitations: Obtain overhead coiling doors from single source from single manufacturer.
   1. Obtain operators and controls from overhead coiling door manufacturer.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of overhead doors that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Structural failures including, but not limited to, excessive deflection.
      b. Faulty operation of hardware.
      c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use; rust through.
      d. Delimitation of exterior or interior facing materials.
   2. Warranty Period: 2 years from date of Substantial Completion.

1.8 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, provide two years full maintenance service by skilled employees of sectional door Installer. Include monthly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper elevator operation at rated speed and capacity. Provide parts and supplies same as those used in the manufacture and installation of original equipment.
   1. Perform maintenance, including emergency callback service, during normal working hours.
   2. Include 24-hour-per-day, 7-day-per-week emergency callback service.
      a. Response Time: Two hours or less.

PART 2 - PRODUCTS

2.1 DOOR CURTAIN MATERIALS AND CONSTRUCTION

A. Door Curtains: Fabricate overhead coiling-door curtain of interlocking metal slats, designed to withstand wind loading indicated, in a continuous length for width of door

without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:

1. Steel Door Curtain Slats: Zinc-coated (galvanized), cold-rolled structural steel sheet; complying with ASTM A 653/A 653M, with G90 zinc coating; nominal sheet thickness (coated) of 0.028 inch and as required to meet requirements.
   a. Provide manufacturer's standard flat-profile slats.
   b. Provide hinge connections allowing doors to be in service when slat can be replaced.

B. Metal Interior Curtain-Slat Facing: Match metal of exterior curtain-slat face.

1. Galvanized Steel Sheet Thickness: Not less than 0.028 inch.

C. Gasket Seal: Provide insulated slats with manufacturer's standard interior-to-exterior thermal break or with continuous gaskets between slats.

D. Endlocks: Malleable-iron castings galvanized after fabrication, secured to curtain slats with galvanized rivets, or high-strength nylon. Provide locks on not less than alternate curtain slats for curtain alignment and resistance against lateral movement.

E. Bottom Bar: Consisting of 2 angles, each not less than 1-1/2 by 1-1/2 by 1/8 inch thick, either hot dipped galvanized steel or No. 2B stainless-steel with a No. 4 finish to suit type of curtain slats.

F. Provide motor-operated doors where indicated and scheduled, with combination bottom astragal and sensor edge.

G. Curtain Jamb Guides: Fabricate curtain jamb guides of galvanized steel angles, or channels and angles, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Build up units with not less than 3/16-inch-thick, galvanized steel sections complying with ASTM A 36, and ASTM A 123. Provide slotted bolt holes for guide adjustment. Provide removable stops on guides to prevent over travel of curtain.

2.2 HOOD

A. Hood: Form to entirely enclose coiled curtain and operating mechanism at opening head and act as weatherseal. Contour to suit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Provide closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting projecting beyond wall face. Provide two intermediate equally spaced support brackets to prevent "oil canning" and sag.
   1. Fabricate steel hoods and access doors of not less than 0.028-inch thick, hot-dip galvanized steel sheet with G90 zinc coating, complying with ASTM A 653.
   2. Shape: Round.
   3. Exterior Mounted Door: Fabricate hood with sealant-joint bead profile for applying joint sealant.

B. Push/Pull Handles: For push-up-operated or emergency-operated doors, provide galvanized steel lifting handles on each side of door.

1. Provide pull-down straps or pole hooks for doors more than 84 inches high.

C. Fabricate locking device assembly with lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bar to engage through slots in tracks.

1. Locking Bars: Full-disc Cremone type, both jamb sides, operable from inside and outside.
2. Provide ASSA mogul V10 detention grade lock cylinder.

D. Provide safety interlock switch to disengage power supply when door is locked.

2.3 LOCKING DEVICES

A. Locking:

1. Coordinate operations between locking devise and detention hardware & buildings main secure system as specified in Division 28 Section “Detention Hardware.”.

B. Locking Device Assembly: Coordinate fabrication with detention hardware and software. Locking device may include, but not limited to cylinder lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.

1. Lock Cylinders: Provide cylinders and keyed to building keying system.

C. Safety Interlock Switch: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

2.4 COUNTERBALANCING MECHANISM

A. General: Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.

B. Counterbalance Barrel: Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, welded or seamless carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats and to limit barrel deflection to not more than 0.03 in./ft. (2.5 mm/m) of span under full load.

C. Spring Balance: One or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Secure ends of springs to barrel and shaft with cast-steel barrel plugs.

D. Torsion Rod for Counterbalance Shaft: Fabricate of manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.

E. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

2.5 ELECTRIC DOOR OPERATORS

A. General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and operation-cycles requirement specified,

with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, remote-control stations, control devices, integral gearing for locking door, and accessories required for proper operation.

1. Operations of overhead door shall be controlled by building's master security system. Submitted product shall demonstrate door is fully operational with specified security system. Coordinate operations with "PLC/GUI Control System Hardware and software" for operational controls between the main control center and door.
2. Coordinate operations between door operators and detention hardware
3. Comply with NFPA 70.
4. Provide control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24 V, ac or dc.

B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each door.

C. Door Operator Location(s): Door Operated by Master control.

D. Electric Motors: Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements specified in Division 11 Section "Common Motor Requirements for Equipment" unless otherwise indicated.

1. Electrical Characteristics:
   a. Phase: Per electrical documents
   b. Volts: Per electrical documents
   c. Hertz: Per electrical documents
2. Motor Type and Controller: Reversible motor and controller (disconnect switch) for motor exposure indicated.
3. Motor Size: Minimum size large enough to start, accelerate, and operate door in either direction from any position, at a speed not less than 8 in./sec. and not more than 12 in./sec., without exceeding nameplate ratings or service factor.
4. Operating Controls, Controllers (Disconnect Switches), Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.
5. Coordinate wiring requirements and electrical characteristics of motors and other electrical devices with building electrical system and each location where installed.

E. Limit Switches: Equip each motorized door with adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.

F. Obstruction Detection Device: Equip motorized door with indicated external automatic safety sensor capable of protecting full width of door opening For non-fire-rated doors, activation of device immediately stops and reverses downward door travel. and for fire-rated doors, activation delays closing.

1. Sensor Edge: Automatic safety sensor edge, located within astragal or weather stripping mounted to bottom bar. Contact with sensor activates device. Connect to control circuit using manufacturer's standard take-up reel or self-coiling cable.
   a. Self-Monitoring Type: Four-wire configured device designed to interface with door operator control circuit to detect damage to or disconnection of sensor edge.

G. Remote-Control Station: Momentary-contact, three-button control station with push-button controls labeled "Open," "Close," and "Stop."

1. Coordinate operations between locking devise and detention hardware & buildings main secure system.
2. Intunits, full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.
3. Exterior units, full-guarded, standard-duty, surface-mounted, weatherproof type, NEMA ICS 6, Type 4 enclosure, key operated.

H. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.

I. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.

J. Audible and Visual Signals: Audible alarm and visual indicator lights in compliance with regulatory requirements for accessibility.

2.6 DOOR ASSEMBLY:

A. High Speed Coiling Doors**:**

1. Location:
   a. Exterior Coiling Overhead Door at Vehicle Sallyport.
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings **"Ultrasecure 3000" by Albany Door Systems,** high speed door" or comparable product by one of the following:
   a. Atlas Door Corp.; Division of Clopay Building Products Co.
   b. The Cookson Company.
   c. Cornell Iron Works Inc.
   d. McKeon Rolling Steel Door Company, Inc.
   e. Overhead Door Corporation.
   f. Raynor.

B. Door Panel:

1. Galvanized steel slats with a flat profile
2. Non-rated door.
3. With durable EPDM rubber weather seal between slats.
4. Each individual slat can be easily removed and replaced within the space of the overall door.
5. Overhead coiling door formed with curtain of interlocking metal slats

C. Door Speed:

1. Door to operate at a variable speed up to 80" per second in the up direction, and operate at a variable speed in the downward direction.

D. Locking Devices:

1. Door controls operated by building security system. Refer to specification section 28.

E. Electric Door Operator:

Usage Classification: Heavy duty, 60 to 90 cycles per hour

1. Motor Exposure: Interior.
2. Emergency Manual Operation: Crank type.
3. "Pneumatic sensor" option in first subparagraph below may be limited to a width of 18 feet (5.5 m). Verify availability with manufacturer.
4. Obstruction-Detection Device: Automatic photoelectric sensor.
   a. Sensor Edge Bulb Color: Black.
5. Remote-Control Station: Interior

2.7 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.8 STEEL AND GALVANIZED-STEEL FINISHES

A. High-Performance Organic Finish: 3-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates areas and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.

B. Examine locations of electrical connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install overhead coiling doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.

B. Coordinate installation of door equipment with building security system.

C. Install overhead coiling doors, hoods, and operators at the mounting locations indicated for each door.

D. Accessibility: Install overhead coiling doors, switches, and controls along accessible routes in compliance with regulatory requirements for accessibility.

3.3 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.
   1. Perform installation and startup checks according to manufacturer's written instructions.
   2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
   3. Test door closing when activated by detector or alarm-connected fire-release system. Reset door-closing mechanism after successful test.

3.4 ADJUSTING

A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.
   1. Lubricate bearings and sliding parts as recommended by manufacturer.

B. DEMONSTRATION
   1. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain overhead coiling doors.

END OF SECTION 083323

SECTION 08 33 26 - OVERHEAD COILING GRILLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Open-curtain overhead countertop coiling grilles.

B. Related Requirements:

1. Division 05 Section "Metal Fabrications" for miscellaneous steel supports.
2. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
3. Division 11 Sections “Detention Hardware” for cylinders.
4. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.
5. Division 26 Sections for electrical service and connections for powered operators and accessories.

1.3 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable LEED Credits

1. MRc2
2. MRc4
3. MRc5
4. IEQc4.1

B. LEED Requirements

1. MRc2: CONSTRUCTION WASTE MANAGEMENT

   No less than the specified portion of all construction waste from the Project shall be diverted from disposal in a landfill and/or incineration in with the Project Requirements for Construction Waste Management and Disposal. Refer to Specification Sections 017419 Construction Waste Management and Disposal and 013510 Sustainable Design Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

2. MRc4: Recycled Content Material

   No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the

Project Requirements for Recycled Content Materials. All materials counted towards the computations of the proportion of the Recycled Content Materials shall comply with the standard minimum percentages of post-consumer waste materials and for the minimum percentages of pre-consumer waste materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

3. MRc5: REGIONALLY MANUFACTURED HARVESTED MATERIALS

   No less than the specified minimum proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the Project Site in accordance with the Project Requirements for Regionally Manufactured and/or Harvested Materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

4. IEQc4.1: Low Emitting Materials: Sealants and Adhesives

   All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the Project Requirements for Low Emitting Materials – Sealants and Adhesives. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

1.4 ACTION SUBMITTALS

A. Product Data: For each type and size of overhead coiling grille and accessory.

   1. Include construction details, material descriptions, dimensions of individual components, profiles for curtain components, and finishes.
   2. Include operating characteristics, electrical characteristics, and furnished accessories.

B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.

   1. Include plans, elevations, sections, and mounting details.
   2. Include details of equipment assemblies. Indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
   3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
   4. Show locations of controls, locking devices, and other accessories.
   5. Include diagrams for power, signal, and control wiring.

C. Samples for Initial Selection: Manufacturer's finish charts showing full range of colors and textures available for units with factory-applied finishes.

   1. Include similar Samples of accessories involving color selection.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For overhead coiling grilles to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.

PART 2 - PRODUCTS

2.1 MANUFACTURERS, GENERAL

A. Source Limitations: Obtain overhead coiling grilles from single source from single manufacturer.

1. Obtain operators and controls from overhead coiling-grille manufacturer.

2.2 OPEN-CURTAIN GRILLE ASSEMBLY

A. Open-Curtain Grille: Overhead coiling grille with a curtain having a network of horizontal rods that interconnect with vertical links.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Overhead Door Corporation; model 670 or a comparable product by one of the following:

a. Alpine Overhead Doors, Inc.
b. Cookson Company.
c. Raynor.

B. Operation Cycles: Grille components and operators capable of operating for not less than 50,000. One operation cycle is complete when a grille is opened from the closed position to the fully open position and returned to the closed position.

1. Include tamperproof cycle counter.

C. Grille Curtain Material: Stainless steel.

1. Rod Spacing: Approximately 3 inches (76 mm) o.c.
2. Link Spacing: Approximately 6 inches (152 mm) apart in a straight in-line pattern.
3. Spacers: Metal tubes matching curtain material.

D. Bottom Bar: Continuous tubular shape, fabricated from stainless steel and finished to match grille.

E. Curtain Jamb Guides: Stainless steel with exposed finish matching curtain slats. Provide continuous integral wear strips to prevent metal-to-metal contact and to minimize operational noise.

F. Hood: Stainless steel.

1. Shape: Round.
2. Mounting: As indicated on Drawings.

G. Electric Grille Operator:

1. Usage Classification: Standard duty, up to 25 cycles per hour and up to 90 cycles per day.
2. Safety: Listed according to UL 325 by a qualified testing agency for commercial or industrial use; moving parts of operator enclosed or guarded if exposed and mounted at 8 feet (2.4 m) or lower.
3. Motor Exposure: Interior.
4. Emergency Manual Operation: Push-up type.
5. Obstruction-Detection Device: Automatic electric sensor edge on bottom bar.
6. Control Station: Interior mounted.

H. Curtain Accessories: Equip grille with astragal and push/pull handles.

I. Grille Finish:
1. Stainless-Steel Finish: No. 4 (polished directional satin).

2.3 MATERIALS, GENERAL

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.4 GRILLE CURTAIN MATERIALS AND CONSTRUCTION

A. Open-Curtain Grilles: Fabricate metal grille curtain as an open network of horizontal rods, spaced at regular intervals, that are interconnected with vertical links, which are formed and spaced as indicated and are free to rotate on the rods.

1. Aluminum Grille Curtain: ASTM B 221 (ASTM B 221M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
2. Stainless-Steel Grille Curtain: ASTM A 666 or ASTM A 240/A 240M, Type 300 series.
3. Steel Grille Curtain: Hot-dip zinc coated (galvanized) complying with ASTM A 123/A 123M, or electrogalvanized complying with ASTM 653/A 653M, and phosphatized before fabrication.
4. Glazing Insert: Manufacturer's standard glazing of clear polycarbonate sheet secured by the curtain links.

B. Bottom Bar: Manufacturer's standard continuous shape unless otherwise indicated, finished to match grille.

1. Astragal: Equip grille bottom bar with a replaceable, adjustable, continuous, compressible gasket of flexible vinyl, rubber, or neoprene as a cushion bumper.
2. Provide motor-operated grilles with combination bottom astragal and sensor edge.

C. Grille Curtain Jamb Guides: Manufacturer's standard shape having curtain groove with return lips or bars to retain curtain. Provide continuous integral wear strips to prevent metal-to-metal contact and to minimize operational noise; with removable stops on guides to prevent overtravel of curtain.

1. Removable Posts and Jamb Guides: Manufacturer's standard.

2.5 HOODS AND ACCESSORIES

A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.
1. Stainless Steel: 0.025-inch- (0.64-mm-) thick stainless-steel sheet, Type 304, complying with ASTM A 666 or ASTM A 240/A 240M.

B. Mounting Frame: Manufacturer's standard mounting frame designed to support grille; factory fabricated from ASTM A 36/A 36M structural-steel tubes or shapes, hot-dip galvanized per ASTM A 123/A 123M; fastened to floor and structure above grille; to be built into wall construction; and complete with anchors, connections, and fasteners.

C. Push/Pull Handles: Equip push-up-operated or emergency-operated grille with lifting handles on each side of grille, finished to match grille.

D. Pull-Down Strap: Provide pull-down straps for grilles more than 84 inches (2130 mm) high.

E. Pole Hooks: Provide pole hooks and poles for grilles more than 84 inches (2130 mm) high.

2.6 LOCKING DEVICES

A. Slide Bolt: Fabricate with side-locking bolts to engage through slots in tracks for locking by padlock, located on both left and right jamb sides, operable from coil side.

B. Locking Device Assembly: Fabricate with cylinder lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.

1. Lock Cylinders: Cylinders specified in Section 087100 "Door Hardware" and keyed to building keying system.
2. Keys: Three for each cylinder.

C. Safety Interlock Switch: Equip power-operated grilles with safety interlock switch to disengage power supply when grille is locked.

2.7 COUNTERBALANCING MECHANISM

A. General: Counterbalance grilles by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.

B. Counterbalance Barrel: Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, seamless or welded carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of parts and to limit barrel deflection to not more than 0.03 in./ft. (2.5 mm/m) of span under full load.

C. Counterbalance Spring: One or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Secure ends of springs to barrel and shaft with cast-steel barrel plugs.

D. Torsion Rod for Counterbalance Shaft: Fabricate of manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.

E. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

2.8 ELECTRIC GRILLE OPERATORS

A. General: Electric grille operator assembly of size and capacity recommended and provided by grille manufacturer for grille and operation cycles requirement specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, control stations, control devices, integral gearing for locking grille, and accessories required for proper operation.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

   a. Chamberlain Group, Inc. (The).
2. Comply with NFPA 70.
3. Control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24-V ac or dc.

B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each grille.

C. Grille Operator Location(s): Operator location indicated for each grille.

1. Top-of-Hood Mounted: Operator is mounted to the right or left grille head plate, with the operator on top of the grille-hood assembly and connected to the grille drive shaft with drive chain and sprockets. Headroom is required for this type of mounting.
2. Front-of-Hood Mounted: Operator is mounted to the right or left grille head plate, with the operator on coil side of the grille-hood assembly and connected to the grille drive shaft with drive chain and sprockets. Front clearance is required for this type of mounting.
3. Wall Mounted: Operator is mounted to the inside front wall on the left or right side of grille and connected to grille drive shaft with drive chain and sprockets. Side

room is required for this type of mounting. Wall-mounted operator can also be mounted above or below shaft; if above shaft, headroom is required.

4. Bench Mounted: Operator is mounted to the right or left grille head plate and connected to the grille drive shaft with drive chain and sprockets. Side room is required for this type of mounting.
5. Through-Wall Mounted: Operator is mounted on other side of wall from coil side of grille.

D. Motors: Reversible-type motor with controller (disconnect switch) for motor exposure indicated.

1. Electrical Characteristics:

   a. Phase: Single phase.
   b. Volts: 115 V.
   c. Hertz: 60.

2. Motor Size: Minimum size as indicated. If not indicated, large enough to start, accelerate, and operate grille in either direction from any position, at a speed not less than 8 in./sec. (203 mm/s) and not more than 12 in./sec. (305 mm/s), without exceeding nameplate ratings or service factor.
3. Operating Controls, Controllers (Disconnect Switches), Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.
4. Coordinate wiring requirements and electrical characteristics of motors and other electrical devices with building electrical system and each location where installed.

E. Limit Switches: Equip motorized grille with adjustable switches interlocked with motor controls and set to automatically stop grille at fully opened and fully closed positions.

F. Obstruction-Detection Device: External entrapment protection consisting of indicated automatic safety sensor capable of protecting full width of grille opening. Activation of sensor immediately stops and reverses downward grille travel.

1. Photoelectric Sensor: Manufacturer's standard system designed to detect an obstruction in grille opening without contact between grille and obstruction.

   a. Self-Monitoring Type: Designed to interface with grille operator control circuit to detect damage to or disconnection of sensing device. When self-monitoring feature is activated, grille closes only with sustained or constant pressure on close button.

2. Electric Sensor Edge: Automatic safety sensor edge, located within astragal or weather stripping mounted to bottom bar. Contact with sensor activates device. Connect to control circuit using manufacturer's standard take-up reel or self-coiling cable.

   a. Self-Monitoring Type: Four-wire configured device designed to interface with grille operator control circuit to detect damage to or disconnection of sensor edge.

3. Pneumatic Sensor Edge: Automatic safety sensor edge, located within astragal mounted to bottom bar. Contact with sensor activates device.

G. Control Station: Three-button control station in fixed location with momentary-contact push-button controls labeled "Open" and "Stop" and sustained- or constant-pressure push-button control labeled "Close."

1. Interior-Mounted Units: Full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.

H. Emergency Manual Operation: Equip electrically powered grille with capability for emergency manual operation. Design manual mechanism so required force for grille operation does not exceed 25 lbf (111 N).

I. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.

2.9 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM/NOMMA's "Metal Finishes Manual for Architectural and Metal Products (AMP 500-06)" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.10 STAINLESS-STEEL FINISHES

A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.

1. Run grain of directional finishes with long dimension of each piece.
2. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
3. Directional Satin Finish: No. 4.

C. Bright, Cold-Rolled, Unpolished Finish: No. 2B.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.

B. Examine locations of electrical connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install overhead coiling grilles and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports, according to manufacturer's written instructions and as specified.

B. Install overhead coiling grilles, hoods, controls, and operators at the mounting locations indicated for each grille.

C. Accessibility: Install overhead coiling grilles, switches, and controls along accessible routes in compliance with regulatory requirements for accessibility.

D. Power-Operated Grilles: Install according to UL 325.

3.3 STARTUP SERVICE

A. Perform installation and startup checks according to manufacturer's written instructions.

B. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

C. Test grille opening when activated by detector, fire-alarm system, emergency-egress release, or self-opening mechanism as required. Reset grille-opening mechanism after successful test.

3.4 ADJUSTING

A. Adjust hardware and moving parts to function smoothly, so that grilles operate easily, free of warp, twist, or distortion.

1. Adjust exterior components to be weather resistant.

B. Lubricate bearings and sliding parts as recommended by manufacturer.

3.5 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include six months' full maintenance by skilled employees of coiling-grille Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for grille operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

1. Perform maintenance, including emergency callback service, during normal working hours.
2. Include 24-hour-per-day, 7-day-per-week, emergency callback service.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain overhead coiling grilles.

END OF SECTION 083326

SECTION 08 41 13 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Exterior and interior storefront framing.
2. Exterior and interior entrance doors and door-frame units.

B. Related Requirements:

1. Division 07 Section "Joint Sealants" for installation of joint sealants installed with glazed aluminum-framed entrances and storefronts and for sealants to the extent not specified in this Section.
2. Division 07 section “Security Joint Sealants” for requirements for and locations to receive security joint sealants;
3. Division 08 Section “Automatic Door Operators” for power door operators.
4. Division 08 Section “Glazing” for insulating glass requirements.
5. Division 08 Section “Security Glazing” for requirements for and locations indicated to receive security glazing.
6. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable LEED Credits

1. MRc2
2. MRc4
3. MRc5
4. IEQc4.1

B. LEED Requirements

1. MRc2: CONSTRUCTION WASTE MANAGEMENT

No less than the specified portion of all construction waste from the Project shall be diverted from disposal in a landfill and/or incineration in with the Project

Requirements for Construction Waste Management and Disposal. Refer to Specification Sections 017419 Construction Waste Management and Disposal and 013510 Sustainable Design Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

2. MRc4: Recycled Content Material

   No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the Project Requirements for Recycled Content Materials. All materials counted towards the computations of the proportion of the Recycled Content Materials shall comply with the standard minimum percentages of post-consumer waste materials and for the minimum percentages of pre-consumer waste materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

3. MRc5: REGIONALLY MANUFACTURED HARVESTED MATERIALS

   No less than the specified minimum proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the Project Site in accordance with the Project Requirements for Regionally Manufactured and/or Harvested Materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

4. IEQc4.1: Low Emitting Materials: Sealants and Adhesives

   All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the Project Requirements for Low Emitting Materials – Sealants and Adhesives. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For aluminum-framed entrances and storefronts. Include plans, elevations, sections, full-size details, and attachments to other work.

   1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
   2. Include full-size isometric details of each vertical-to-horizontal intersection of aluminum-framed entrances and storefronts, showing the following:

      a. Joinery, including concealed welds.
      b. Anchorage.
      c. Expansion provisions.
      d. Glazing.
      e. Flashing and drainage.

3. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.

C. Samples for Initial Selection: For units with factory-applied color finishes.

D. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

E. Fabrication Sample: Of each vertical-to-horizontal intersection of assemblies, made from 12-inch (300-mm) lengths of full-size components and showing details of the following:

1. Joinery, including concealed welds.
2. Anchorage.
3. Expansion provisions.
4. Glazing.
5. Flashing and drainage.

F. Entrance Door Hardware Schedule: Prepared by or under supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.

G. Delegated-Design Submittal: For aluminum-framed entrances and storefronts indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and field testing agency.

B. Energy Performance Certificates: For aluminum-framed entrances and storefronts, accessories, and components, from manufacturer.

1. Basis for Certification: NFRC-certified energy performance values for each aluminum-framed entrance and storefront.

C. Product Test Reports: For aluminum-framed entrances and storefronts, for tests performed by manufacturer and witnessed by a qualified testing agency.

D. Field quality-control reports.

E. Sample Warranties: For special warranties.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For aluminum-framed entrances and storefronts to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated and accredited by IAS or ILAC Mutual Recognition Arrangement as complying with ISO/IEC 17025.

C. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.

1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

1.9 WARRANTY

A. Special Warranty: Installer agrees to repair or replace components of aluminum-framed entrances and storefronts that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including, but not limited to, excessive deflection.
b. Noise or vibration created by wind and thermal and structural movements.
c. Water penetration through fixed glazing and framing areas.
d. Failure of operating components.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design aluminum-framed entrances and storefronts.

B. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

1. Aluminum-framed entrances and storefronts shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
2. Failure also includes the following:

a. Thermal stresses transferring to building structure.
b. Glass breakage.
c. Noise or vibration created by wind and thermal and structural movements.
d. Loosening or weakening of fasteners, attachments, and other components.
e. Failure of operating units.

C. Structural Loads:

1. Wind Loads: As indicated on Drawings.
2. Other Design Loads: As indicated on Drawings.

D. Deflection of Framing Members: At design wind pressure, as follows:

1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane not exceeding 1/175 of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to 3/4 inch (19.1 mm), whichever is less.
2. Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or 1/8 inch (3.2 mm), whichever is smaller .

a. Operable Units: Provide a minimum 1/16-inch (1.6-mm) clearance between framing members and operable units.

E. Structural: Test according to ASTM E 330 as follows:

1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
3. Test Durations: As required by design wind velocity, but not less than 10 seconds.

F. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:

1. Fixed Framing and Glass Area:

a. Maximum air leakage of 0.06 cfm/sq. ft. (0.30 L/s per sq. m) at a static-air-pressure differential of 1.57 lbf/sq. ft. (75 Pa).

2. Entrance Doors:

a. Pair of Doors: Maximum air leakage of 1.0 cfm/sq. ft. (5.08 L/s per sq. m) at a static-air-pressure differential of 1.57 lbf/sq. ft. (75 Pa).

G. Water Penetration under Static Pressure: Test according to ASTM E 331 as follows:

1. No evidence of water penetration through fixed glazing and framing areas when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 10 lbf/sq. ft. (480 Pa).

H. Seismic Performance: Aluminum-framed entrances and storefronts shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

I. Energy Performance: Certify and label energy performance according to NFRC as follows:

1. Thermal Transmittance (U-factor): Fixed glazing and framing areas shall have U-factor of not more than 0.39 Btu/sq. ft. x h x deg F as determined according to NFRC 100.
2. Solar Heat Gain Coefficient: Fixed glazing and framing areas shall have a solar heat gain coefficient of no greater than 0.35 as determined according to NFRC 200.
3. Condensation Resistance: Fixed glazing and framing areas shall have an NFRC-certified condensation resistance rating of no less than 15.

J. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes:

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 MANUFACTURERS

A. Basis-of-Design Product – Entrances: Subject to compliance with requirements, provide the following:

1. Vistawall Architectural Products “Rugged Entrance System,” MS-375 Medium Stile.

a. Door Construction: 2 inches overall thickness, with minimum 0.188-inch thick, extruded aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.
b. Door Design: As indicated.

1) Accessible Doors: Smooth surfaced for width of door in area within 10 inches (255 mm) above floor or ground plane.

c. Glazing Stops and Gaskets: Beveled, snap-on, extruded-aluminum stops and preformed gaskets.

1) Provide nonremovable glazing stops on outside of door.

d. Entrance Door Hardware: As specified in Division 08 Section “Door Hardware.”
e. Glazing: In accordance with Divison 08 Section “Glazing.”

2.3 FRAMING

A. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Construction: Thermally broken.
2. Glazing System: Retained mechanically with gaskets on four sides.
3. Finish: Clear anodizes finish.
4. Fabrication Method: Field-fabricated stick system.

B. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.

C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

D. Materials:

1. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

   a. Sheet and Plate: ASTM B 209 (ASTM B 209M).
   b. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
   c. Extruded Structural Pipe and Tubes: ASTM B 429/B 429M.
   d. Structural Profiles: ASTM B 308/B 308M.

2. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM, and prepare surfaces according to applicable SSPC standard.

   a. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
   b. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
   c. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

2.4 ENTRANCE DOOR SYSTEMS

A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.

1. Door Construction: 1-3/4-inch (44.5-mm) overall thickness, with minimum 0.125-inch- (3.2-mm-) thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.

2. Door Design: As indicated.
3. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets.

   a. Provide nonremovable glazing stops on outside of door.

2.5 ENTRANCE DOOR HARDWARE

A. Entrance Door Hardware: Hardware not specified in this Section is specified in Section 087100 "Door Hardware."

2.6 GLAZING

A. Glazing: Comply with Section 088000 "Glazing."

B. Glazing Gaskets: Comply with Section 088000 "Glazing."

C. Glazing Sealants: Comply with Section 088000 "Glazing."

2.7 ACCESSORIES

A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
2. Reinforce members as required to receive fastener threads.

B. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch (25.4 mm) that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.

1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.

C. Concealed Flashing: Dead-soft, 0.018-inch- (0.457-mm-) thick stainless steel, ASTM A 240/A 240M of type recommended by manufacturer.

D. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil (0.762-mm) thickness per coat.

2.8 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Physical and thermal isolation of glazing from framing members.
4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
5. Provisions for field replacement of glazing from interior.
6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

E. Structural-Sealant-Glazed Framing Members: Include accommodations for using temporary support device to retain glazing in place while structural sealant cures.

F. Storefront Framing: Fabricate components for assembly using shear-block system.

G. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.

1. At exterior doors, provide compression weather stripping at fixed stops.
2. At interior doors, provide silencers at stops to prevent metal-to-metal contact. Install three silencers on strike jamb of single-door frames and two silencers on head of frames for pairs of doors.

H. Entrance Doors: Reinforce doors as required for installing entrance door hardware.

1. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
2. At exterior doors, provide weather sweeps applied to door bottoms.

I. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.

J. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.9 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General:

1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure nonmovement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
6. Seal perimeter and other joints watertight unless otherwise indicated.

B. Metal Protection:

1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.

2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install components plumb and true in alignment with established lines and grades.

D. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation.

E. Install glazing as specified in Section 088000 "Glazing."

F. Install weatherseal sealant according to Section 079200 "Joint Sealants" and according to sealant manufacturer's written instructions to produce weatherproof joints. Install joint filler behind sealant as recommended by sealant manufacturer.

G. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.

1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

3.3 ERECTION TOLERANCES

A. Erection Tolerances: Install aluminum-framed entrances and storefronts to comply with the following maximum tolerances:

1. Plumb: 1/8 inch in 10 feet (3.2 mm in 3 m); 1/4 inch in 40 feet (6.35 mm in 12.2 m).
2. Level: 1/8 inch in 20 feet (3.2 mm in 6 m); 1/4 inch in 40 feet (6.35 mm in 12.2 m).
3. Alignment:

    a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch (12.7 mm) wide, limit offset from true alignment to 1/16 inch (1.6 mm).
    b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch (12.7 to 25.4 mm) wide, limit offset from true alignment to 1/8 inch (3.2 mm).
    c. Where surfaces are separated by reveal or protruding element of 1 inch (25.4 mm) wide or more, limit offset from true alignment to 1/4 inch (6 mm).

4. Location: Limit variation from plane to 1/8 inch in 12 feet (3.2 mm in 3.6 m); 1/2 inch (12.7 mm) over total length.

3.4 MAINTENANCE SERVICE

A. Entrance Door Hardware:

1. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of entrance door hardware.
2. Initial Maintenance Service: Beginning at Substantial Completion, provide six months' full maintenance by skilled employees of entrance door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper entrance door hardware operation at rated speed and capacity. Use parts and supplies that are the same as those used in the manufacture and installation of original equipment.

END OF SECTION 08 41 13

SECTION 08 45 23 - FIBERGLASS-SANDWICH-PANEL ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes aluminum-framed assemblies incorporating fiberglass-sandwich panels as follows:

1. Wall assemblies
2. Window inserts

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for aluminum components of panel assemblies.

B. Sustainable Design Submittals:

1. Product Data: For sealants, indicating VOC content.
2. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: For panel assemblies.

1. Include plans, elevations, sections, details, and attachments to other work.
2. Include details of provisions for assembly expansion and contraction and for draining moisture within the assembly to the exterior.

D. Samples: In manufacturer's standard size.

1. For each type of fiberglass-sandwich panel.
2. For each type of exposed finish for framing members.

E. Fabrication Samples: Of each framing system intersection and adjacent panels, made from 12-inch (305-mm) lengths of full-size framing members and showing details of the following:

1. Joinery.
2. Anchorage.
3. Expansion provisions.
4. Fiberglass-sandwich panels.
5. Flashing and drainage.

F. Delegated-Design Submittal: For panel assemblies indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable LEED Credits

1. MRc2
2. MRc4
3. MRc5
4. IEQc4.1

B. LEED Requirements

1. MRc2: Construction Waste Management:

   No less than the specified portion of all construction waste from the Project shall be diverted from disposal in a landfill and/or incineration in with the Project Requirements for Construction Waste Management and Disposal. Refer to Specification Sections 017419 Construction Waste Management and Disposal and 013510 Sustainable Design Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

2. MRc4: Recycled Content Material:

   No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the Project Requirements for Recycled Content Materials. All materials counted towards the computations of the proportion of the Recycled Content Materials shall comply with the standard minimum percentages of post-consumer waste materials and for the minimum percentages of pre-consumer waste materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

3. MRc5: Regionally Manufactured and/or Harvested Materials:

   No less than the specified minimum proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the Project Site in accordance with the Project Requirements for Regionally Manufactured and/or Harvested Materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

4. IEQc4.1: Low Emitting Materials – Sealant and Adhesives

All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the Project Requirements for Low Emitting Materials – Sealants and Adhesives. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer, manufacturer, and testing agency.

B. Product Test Reports: For each fiberglass-sandwich-panel assembly, for tests performed by a qualified testing agency.

C. Evaluation Reports: For fiberglass-sandwich-panel assemblies from ICC-ES.

D. Field quality-control reports.

E. Sample Warranties: For special warranties.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For panel assemblies to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: For fiberglass-sandwich panels, a qualified manufacturer whose facilities, processes, and products are monitored by an independent, accredited quality-control agency for compliance with applicable requirements in ICC-ES AC04 or ICC-ES AC177.

B. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

C. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockup of typical panel assemblies as shown on Drawings.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

D. Installer’s Qualifications: Installation shall be by an experienced installer, which has been in the business of installing specified panel systems for at least two consecutive years and can show evidence of satisfactory completion of projects of similar size, scope and type.

1.9 WARRANTY

A. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace fiberglass-sandwich panels that exhibit defects in materials or workmanship within specified warranty period.

1. Defects include, but are not limited to, the following:

a. Fiberbloom.
b. Delamination of coating, if any, from exterior face sheet.
c. Color change exceeding requirements.
d. Delamination of panel face sheets from panel cores.

2. Warranty Period: 10 years from date of Substantial Completion.

B. Special Aluminum-Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes fail within specified warranty period. Warranty does not include normal weathering.

1. Failures include, but are not limited to, checking, crazing, peeling, chalking, and fading of finishes.
2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design fiberglass-sandwich-panel assemblies.

B. Structural Loads: As indicated on Structural Drawings.

C. Deflection Limits:

1. Vertical Panel Assemblies: Limited to 1/60 of clear span for each assembly component.
2. Overhead Panel Assemblies: Limited to 1/60 of clear span for each assembly component.

D. Structural-Test Performance: Provide panel assemblies tested according to ASTM E 330, as follows:

1. When tested at positive and negative wind-load design pressures, assemblies do not show evidence of deflection exceeding specified limits.
2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not show evidence of material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
3. Test Durations: As required by design wind velocity, but not less than 10 seconds.

E. Water Penetration under Static Pressure: Provide panel assemblies that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft. (300 Pa).

F. Water Penetration under Dynamic Pressure: Provide panel assemblies that do not evidence water leakage through fixed glazing and framing areas when tested according to AAMA 501.1 under dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft. (300 Pa).

1. Maximum Water Leakage: According to AAMA 501.1. Water leakage does not include water that is controlled by flashing and gutters and drained to the exterior, or water that cannot damage adjacent materials or finishes.

G. Thermal Movements: Allow for thermal movements from ambient- and surface-temperature changes. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

H. Energy Performance: Provide panel assemblies with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below and certified and labeled according to NFRC:

1. Thermal Transmittance (U-Factor): Fixed glazing and framing areas shall have U-factor of not more than 0.15 Btu/sq. ft. x h x deg F as determined according to NFRC 100.
2. Solar Heat Gain Coefficient (SHGC): Fixed glazing and framing areas shall have a SHGC of no greater than 0.10 as determined according to NFRC 200.
3. Air Infiltration: Maximum air leakage through fixed glazing and framing areas of 0.01 cfm/sq. ft. of fixed wall area as determined according to ASTM E 283 at a minimum static-air-pressure differential of 6.24 PSF.

2.2 FIBERGLASS-SANDWICH-PANEL ASSEMBLIES

A. Fiberglass-Sandwich-Panel Assemblies: Translucent assemblies that are supported by aluminum framing and glazed with fiberglass-sandwich panels.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Kalwall Corporation; or a comparable product by one of the following:

a. Major Industries, Inc.

2.3 FIBERGLASS-SANDWICH PANELS

A. Fiberglass-Sandwich Panels: Uniformly colored, translucent, thermoset, fiberglass-reinforced-polymer face sheets bonded to both sides of a grid core.

1. Core Insulation: Fill panel cores with fiberglass.

B. Panel Thickness: 4 inches.

C. Grid Core: Mechanically interlocked, extruded-aluminum I-beams, with a minimum flange width of 7/16 inch (11.1 mm).

1. Extruded Aluminum: ASTM B 221 (ASTM B 221M), in alloy and temper recommended in writing by manufacturer.
2. I-Beam Construction: Thermally broken, extruded aluminum.
3. Grid Pattern: As indicated on Drawings.

D. Exterior Face Sheet:

1. Thickness: 0.070 inch (1.78 mm).
2. Color: White.
3. Protective Weathering Surface: Manufacturer's standard.

E. Interior Face Sheet:

1. Thickness: 0.060 inch (1.52 mm).
2. Color: Crystal.

F. Fiberglass-Sandwich-Panel Adhesive: Manufacturer's standard for permanent adhesion of facings to cores.

G. Panel Strength:

1. Maximum Panel Deflection: 3-1/2 inches (89 mm) when a 4-by-12-foot (1.2-by-3.6-m) panel is tested according to ASTM E 72 at 34 lbf/sq. ft. (1.6 kPa), with a maximum 0.090-inch (2.3-mm) set deflection after five minutes.
2. Panel Support Strength: Capable of supporting, without failure, a 300-lbf (1334-N) concentrated load when applied to a 3-inch- (76-mm-) diameter disk according to ASTM E 661.

H. Panel Performance:

1. Self-Ignition Temperature: 650 deg F (343 deg C) or more according to ASTM D 1929.
2. Smoke-Developed Index: 450 or less according to ASTM E 84, or 75 or less according to ASTM D 2843.
3. Combustibility Classification: Class CC1 based on testing according to ASTM D 635.
4. Interior Finish Classification: Class A based on testing according to ASTM E 84.
5. Color Change: Not more than 3.0 units Delta E, when measured according to ASTM D 2244, after outdoor weathering compliant with procedures in ASTM D 1435.
6. Impact Resistance: No fracture or tear at impact of 60 ft. x lbf (81 J) by a 3-1/4-inch- (83-mm-) diameter, 5-lb (2.3-kg) freefalling ball according to UL 972 test procedure.
7. Haze Factor: Greater than 90 percent when tested according to ASTM D 1003.

2.4 WINDOW INSERTS

A. Widows shall be designed specifically for inclusion in the translucent panel unit system and factory unitized to the panels.

B. The Uinits shall fixed lite.

C. The performance of the windows shall pass or exceed requirements fo AAMA/WDMA/CSA-101.1.S.2/A440-05(08).

D. HC-2000 fixed windows: F-AW80 shall pass requirements at 120 psf uniform structural load with air infiltration <.01 CFM/FT2 @6.24 psf and no water penetration at 12 psf.

E. Construction of all window members shall be of heavy guage 6050-T5 extruded aluminum with a thermal break. Frame section shall be coped and joined be stainless steel screws at each corner. All loints exposed to the weather shall be sealed with an elastic compound. All openins shall be double weather striped using T-slot bulb gaskets to insure minimum air infiltration.

F. All lites shall be inside glazed with an expanded EPDM closed cell sponge gasket to exterior, with aluminum glazing bead and a driven EPDM wedge gasket to the interior for rapid removal and replacement.

G. Glazing shall be with 1” Low-E double insulated glass.

2.5 ALUMINUM FRAMING SYSTEMS

A. Components: Manufacturer's standard extruded-aluminum members of thickness required and reinforced as required to support imposed loads.

1. Construction: Thermally broken, extruded aluminum.

B. Aluminum: Alloy and temper recommended in writing by manufacturer for type of use and finish indicated.

1. Sheet and Plate: ASTM B 209 (ASTM B 209M).
2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
3. Extruded Structural Pipe and Tubes: ASTM B 429 (/B 429M).
4. Structural Profiles: ASTM B 308 (/B 308M).

C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning skylight components.

D. Fasteners and Accessories: Manufacturer's standard, corrosion-resistant, nonstaining, and nonbleeding fasteners and accessories; compatible with adjacent materials.

1. At closures, retaining caps, or battens, use ASTM A 193 (/A 193M), 300 series stainless-steel screws.
2. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
3. At movement joints, use slip-joint linings, spacers, and sleeves of material and type recommended in writing by manufacturer.

E. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123 (/A 123M) or ASTM A 153 (/A 153M)requirements.

F. Anchor Bolts: ASTM A 307, Grade A, galvanized steel.

G. Concealed Flashing: Corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.

H. Exposed Flashing and Closures: Aluminum sheet not less than 0.050 inch (1.27 mm) thick, finished to match framing.

I. Framing Gaskets: Manufacturer's standard.

J. Frame-System Sealants: As recommended in writing by manufacturer.

1. Sealant shall have a VOC content of 250 g/L or less.
2. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

K. Corrosion-Resistant Coating: Cold-applied asphalt mastic, compounded for 15-mil (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.6 FABRICATION

A. Frame System Fabrication:

1. Fabricate components that, when assembled, have the following characteristics:

a. Profiles that are sharp, straight, and free of defects or deformations.
b. Accurately fitted joints with ends coped or mitered.
c. Internal guttering systems or other means to drain water passing through joints, and moisture migrating within assembly to exterior.

2. Fabricate sill closures with weep holes and for installation as continuous component.
3. Reinforce components as required to receive fastener threads.

B. Panel Fabrication: Factory assemble and seal panels.

1. Laminate face sheets to grid core under a controlled process using heat and pressure to produce straight adhesive bonding lines that cover width of core members and that have sharp edges.

a. White spots indicating lack of bond at intersections of grid-core members are limited in number to four for every 40 sq. ft. (3.7 sq. m) of panel and limited in diameter to 3/64 inch (1.2 mm).

2. Fabricate with grid pattern that is symmetrical about centerlines of each panel.
3. Fabricate panel to allow condensation within panel to escape.
4. Reinforce panel corners.

2.7 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Comply with manufacturer's written instructions.

1. Do not install damaged components.
2. Fit joints between aluminum components to produce hairline joints free of burrs and distortion.
3. Rigidly secure nonmovement joints.
4. Install anchors with separators and isolators to prevent metal corrosion, electrolytic deterioration, and immobilization of moving joints.
5. Seal joints watertight unless otherwise indicated.

B. Metal Protection: Where aluminum components will contact dissimilar materials, protect against galvanic action by painting contact surfaces with corrosion-resistant coating or by installing nonconductive spacers as recommended in writing by manufacturer for this purpose.

C. Install components plumb and true in alignment with established lines and elevations.

D. Skylight Assemblies: Install continuous aluminum sill closures with weatherproof expansion joints and locked and sealed corners. Locate weep holes at rafters. Install components to drain water passing through joints and moisture migrating within assembly to exterior.

E. Erection Tolerances: Install panel assemblies to comply with the following maximum tolerances:

1. Alignment: Limit offset from true alignment to 1/32 inch (0.8 mm) where surfaces abut in line, edge to edge, at corners, or where a reveal or protruding element separates aligned surfaces by less than 3 inches (76 mm); otherwise, limit offset to 1/8 inch (3.2 mm).
2. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet (3.2 mm in 3.7 m), but no greater than 1/2 inch (13 mm) over total length.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

1. Water-Spray Test: Before installation of interior finishes has begun, panel assemblies shall be tested according to AAMA 501.2 and shall not show evidence of water penetration.
2. Water Penetration under Static Pressure: Before installation of interior finishes has begun, areas shall be tested according to ASTM E 1105.

B. Repair or remove work where test results and inspections indicate that it does not comply with specified requirements.

C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

D. Prepare test and inspection reports.

END OF SECTION 08 45 23

SECTION 08 63 00 - METAL-FRAMED SKYLIGHTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes skylights with metal framing.
   1. Related Requirements:
      a. Section 08 80 00 "Glazing."

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable LEED Credits

   1. MRc2
   2. MRc4
   3. MRc5
   4. IEQc4.1

B. LEED Requirements

   1. MRc2: CONSTRUCTION WASTE MANAGEMENT

      No less than the specified portion of all construction waste from the Project shall be diverted from disposal in a landfill and/or incineration in with the Project Requirements for Construction Waste Management and Disposal. Refer to Specification Sections 017419 Construction Waste Management and Disposal and 013510 Sustainable Design Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

   2. MRc4: Recycled Content Material

      No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the Project Requirements for Recycled Content Materials. All materials counted towards the computations of the proportion of the Recycled Content Materials shall comply with the standard minimum percentages of post-consumer waste materials and for the minimum percentages of pre-consumer waste materials. Refer to Specification Section 013510 Sustainable Project Requirements.

Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

3. MRc5: REGIONALLY MANUFACTURED HARVESTED MATERIALS

   No less than the specified minimum proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the Project Site in accordance with the Project Requirements for Regionally Manufactured and/or Harvested Materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

4. IEQc4.1: Low Emitting Materials: Sealants and Adhesives

   All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the Project Requirements for Low Emitting Materials – Sealants and Adhesives. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for metal-framed skylights.

B. Sustainable Design Submittals:

   1. Product Data: For sealants, indicating VOC content.
   2. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: For metal-framed skylights.

   1. Include plans, elevations, sections, and attachment details.
   2. Indicate structural loadings and reactions to be transmitted to supporting curbs.
   3. Include details of provisions for assembly expansion and contraction and for draining moisture within the assembly to the exterior.
   4. Include full-size isometric details of each vertical-to-horizontal intersection of assembly, showing the following:

      a. Joinery including concealed welds.
      b. Anchorage.
      c. Expansion provisions.
      d. Glazing.
      e. Flashing and drainage.

D. Samples for Initial Selection: For units with factory-applied finishes.

E. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

F. Fabrication Sample: Of each framing intersection of assemblies, made from 12-inch (305-mm) lengths of full-size components and showing details of the following:

1. Joinery including concealed welds.
2. Anchorage.
3. Expansion provisions.
4. Glazing.
5. Flashing and drainage.

G. Delegated-Design Submittal: For metal-framed skylights indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Compatibility and Adhesion Test Reports: For structural-sealant-glazed skylights, test reports from sealant manufacturer indicating that joint sealants have been tested for each material that will come in contact with sealants.

C. Product Test Reports: For metal-framed skylights, for tests performed by a qualified testing agency.

D. Field quality-control reports.

E. Sample Warranties: For special warranties.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of metal-framed skylights required for this Project.

1.8 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of metal framed skylights that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including, but not limited to, excessive deflection.
b. Noise or vibration caused by thermal movements.
c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
d. Adhesive or cohesive sealant failures.
e. Water leakage.

2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design metal-framed skylights.

B. Structural Loads: As indicated on Drawings.

C. Deflection of Framing Members: At design wind pressure, as follows:

1. Deflection Normal to Glazing Plane: Limited to edge of glass in a direction perpendicular to glass plane not exceeding L/175 of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to 3/4 inch (19.1 mm), whichever is less.
2. Deflection Parallel to Glazing Plane: Limited to L/360 of clear span or 1/8 inch (3.2 mm), whichever is smaller.

D. Lateral Bracing of Framing Members: Compression flanges of flexural members are laterally braced by cross members with minimum depth equal to 50 percent of flexural member that is braced. Glazing does not provide lateral support.

E. Structural-Test Performance: Metal-framed skylights tested according to ASTM E 330, as follows:

1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified deflection limits.
2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
3. Test Durations: As required by design wind velocity, but not less than 10 seconds.

F. Air Infiltration: Metal-framed skylights with maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. ft. (0.03 L/s per sq. m) of when tested according to ASTM E 283 at a minimum static-air-pressure difference of 6.24 lbf/sq. ft. (300 Pa).

G. Water Penetration under Static Pressure: Metal-framed skylights that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft. (300 Pa).

H. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

I. Condensation Resistance: Metal-framed skylights with fixed glazing and framing areas having condensation-resistance factor (CRF) of not less than 45 when tested according to AAMA 1503.

1. Haze Factor: Greater than 90 percent when tested according to ASTM D 1003.

J. Energy Performance: Provide metal-framed skylights with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below and certified and labeled according to NFRC:

1. Thermal Transmittance (U-Factor): Fixed glazing and framing areas shall have U-factor of not more than 0.39 Btu/sq. ft. x h x deg F Insert value as determined according to NFRC 100.
2. Solar Heat Gain Coefficient: Fixed glazing and framing areas shall have a solar heat gain coefficient of no greater than 0.27 as determined according to NFRC 200.

2.2 METAL-FRAMED SKYLIGHTS

A. Metal-Framed Skylights: Glazed skylight assemblies supported by aluminum framing.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Kawneer North America; an Alcoa company; 2000 Skylight or a comparable product by one of the following:

a. Acurlite Structural Skylights Inc.
b. CPI Daylighting, Inc.
c. GSI Glazed Structures, Inc.
d. O'Keeffe's Inc.
e. Oldcastle Building Envelope.
f. Wasco Products, Inc.

B. Aluminum Framing Systems: Manufacturer's standard extruded-aluminum members of thickness required and reinforced as required to support imposed loads.

C. Aluminum: Alloy and temper as recommended in writing by manufacturer for type of use and finish indicated.

1. Sheet and Plate: ASTM B 209 (ASTM B 209M).
2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
3. Extruded Structural Pipe and Tubes: ASTM B 429/B 429M.
4. Structural Profiles: ASTM B 308/B 308M.

D. Pressure Caps: Manufacturer's standard aluminum components that mechanically retain glazing.

1. Include snap-on aluminum trim that conceals fasteners.

E. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning skylight components.

F. Fasteners and Accessories: Manufacturer's standard, corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. At pressure caps, use ASTM A 193/A 193M stainless-steel screws.
2. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
3. Reinforce members as required to receive fastener threads.
4. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.

G. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.

H. Concealed Flashing: Manufacturer's standard, corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.

I. Exposed Flashing and Closures: Manufacturer's standard aluminum components not less than 0.030 inch (0.762 mm) thick.

J. Framing Sealants: As specified in Section 07 92 00 "Joint Sealants."

1. Sealant shall have a VOC content of 250 g/L or less.

K. Corrosion-Resistant Coating: Cold-applied asphalt mastic, compounded for 15-mil (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.3 GLAZING

A. Glazing: As specified in Section 08 80 00 "Glazing."

2.4 FABRICATION

A. Where practical, fit and assemble metal-framed skylights in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Fabricate aluminum components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Internal guttering systems or other means to drain water passing joints and moisture migrating within skylight to exterior.
4. Physical and thermal isolation of glazing from framing members.
5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.

C. Fabricate aluminum sill closures with weep holes and for installation as continuous component.

D. Reinforce aluminum components as required to receive fastener threads.

E. Factory-Glazed, Metal-Framed Skylights:

1. Factory install glazing to comply with requirements in Section 08 80 00 "Glazing."

F. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.5 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Comply with manufacturer's written instructions.

1. Do not install damaged components.
2. Fit joints between aluminum components to produce hairline joints free of burrs and distortion.
3. Rigidly secure nonmovement joints.
4. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
5. Seal joints watertight unless otherwise indicated.

B. Metal Protection: Where aluminum will contact dissimilar materials, protect against galvanic action by painting contact surfaces with protective coating or by installing nonconductive spacers as recommended in writing by manufacturer for this purpose.

C. Install continuous aluminum sill closure with weatherproof expansion joints and locked and sealed or welded corners. Locate weep holes at rafters.

D. Install components to drain water passing joints, and moisture migrating within skylight to exterior.

E. Install components plumb and true in alignment with established lines and elevations.

F. Glazing: Install glazing as specified in Section 08 80 00 "Glazing."

G. Erection Tolerances: Install metal-framed skylights to comply with the following maximum tolerances:

1. Alignment: Limit offset from true alignment to 1/32 inch (0.8 mm) where surfaces abut in line, edge to edge, at corners, or where a reveal or protruding element separates aligned surfaces by less than 3 inches (76 mm); otherwise, limit offset to 1/8 inch (3.2 mm).
2. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet (3.2 mm in 3.7 m) but no greater than 1/2 inch (13 mm) over total length.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

1. Water-Spray Test: Before installation of interior finishes has begun, skylights shall be tested according to AAMA 501.2 and shall not evidence water penetration.

B. Repair or remove work where test results and inspections indicate that it does not comply with specified requirements.

C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

D. Prepare test and inspection reports.

3.4 CLEANING AND PROTECTION

A. Clean exposed surfaces immediately after installing skylights. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.

B. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

C. Protect skylights from contact with contaminating substances resulting from construction operations. If contaminating substances do contact skylight surfaces, remove contaminants immediately according to manufacturer's written instructions.

END OF SECTION 08 63 00

SECTION 087100 – DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:

1. Mechanical and electrified door hardware for:

a. Swinging doors.

B. Exclusions: Unless specifically listed in hardware sets, hardware is not specified in this section for:

1. Windows
2. Cabinets (casework), including locks in cabinets
3. Signage
4. Toilet accessories
5. Overhead doors

C. Related Sections:

1. Division 01 Section “Alternates” for alternates affecting this section.
2. Division 07 Section “Joint Sealants” for sealant requirements applicable to threshold installation specified in this section.
3. Division 08 Section for “Hollow Metal Doors and Frames”.
4. Division 08 Section “Flush Wood Doors”.
5. Division 08 Section “Detention Door Hardware”
6. Division 08 Section “Detention Doors and Frames”
7. Division 26 sections for connections to electrical power system and for low-voltage wiring.
8. Division 28 sections for coordination with other components of electronic access control system.

1.3 REFERENCES

A. Fire/Life Safety

1. NFPA - National Fire Protection Association

a. NFPA 70 – National Electric Code
b. NFPA 80 - Standard for Fire Doors and Fire Windows
c. NFPA 101 - Life Safety Code

d. NFPA 105 - Smoke and Draft Control Door Assemblies

2. State Fire Safety Code.

B. UL - Underwriters Laboratories

1. UL 10B - Fire Test of Door Assemblies
2. UL 10C - Positive Pressure Test of Fire Door Assemblies
3. UL 1784 - Air Leakage Tests of Door Assemblies
4. UL 305 - Panic Hardware

C. Accessibility

1. ADA - Americans with Disabilities Act.
2. ANSI A117.1 - Accessible and Usable Buildings and Facilities.

D. DHI - Door and Hardware Institute

1. Sequence and Format for the Hardware Schedule
2. Recommended Locations for Builders Hardware
3. Key Systems and Nomenclature

E. ANSI - American National Standards Institute

1. ANSI/BHMA A156.1 - A156.29, and ANSI A156.31 - Standards for Hardware and Specialties

1.4 SUBMITTALS

A. General:

1. Submit in accordance with Conditions of Contract and Division 01 requirements.
2. Highlight, encircle, or otherwise specifically identify on submittals deviations from Contract Documents, issues of incompatibility or other issues which may detrimentally affect the Work.
3. Prior to forwarding submittal, comply with procedures for verifying existing door and frame compatibility for new hardware, as specified in PART 3, “EXAMINATION” article, herein.

B. Action Submittals:

1. Product Data: Product data including manufacturers’ technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
2. Riser and Wiring Diagrams: After final approval of hardware schedule, submit details of electrified door hardware, indicating:

a. Wiring Diagrams: For power, signal, and control wiring and including:
1) Details of interface of electrified door hardware and building safety and security systems.
2) Schematic diagram of systems that interface with electrified door hardware.
3) Point-to-point wiring.
4) Risers.

3. Samples for Verification: If requested by Architect, submit production sample or sample installations of each type of exposed hardware unit in finish indicated, and tagged with full description for coordination with schedule.

    a. Samples will be returned to supplier in like-new condition. Units that are acceptable to Architect may, after final check of operations, be incorporated into Work, within limitations of key coordination requirements.

4. Door Hardware Schedule: Submit schedule with hardware sets in vertical format as illustrated by Sequence of Format for the Hardware Schedule as published by the Door and Hardware Institute. Indicate complete designations of each item required for each door or opening, include:

    a. Door Index; include door number, heading number, and Architects hardware set number.
    b. Opening Lock Function Spreadsheet: List locking device and function for each opening.
    c. Type, style, function, size, and finish of each hardware item.
    d. Name and manufacturer of each item.
    e. Fastenings and other pertinent information.
    f. Location of each hardware set cross-referenced to indications on Drawings.
    g. Explanation of all abbreviations, symbols, and codes contained in schedule.
    h. Mounting locations for hardware.
    i. Door and frame sizes and materials.
    j. Name and phone number for local manufacturer's representative for each product.
    k. Operational Description of openings with any electrified hardware (locks, exits, electromagnetic locks, electric strikes, automatic operators, door position switches, magnetic holders or closer/holder units, and access control components). Operational description should include how door will operate on egress, ingress, and fire and smoke alarm connection.
        1) Submittal Sequence: Submit door hardware schedule concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate fabrication of other work that is critical in Project construction schedule.

5. Key Schedule:

    a. After Keying Conference, provide keying schedule listing levels of keying as well as explanation of key system's function, key symbols used and door numbers controlled.
    b. Use ANSI A156.28 “Recommended Practices for Keying Systems” as guideline for nomenclature, definitions, and approach for selecting optimal keying system.
    c. Provide 3 copies of keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations.
    d. Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions.
    e. Provide one complete bitting list of key cuts and one key system schematic illustrating system usage and expansion.
        1) Forward bitting list, key cuts and key system schematic directly to Owner, by means as directed by Owner.

    f. Prepare key schedule by or under supervision of supplier, detailing Owner’s final keying instructions for locks.

6. Templates: After final approval of hardware schedule, provide templates for doors, frames and other work specified to be factory prepared for door hardware installation.

C. Informational Submittals:

1. Qualification Data: For Supplier, Installer and Architectural Hardware Consultant.
2. Product Certificates for electrified door hardware, signed by manufacturer:

   a. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.

3. Certificates of Compliance:

   a. Certificates of compliance for fire-rated hardware and installation instructions if requested by Architect or Authority Having Jurisdiction.
   b. Installer Training Meeting Certification: Letter of compliance, signed by Contractor, attesting to completion of installer training meeting specified in "QUALITY ASSURANCE" article, herein.
   c. Electrified Hardware Coordination Conference Certification: Letter of compliance, signed by Contractor, attesting to completion of electrified hardware coordination conference, specified in "QUALITY ASSURANCE" article, herein.

4. Product Test Reports: For compliance with accessibility requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by qualified testing agency, for door hardware on doors located in accessible routes.
5. Warranty: Special warranty specified in this Section.

D. Closeout Submittals:

1. Operations and Maintenance Data : Provide in accordance with Division 01 and include:

   a. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
   b. Catalog pages for each product.
   c. Name, address, and phone number of local representative for each manufacturer.
   d. Parts list for each product.
   e. Final approved hardware schedule, edited to reflect conditions as-installed.
   f. Final keying schedule
   g. Copies of floor plans with keying nomenclature
   h. As-installed wiring diagrams for each opening connected to power, both low voltage and 110 volts.
   i. Copy of warranties including appropriate reference numbers for manufacturers to identify project.

1.5 QUALITY ASSURANCE

A. Product Substitutions: Comply with product requirements stated in Division 01 and as specified herein.

1. Where specific manufacturer's product is named and accompanied by "No Substitute," including make or model number or other designation, provide

product specified. (Note: Certain products have been selected for their unique characteristics and particular project suitability.)

a. Where no additional products or manufacturers are listed in product category, requirements for “No Substitute” govern product selection.

2. Where products indicate “acceptable substitute” or “acceptable manufacturer”, provide product from specified manufacturers, subject to compliance with specified requirements and “Single Source Responsibility” requirements stated herein.

B. Supplier Qualifications and Responsibilities: Recognized architectural hardware supplier with record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this Project and that provides certified Architectural Hardware Consultant (AHC) available to Owner, Architect, and Contractor, at reasonable times during the Work for consultation.

1. Warehousing Facilities: In Project's vicinity.
2. Scheduling Responsibility: Preparation of door hardware and keying schedules.
3. Engineering Responsibility: Preparation of data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
4. Coordination Responsibility: Coordinate installation of electronic security hardware with Architect and electrical engineers and provide installation and technical data to Architect and other related subcontractors.

a. Upon completion of electronic security hardware installation, inspect and verify that all components are working properly.

C. Installer Qualifications: Qualified tradesmen, skilled in application of commercial grade hardware with record of successful in-service performance for installing door hardware similar in quantity, type, and quality to that indicated for this Project.

D. Architectural Hardware Consultant Qualifications: Person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and meets these requirements:

1. For door hardware, DHI-certified, Architectural Hardware Consultant (AHC).
2. Can provide installation and technical data to Architect and other related subcontractors.
3. Can inspect and verify components are in working order upon completion of installation.
4. Capable of producing wiring diagrams.
5. Capable of coordinating installation of electrified hardware with Architect and electrical engineers.

E. Single Source Responsibility: Obtain each type of door hardware from single manufacturer.

1. Provide electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated.
2. Manufacturers that perform electrical modifications and that are listed by testing and inspecting agency acceptable to authorities having jurisdiction are acceptable.

F. Fire-Rated Door Openings: Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and are identical to products tested by Underwriters Laboratories, Intertek Testing Services, or other testing and inspecting organizations acceptable to authorities having jurisdiction for use on types and sizes of doors indicated, based on testing at positive pressure and according to NFPA 252 or UL 10C and in compliance with requirements of fire-rated door and door frame labels.

G. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.

1. Air Leakage Rate: Maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at tested pressure differential of 0.3-inch wg (75 Pa) of water.

H. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction.

I. Means of Egress Doors: Latches do not require more than 15 lbf (67 N) to release latch. Locks do not require use of key, tool, or special knowledge for operation.

J. Accessibility Requirements: For door hardware on doors in an accessible route, comply with governing accessibility regulations cited in “REFERENCES” article, herein.

1. Provide operating devices that do not require tight grasping, pinching, or twisting of wrist and that operate with force of not more than 5 lbf (22.2 N).
2. Maximum opening-force requirements:

a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf (22.2 N) applied perpendicular to door.
b. Sliding or Folding Doors: 5 lbf (22.2 N) applied parallel to door at latch.
c. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.

3. Bevel raised thresholds with slope of not more than 1:2. Provide thresholds not more than 1/2 inch (13 mm) high.
4. Adjust door closer sweep periods so that, from open position of 70 degrees, door will take at least 3 seconds to move to 3 inches (75 mm) from latch, measured to leading edge of door.

K. Keying Conference: Conduct conference at Project site to comply with requirements in Division 01.

1. Attendees: Owner, Contractor, Architect, Installer, Owner's security consultant, and Supplier’s Architectural Hardware Consultant.
2. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including:

a. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
b. Preliminary key system schematic diagram.
c. Requirements for key control system.
d. Requirements for access control.
e. Address for delivery of keys.

L. Pre-installation Conference: Conduct conference at Project site.

1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Inspect and discuss preparatory work performed by other trades.
3. Inspect and discuss electrical roughing-in for electrified door hardware.
4. Review sequence of operation for each type of electrified door hardware.
5. Review required testing, inspecting, and certifying procedures.

M. Coordination Conferences:

1. Installation Coordination Conference: Prior to hardware installation, schedule and hold meeting to review questions or concerns related to proper installation and adjustment of door hardware.

a. Attendees: Door hardware supplier, door hardware installer, Contractor.
b. After meeting, provide letter of compliance to Architect, indicating when meeting was held and who was in attendance.

2. Electrified Hardware Coordination Conference: Prior to ordering electrified hardware, schedule and hold meeting to coordinate door hardware with security, electrical, doors and frames, and other related suppliers.

a. Attendees: electrified door hardware supplier, doors and frames supplier, electrified door hardware installer, electrical subcontractor, Owner, Owner’s security consultant, Architect and Contractor.
b. After meeting, provide letter of compliance to Architect, indicating when coordination conference was held and who was in attendance.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site.

B. Tag each item or package separately with identification coordinated with final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.

1. Deliver each article of hardware in manufacturer’s original packaging.

C. Project Conditions:

1. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.
2. Provide secure lock-up for door hardware delivered to Project, but not yet installed. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.

D. Protection and Damage:

1. Promptly replace products damaged during shipping.
2. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during Work.
3. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.

E. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

F. Deliver keys and permanent cores to Owner by registered mail or overnight package service.

1.7 COORDINATION

A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete. Concrete, reinforcement, and formwork requirements are specified in Division 03.

B. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.

D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.

E. Direct shipments not permitted, unless approved by Contractor.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Years from date of Substantial Completion, for durations indicated.

a. Closers:
1) Mechanical: 30 years.
2) Electrified: 2 years.

b. Automatic Operators: 2 years.
c. Exit Devices:
1) Mechanical: 3 years.
2) Electrified: 1 year.

d. Locksets:
1) Mechanical: 3 years.
2) Electrified: 1 year.

e. Continuous Hinges: Lifetime warranty.
f. Key Blanks: Lifetime

2. Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.

1.9 MAINTENANCE

A. Extra Materials:

1. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

B. Maintenance Tools:

1. Furnish complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Approval of manufacturers other than those listed shall be in accordance with QUALITY ASSURANCE article, herein.

B. Approval of products from manufacturers indicated as “Acceptable Manufacturer” is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer’s product.

C. Hand of Door: Drawings show direction of slide, swing, or hand of each door leaf. Furnish each item of hardware for proper installation and operation of door movement as shown.

D. Where specified hardware is not adaptable to finished shape or size of members requiring hardware, furnish suitable types having same operation and quality as type specified, subject to Architect's approval.

2.2 MATERIALS

A. Fasteners

1. Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation.
2. Furnish screws for installation with each hardware item. Finish exposed (exposed under any condition) screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work including prepared for paint surfaces to receive painted finish.
3. Provide concealed fasteners for hardware units exposed when door is closed except when no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work unless thru-bolts are required to fasten hardware securely. Review door specification and advise Architect if thru-bolts are required.
4. Install hardware with fasteners provided by hardware manufacturer.

B. Modification and Preparation of Existing Doors: Provide necessary fillers, Dutchmen, reinforcements, and fasteners, compatible with existing materials, as required for mounting new opening hardware and to cover existing door and frame preparations.

1. Use materials which match materials of adjacent modified areas.
2. When modifying existing fire-rated openings, provide materials permitted by NFPA 80 as required to maintain fire-rating.

C. Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.

1. Where fasteners are exposed to view: Finish to match adjacent door hardware material.

2.3 HINGES

A. Provide five-knuckle, ball bearing hinges.

1. Manufacturers and Products:

a. Scheduled Manufacturer and Product: Ives 5BB series.
b. Acceptable Manufacturers and Products: Hager BB series, Stanley FBB Series.

B. Requirements:

1. 1-3/4 inch (44 mm) thick doors, up to and including 36 inches (914 mm) wide:

a. Exterior: Standard weight, bronze or stainless steel, 4-1/2 inches (114 mm) high
b. Interior: Standard weight, steel, 4-1/2 inches (114 mm) high

2. 1-3/4 inch (44 mm) thick doors over 36 inches (914 mm) wide:

a. Exterior: Heavy weight, bronze/stainless steel, 5 inches (127 mm) high
b. Interior: Heavy weight, steel, 5 inches (127 mm) high

3. 2 inches or thicker doors:

a. Exterior: Heavy weight, bronze or stainless steel, 5 inches (127 mm) high
b. Interior: Heavy weight, steel, 5 inches (127 mm) high

4. Provide three hinges per door leaf for doors 90 inches (2286 mm) or less in height, and one additional hinge for each 30 inches (762 mm) of additional door height.
5. Where new hinges are specified for existing doors or existing frames, provide new hinges of identical size to hinge preparation present in existing door or existing frame.
6. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:

a. Steel Hinges: Steel pins
b. Non-Ferrous Hinges: Stainless steel pins
c. Out-Swinging Exterior Doors: Non-removable pins
d. Out-Swinging Interior Lockable Doors: Non-removable pins
e. Interior Non-lockable Doors: Non-rising pins

7. Width of hinges: 4-1/2 inches (114 mm) at 1-3/4 inch (44 mm) thick doors, and 5 inches (127 mm) at 2 inches (51 mm) or thicker doors. Adjust hinge width as required for door, frame, and wall conditions to allow proper degree of opening.

8. Doors 36 inches (914 mm) wide or less furnish hinges 4-1/2 inches (114 mm) high; doors greater than 36 inches (914 mm) wide furnish hinges 5 inches (127 mm) high, heavy weight or standard weight as specified.
9. Provide hinges with electrified options as scheduled in the hardware sets. Provide with sufficient number and wire gage to accommodate electric function of specified hardware. Locate electric hinge at second hinge from bottom or nearest to electrified locking component.
10. Provide mortar guard for each electrified hinge specified, unless specified in hollow metal frame specification.
11. Provide spring hinges where specified. Provide two spring hinges and one bearing hinge per door leaf for doors 90 inches (2286 mm) or less in height. Provide one additional bearing hinge for each 30 inches (762 mm) of additional door height.

2.4 CONTINUOUS HINGES

A. Stainless Steel

1. Manufacturers:

a. Scheduled Manufacturer: Ives
b. Acceptable Manufacturers: Markar, Stanley

2. Requirements:

a. Provide pin and barrel continuous hinges conforming to ANSI A156.26, Grade 2.
b. Provide pin and barrel continuous hinges fabricated from 14 gauge, type 304 stainless steel.
c. Provide twin self-lubricated nylon bearings at each hinge knuckle, with 0.25-inch (6 mm) diameter stainless steel pin.
d. Provide hinges capable of supporting door weights up to 600 pounds, and successfully tested for 1,500,000 cycles.
e. On fire-rated doors, provide pin and barrel continuous hinges that are classified for use on rated doors by testing agency acceptable to authority having jurisdiction.
f. Provide pin and barrel continuous hinges with electrified options as scheduled in the hardware sets. Provide with sufficient number and wire gage to accommodate electric function of specified hardware.
g. Install hinges with fasteners supplied by manufacturer.
h. Provide hinges with symmetrical hole pattern.

B. Aluminum Geared

1. Manufacturers:

a. Scheduled Manufacturer: Ives.
b. Acceptable Manufacturers: Markar, Stanley.

2. Requirements:

a. Provide aluminum geared continuous hinges conforming to ANSI A156.25, Grade 2.
b. Provide aluminum geared continuous hinges, where specified in the hardware sets, fabricated from 6063-T6 aluminum, with 0.25-inch (6 mm) diameter Teflon coated stainless steel hinge pin.

c. Provide split nylon bearings at each hinge knuckle for quiet, smooth, self-lubricating operation.
d. Provide hinges capable of supporting door weights up to 450 pounds, and successfully tested for 1,500,000 cycles.
e. On fire-rated doors, provide aluminum geared continuous hinges that are classified for use on rated doors by testing agency acceptable to authority having jurisdiction.
f. Provide aluminum geared continuous hinges with electrified option scheduled in the hardware sets. Provide with sufficient number and wire gage to accommodate electric function of specified hardware.
g. Install hinges with fasteners supplied by manufacturer.
h. Provide hinges with symmetrical hole pattern.

2.5 ELECTRIC POWER TRANSFER

A. Manufacturers:

a. Scheduled Manufacturer: Schlage Electronics, Von Duprin
b. Acceptable Manufacturers: Securitron, ABH

B. Provide power transfer with electrified options as scheduled in the hardware sets. Provide with number and gage of wires sufficient to accommodate electric function of specified hardware.

C. Locate electric power transfer per manufacturer's template and UL requirements, unless interference with operation of door or other hardware items.

2.6 FLUSH BOLTS

A. Manufacturers:

1. Scheduled Manufacturer: Ives
2. Acceptable Manufacturers: Burns, Trimco

B. Requirements:

1. Provide automatic, constant latching, and manual flush bolts with forged bronze or stainless steel face plates, extruded brass levers, and with wrought brass guides and strikes. Provide 12 inch (305 mm) steel or brass rods at doors up to 90 inches (2286 mm) in height. For doors over 90 inches (2286 mm) in height increase top rods by 6 inches (152 mm) for each additional 6 inches (152 mm) of door height. Provide dust-proof strikes at each bottom flush bolt.

2.7 COORDINATORS

A. Manufacturers:

1. Scheduled Manufacturer: Ives
2. Acceptable Manufacturers: Burns, Trimco

B. Requirements:

1. Where pairs of doors are equipped with automatic flush bolts, an astragal, or other hardware that requires synchronized closing of the doors, provide bar-type coordinating device, surface applied to underside of stop at frame head.
2. Provide filler bar of correct length for unit to span entire width of opening, and appropriate brackets for parallel arm door closers and surface vertical rod exit device strikes. Factory-prep coordinators for vertical rod devices if required.

2.8 MORTISE LOCKS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: Schlage L9000 series, Town Steel Anti Ligature MRX Series (for Anti-Ligature doors only as specified in Hardware Sets)
2. Acceptable Manufacturers and Products: Best 45H series, Sargent 8200 series

B. Requirements:

1. Provide mortise locks certified as ANSI A156.13, Grade 1 Operational, Grade 1 Security, and manufactured from heavy gauge steel, containing components of steel with a zinc dichromate plating for corrosion resistance. Provide lock case that is multi-function and field reversible for handing without opening case. Cylinders: Refer to “KEYING” article, herein.
2. Provide locks with standard 2-3/4 inches (70 mm) backset with full 3/4 inch (19 mm) throw stainless steel mechanical anti-friction latchbolt. Provide deadbolt with full 1 inch (25 mm) throw, constructed of stainless steel.
3. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
4. Provide electrified options as scheduled in the hardware sets. Provide electrified locksets with micro switch (RX) option that monitors retractor crank, and is actuated when rotation of inside or outside lever rotates retractor hub. Provide normally closed contacts or normally open contacts as required by security system.
5. Lever Trim: Solid brass, bronze, or stainless steel, cast or forged in design specified, with wrought roses and external lever spring cages. Provide thru-bolted levers with 2-piece spindles.

    a. Lever Design: Schlage 06N.
    b. Tactile Warning (Knurling): Where required by authority having jurisdiction. Provide on levers on exterior (secure side) of doors serving rooms considered to be hazardous.

2.9 AUXILIARY LOCKS

A. Deadlocks:

1. Manufacturers and Products:

    a. Scheduled Manufacturer and Product: Schlage L400 series
    b. Acceptable Manufacturers and Products: Best 38H series, Sargent 4870 series.

2. Requirements:

a. Provide mortise deadlock series conforming to ANSI A156 and function as specified. Cylinders: Refer to "KEYING" article, herein.
b. Provide deadlocks with standard 2-3/4 inches (70 mm) backset. Provide deadbolt with full 1 inch (25 mm) throw, constructed of stainless steel.
c. Provide manufacturer's standard strike.

2.10 EXIT DEVICES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: Von Duprin 98/35 series
2. Acceptable Manufacturers and Products: Sargent 80 series, Precision Apex series

B. Requirements:

1. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1, and UL listed for Panic Exit or Fire Exit Hardware. Cylinders: Refer to "KEYING" article, herein.
2. Provide touchpad type exit devices, fabricated of brass, bronze, stainless steel, or aluminum, plated to standard architectural finishes to match balance of door hardware.
3. Touchpad: Extend minimum of one half of door width. Match exit device finish, stainless steel for US26, US26D, US28, US32, and US32D finishes; and for all other finishes, provide compatible finish to exit device. Provide compression springs in devices, latches, and outside trims or controls; tension springs also acceptable.
4. Provide exit devices with deadlatching feature for security and for future addition of alarm kits and/or other electrified requirements.
5. Provide exit devices with manufacturer's approved strikes.
6. Provide exit devices cut to door width and height. Locate exit devices at height recommended by exit device manufacturer, allowable by governing building codes, and approved by Architect.
7. Mount mechanism case flush on face of doors, or provide spacers to fill gaps behind devices. Where glass trim or molding projects off face of door, provide glass bead kits.
8. Provide hex-key dogging at non-fire-rated exit devices, unless specified less dogging.
9. Removable Mullions: 2 inches (51 mm) x 3 inches (76 mm) steel tube. Where scheduled as keyed removable mullion that is removed by use of a keyed cylinder, which is self-locking when re-installed.
10. Where lever handles are specified as outside trim for exit devices, provide heavy-duty lever trims with forged or cast escutcheon plates. Provide vandal-resistant levers that will travel to 90-degree down position when more than 35 pounds of torque are applied, and which can easily be re-set.

    a. Lever Style: Match lever style of locksets.
    b. Tactile Warning (Knurling): Where required by authority having jurisdiction. Provide on levers on exterior (secure side) of doors serving rooms considered to be hazardous.

11. Provide UL labeled fire exit hardware for fire rated openings.
12. Provide factory drilled weep holes for exit devices used in full exterior application, highly corrosive areas, and where noted in hardware sets.
13. Provide electrified options as scheduled.

2.11 CYLINDERS

A. Manufacturers:

1. Scheduled Manufacturer: Schlage
2. Acceptable Manufacturers: Best, Sargent

B. Requirements: Provide cylinders/cores complying with the following requirements.

1. Furnished by same manufacturer as locks.
2. Cylinders/cores compliant with ANSI/BHMA A156.5; latest revision, Section 12, Grade 1; permanent cylinders; cylinder face finished to match lockset, manufacturer's series as indicated.

C. Full-sized cylinders in the below-listed configuration(s), distributed throughout the Project as indicated.

1. Security: dual-locking cylinder with interchangeable core requiring geographically exclusive, restricted, patented keyway.

D. Patent Protection: Cylinders/cores requiring use of restricted, patented keys, patent-protected.

E. Security Cylinders: Where indicated, provide cylinders/cores with "dual-locking mechanism" with interlocking finger pin(s) to check for patented features on keys.

F. Nickel silver bottom pins.

1. Identification:

G. Mark permanent cylinders/cores and keys with applicable blind code per DHI publication "Keying Systems and Nomenclature" for identification. Blind code marks shall not include actual key cuts.

H. Identification stamping provisions must be approved by the Architect and Owner.

I. Failure to comply with stamping requirements shall be cause for replacement of cylinders/cores involved at no additional cost to Owner.

1. Forward cylinders/cores to Owner, separately from keys, by means as directed by Owner.

J. Replaceable Construction Cores.

1. Provide temporary construction cores replaceable by permanent cores, furnished in accordance with the following requirements.

K. 12 construction change (day) keys.

1. Owner or Owner's Representative will replace temporary construction cores with permanent cores.

2.12 KEYING

A. Keying System: Factory registered, complying with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.

B. Keying Requirements – General

1. Permanent cylinders/cores keyed by the manufacturer according to the following key system.

C. Keying system as directed by the Owner.

D. Key Features: Provide keys with the following features.

1. Patent Protection: Keys and blanks protected by one or more utility patent(s).
2. Geographically Exclusive: Where High Security or Security cylinders/cores are indicated, provide nationwide, geographically exclusive key system complying with the following restrictions.
3. One allocation within postal zip codes with the same first 2 digits.

E. Keys

1. Material: Nickel silver; minimum thickness of .092-inch (2.3mm)
2. Identification:

F. Coordinate with cylinder/core and key identification requirements above.

G. Stamp keys with Owner's unique key system facility code as established by the manufacturer; key symbol and embossed or stamped with "DO NOT DUPLICATE" along with the "PATENTED" or patent number to enforce the patent protection.

H. Failure to comply with stamping requirements shall be cause for replacement of keys involved at no additional cost to Owner.

1. Quantity: Furnish in the following quantities.

a. Change (Day) Keys: 3 per cylinder/core.
b. Permanent Control Keys: 3.
c. Master Keys: 6.
d. Unused balance of key blanks shall be furnished to Owner with the cut keys.

2.13 KEY CONTROL SYSTEM

A. Key Control System Manufacturers:

1. Scheduled Manufacturer: Telkee
2. Acceptable Manufacturers: HPC, Lund

B. Requirements:

1. Provide key control system, including envelopes, labels, tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet, all as recommended by system manufacturer, with capacity for 150% of number of locks required for Project.

a. Provide complete cross index system set up by hardware supplier, and place keys on markers and hooks in cabinet as determined by final key schedule.
b. Provide hinged-panel type cabinet for wall mounting.

C. Key Management Software Manufacturers and Products:

1. Scheduled Manufacturer and Product: Schlage SITEMASTER 200
2. Acceptable Manufacturers and Products: Best Keystone 600N, Sargent KeyWizard.

D. Key Management Software Requirements:

1. Software: Provide tracking, issuing, collecting and transferring information regarding keys. Provide customized query, reporting, searching capability, comprehensive location hardware listings, display key holder photos and signature for verification, and provide automatic reminders for maintenance, back-ups and overdue keys.
2. Provide training for Owner's personnel on proper operation and application of key management software.

2.14 DOOR CLOSERS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: LCN 4010/4110 series
2. Acceptable Manufacturers and Products: Sargent 281/281P10 series factory assembled (without PRV), Corbin Russwin DC6000 series.

B. Requirements:

1. Provide door closers certified to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. ISO 9000 certify closers. Stamp units with date of manufacture code.
2. Provide door closers with fully hydraulic, full rack and pinion action with high strength cast iron cylinder, and full complement bearings at shaft.
3. Cylinder Body: 1-1/2 inch (38 mm) diameter, with 11/16 inch (17 mm) diameter double heat-treated pinion journal.
4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
5. Spring Power: Continuously adjustable over full range of closer sizes, and provideing reduced opening force as required by accessibility codes and standards.
6. Hydraulic Regulation: By tamper-proof, non-critical valves with separate adjustment for latch speed, general speed, and backcheck.
7. Provide closers with a solid forged steel main arms and factory assembled heavy-duty forged forearms for parallel arm closers.
8. Pressure Relief Valve (PRV) Technology: Not permitted.
9. Finish for Closer Cylinders, Arms, Adapter Plates, and Metal Covers: Powder coating finish which has been certified to exceed 100 hours salt spray testing as described in ANSI Standard A156.4 and ASTM B117, or has special rust inhibitor (SRI).
10. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

2.15 ELECTRO-MECHANICAL AUTOMATIC OPERATORS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: LCN Senior Swing.
2. Acceptable Manufacturers and Products: Besam Swingmaster MP, Horton 4000LE series.

B. Requirements:

1. Provide low energy automatic operator units that are electro-mechanical design complying with ANSI A156.19.

    a. Opening: Powered by DC motor working through reduction gears.
    b. Closing: Spring force.
    c. Manual, hydraulic, or chain drive closers: Not permitted.
    d. Operation: Motor is off when door is in closing mode. Door can be manually operated with power on or off without damage to operator. Provide variable adjustments, including opening and closing speed adjustment.
    e. Cover: Aluminum.

2. Provide units with manual off/auto/hold-open switch, push and go function to activate power operator, vestibule interface delay, electric lock delay, hold-open delay adjustable from 2 to 30 seconds, and logic terminal to interface with accessories, mats, and sensors.
3. Provide drop plates, brackets, or adapters for arms as required to suit details.
4. Provide hard-wired motion sensors and/or actuator switches for operation as specified. Provide weather-resistant actuators at exterior applications.
5. Provide key switches, with LED's, recommended and approved by manufacturer of automatic operator as required for function as described in operation description of hardware sets. Cylinders: Refer to "KEYING" article, herein.
6. Provide complete assemblies of controls, switches, power supplies, relays, and parts/material recommended and approved by manufacturer of automatic operator for each individual leaf. Actuators control both doors simultaneously at pairs. Sequence operation of exterior and vestibule doors with automatic operators to allow ingress or egress through both sets of openings as directed by Architect. Locate actuators, key switches, and other controls as directed by Architect.
7. Provide units with inputs for smoke evacuation doors, where specified, which allow doors to power open upon fire alarm activation and hold open indefinitely or until fire alarm is reset, presence detector input, which prevents closed door from opening or door that is fully opened from closing, hold open toggle input, which allows remote activation for indefinite hold open and close second time input is activated, vestibule inputs, which allow sequencing operation of two units, and SPDT relay for interfacing with latching or locking devices.

2.16 DOOR TRIM

A. Manufacturers:

1. Scheduled Manufacturer: Ives.
2. Acceptable Manufacturers: Burns, Trimco.

B. Requirements:

1. Provide push plates 4 inches (102 mm) wide by 16 inches (406 mm) high by 0.050 inch (1 mm) thick and beveled 4 edges. Where width of door stile prevents use of 4 inches (102 mm) wide plate, adjust width to fit.
2. Provide push bars of solid bar stock, diameter and length as scheduled. Provide push bars of sufficient length to span from center to center of each stile. Where required, mount back to back with pull.
3. Provide offset pulls of solid bar stock, diameter and length as scheduled. Where required, mount back to back with push bar.
4. Provide flush pulls as scheduled. Where required, provide back-to-back mounted model.
5. Provide pulls of solid bar stock, diameter and length as scheduled. Where required, mount back to back with push bar.
6. Provide pull plates 4 inches (102 mm) wide by 16 inches (406 mm) high by 0.050 inch (1 mm) thick, beveled 4 edges, and prepped for pull. Where width of door stile prevents use of 4 inches (102 mm) wide plate, adjust width to fit.
7. Provide wire pulls of solid bar stock, diameter and length as scheduled.
8. Provide decorative pulls as scheduled. Where required, mount back to back with pull.

2.17 PROTECTION PLATES

A. Manufacturers:

1. Scheduled Manufacturer: Ives.
2. Acceptable Manufacturers: Burns, Trimco.

B. Requirements:

1. Provide kick plates, mop plates, and armor plates minimum of 0.050 inch (1 mm) thick as scheduled. Furnish with sheet metal or wood screws, finished to match plates.
2. Sizes of plates:

    a. Kick Plates: 10 inches (254 mm) high by 2 inches (51 mm) less width of door on single doors, 1 inch (25 mm) less width of door on pairs
    b. Mop Plates: 4 inches (102 mm) high by 2 inches (51 mm) less width of door on single doors, 1 inch (25 mm) less width of door on pairs
    c. Armor Plates: 36 inches (914 mm) high by 2 inches (51 mm) less width of door on single doors, 1 inch (25 mm) less width of door on pairs

2.18 OVERHEAD STOPS AND OVERHEAD STOP/HOLDERS

A. Manufacturers:

1. Scheduled Manufacturers: Glynn-Johnson
2. Acceptable Manufacturers: Rixson, Sargent

B. Requirements:

1. Provide heavy duty concealed mounted overhead stop or holder as specified for exterior and interior vestibule single acting doors.
2. Provide heavy duty concealed mounted overhead stop or holder as specified for double acting doors.

3. Provide heavy or medium duty and concealed or surface mounted overhead stop or holder for interior doors as specified. Provide medium duty surface mounted overhead stop for interior doors and at any door that swings more than 140 degrees before striking wall, open against equipment, casework, sidelights, and where conditions do not allow wall stop or floor stop presents tripping hazard.
4. Where overhead holders are specified provide friction type at doors without closer and positive type at doors with closer.

2.19 DOOR STOPS AND HOLDERS

A. Manufacturers:

1. Scheduled Manufacturer: Ives.
2. Acceptable Manufacturers: Burns, Trimco.

B. Provide door stops at each door leaf:

1. Provide wall stops wherever possible. Provide convex type where mortise type locks are used and concave type where cylindrical type locks are used.
2. Where a wall stop cannot be used, provide universal floor stops for low or high rise options.
3. Where wall or floor stop cannot be used, provide medium duty surface mounted overhead stop.

2.20 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING

A. Manufacturers:

1. Scheduled Manufacturer: NGP.
2. Acceptable Manufacturers: Reese, Zero.

B. Requirements:

1. Provide thresholds, weatherstripping (including door sweeps, seals, astragals) and gasketing systems (including smoke, sound, and light) as specified and per architectural details. Match finish of other items.
2. Size of thresholds::

a. Saddle Thresholds: 1/2 inch (13 mm) high by jamb width by door width
b. Bumper Seal Thresholds: 1/2 inch (13 mm) high by 5 inches (127 mm) wide by door width

3. Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available.

2.21 SILENCERS

A. Manufacturers:

1. Scheduled Manufacturer: Ives.
2. Acceptable Manufacturers: Burns, Trimco.

B. Requirements:

1. Provide "push-in" type silencers for hollow metal or wood frames.
2. Provide one silencer per 30 inches (762 mm) of height on each single frame, and two for each pair frame.
3. Omit where gasketing is specified.

2.22 MAGNETIC HOLDERS

A. Manufacturers:

1. Scheduled Manufacturer: LCN.
2. Acceptable Manufacturers: Rixson, Sargent.

B. Requirements:

1. Provide wall or floor mounted electromagnetic door release as specified with minimum of 25 pounds of holding force. Coordination projection of holder and armature with other hardware and wall conditions to ensure that door sits parallel to wall when fully open. Wire magnetic holders on fire-rated doors into the fire control panel for fail-safe operation.

2.23 FINSHES

A. Finish: BHMA 626/652 (US26D); except:

1. Hinges at Exterior Doors: BHMA 630 (US32D)
2. Continuous Hinges: BHMA 630 (US32D)
3. Push Plates, Pulls, and Push Bars: BHMA 630 (US32D)
4. Protection Plates: BHMA 630 (US32D)
5. Overhead Stops and Holders: BHMA 630 (US32D)
6. Door Closers: Powder Coat to Match
7. Wall Stops: BHMA 630 (US32D)
8. Latch Protectors: BHMA 630 (US32D)
9. Weatherstripping: Clear Anodized Aluminum
10. Thresholds: Mill Finish Aluminum

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to installation of hardware, examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Existing Door and Frame Compatibility: Field verify existing doors and frames receiving new hardware and existing conditions receiving new openings. Verify that new hardware is compatible with existing door and frame preparation and existing conditions.

C. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Where on-site modification of doors and frames is required:

1. Remove existing hardware being replaced, tag, and store according to contract documents.
2. Field modify and prepare existing door and frame for new hardware being installed.
3. When modifications are exposed to view, use concealed fasteners, when possible.
4. Prepare hardware locations in accordance with:

a. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.
b. Wood Doors: DHI WDHS.5 "Recommended Hardware Reinforcement Locations for Mineral Core Wood Flush Doors."
c. Doors in rated assemblies: NFPA 80 for restrictions on on-site door hardware preparation.

3.3 INSTALLATION

A. Mounting Heights: Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.

1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
2. Custom Steel Doors and Frames: HMMA 831.
3. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."

B. Install each hardware item in compliance with manufacturer’s instructions and recommendations, using only fasteners provided by manufacturer.

C. Do not install surface mounted items until finishes have been completed on substrate. Protect all installed hardware during painting.

D. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.

E. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

F. Install operating parts so they move freely and smoothly without binding, sticking, or excessive clearance.

G. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than quantity recommended by manufacturer for application indicated or one hinge for every 30 inches (750 mm) of door height, whichever is more stringent,

unless other equivalent means of support for door, such as spring hinges or pivots, are provided.

H. Lock Cylinders: Install construction cores to secure building and areas during construction period.

1. Replace construction cores with permanent cores as indicated in keying section.

I. Wiring: Coordinate with Division 26, ELECTRICAL sections for:

1. Conduit, junction boxes and wire pulls.
2. Connections to and from power supplies to electrified hardware.
3. Connections to fire/smoke alarm system and smoke evacuation system.
4. Connection of wire to door position switches and wire runs to central room or area, as directed by Architect.
5. Testing and labeling wires with Architect's opening number.

J. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.

K. Door Closers: Mount closers on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Closers shall not be visible in corridors, lobbies and other public spaces unless approved by Architect.

L. Thresholds: Set thresholds in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."

M. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they may impede traffic or present tripping hazard.

N. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.

O. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.

P. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

3.4 FIELD QUALITY CONTROL

A. Architectural Hardware Consultant: Engage qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.

1. Architectural Hardware Consultant will inspect door hardware and state in each report whether installed work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted.

3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for

final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

1. Spring Hinges: Adjust to achieve positive latching when door is allowed to close freely from an open position of 30 degrees.
2. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
3. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.

B. Occupancy Adjustment: Approximately six (6) months after date of Substantial Completion, Installer's Architectural Hardware Consultant shall examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors, door hardware, and electrified door hardware.

3.6 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items as necessary to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

3.7 DEMONSTRATION

A. Provide training for Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes. Refer to Division 01 Section "Demonstration and Training."

3.8 DOOR HARDWARE SCHEDULE

A. Locksets, exit devices, and other hardware items are referenced in the following hardware sets for series, type and function. Refer to the above-specifications for special features, options, cylinders/keying, and other requirements.

B. Hardware Sets:

Hardware Set No. 01

Door #(s):

0.1A

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	CONT. HINGE	112HD EPT	628	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	ELEC PANIC HARDWARE	RX-QEL+-98-NL	626	VON
1	EA	RIM CYLINDER	20-057-ICX	626	SCH
1	EA	PRIMUS CORE	20-740-XP	626	SCH
1	EA	SURF. AUTO OPERATOR	9531 HL/D MS	ANCLR	LCN
1	EA	ACTUATOR, JAMB MOUNT	8310-818T	630	LCN
1	EA	ACTUATOR, WALL MOUNT	8310-853T	630	LCN
1	EA	DRIP CAP	16A	CL	NGP
1	EA	PERIMETER GASKET	BY DOOR/FRAME MANUFACTURER		
1	EA	DOOR SWEEP	101VA	CL	NGP
1	EA	THRESHOLD	513	AL	NGP
1	EA	DOOR POSITION SWITCH	BY SECURITY CONTRACTOR		
1	EA	POWER SUPPLY	PS902 900-BBK 900-4RL KL900	LGR	SCE

Operational Description
Door normally closed and secure.
Free Egress at all times by push bar or ADA operator.
Access by intercom, device unlatched remotely.

Hardware Set No. 02

Door #(s):

11.1.8 11.1.9

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
2	EA	CONT. HINGE	112HD	628	IVE
1	SET	CONST LATCHING BOLT	FB51P	630	IVE
1	EA	STOREROOM W/DEADBOLT	L9480T 06N L583-363	626	SCH
1	EA	PRIMUS CORE	20-740-XP	626	SCH
1	EA	COORDINATOR	COR X FL	628	IVE
2	EA	SURFACE CLOSER	4111 CUSH	689	LCN
2	EA	KICK PLATE	8400 10" X 1 1/2" LDW B4E	630	IVE
1	SET	SEALS	5050B	BRN	NGP
1	EA	ASTRAGAL	139SP	600	NGP
2	EA	DOOR SWEEP	101VA	CL	NGP
1	EA	THRESHOLD	513	AL	NGP
2	EA	DOOR POSITION SWITCH	BY SECURITY CONTRACTOR		

Hardware Set No. 03

Door #(s):

11.1.3 6.14 6.7 6.9

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	CONT. HINGE	112HD	628	IVE
1	EA	STOREROOM W/DEADBOLT	L9480T 06N L583-363	626	SCH
1	EA	PRIMUS CORE	20-740-XP	626	SCH
1	EA	SURFACE CLOSER	4111 CUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	SET	SEALS	5050B	BRN	NGP
1	EA	DOOR SWEEP	101VA	CL	NGP
1	EA	THRESHOLD	513	AL	NGP
1	EA	DOOR POSITION SWITCH	BY SECURITY CONTRACTOR		

Hardware Set No. 04

Door #(s):
0.1B

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	CONT. HINGE	112HD EPT	628	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	ELEC PANIC HARDWARE	RX-QEL+-98-NL	626	VON
1	EA	RIM CYLINDER	20-057-ICX	626	SCH
1	EA	PRIMUS CORE	20-740-XP	626	SCH
1	EA	SURF. AUTO OPERATOR	9531 HL/D MS	ANCLR	LCN
1	EA	ACTUATOR, JAMB MOUNT	8310-818T	630	LCN
1	EA	ACTUATOR, WALL MOUNT	8310-853T	630	LCN
1	EA	DOOR POSITION SWITCH	BY SECURITY CONTRACTOR		
1	EA	POWER SUPPLY	PS902 900-BBK 900-4RL KL900	LGR	SCE

Operational Description
Door normally closed and secure.
Free Egress at all times by push bar or ADA operator.
Access by intercom, device unlatched remotely.

Hardware Set No. 05

Door #(s):
11.0.1A 11.0.1B 11.0.2

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
6	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	FIRE EXIT HARDWARE	9847-EO-F	626	VON
1	EA	FIRE EXIT HARDWARE	9847-L-NL-F-06	US26D	VON
2	EA	SURFACE CLOSER	4111 EDA	689	LCN
2	EA	KICK PLATE	8400 10" X 1 1/2" LDW B4E	630	IVE
2	EA	WALL STOP	WS406/407CCV	630	IVE
1	SET	SEALS	2525B	BRN	NGP
1	EA	SEALS	5060B	BRN	NGP

Hardware Set No. 06

Door #(s):

4.10.2 4.16 4.18 4.5A 4.5B

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	EU MORTISE LOCK	L9092TEU 06N	626	SCH
1	EA	PRIMUS CORE	20-740-XP	626	SCH
1	EA	SURFACE CLOSER	4011/4111 AS REQ'D	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	EA	FLOOR STOP	FS13	626	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE
1	EA	DOOR POSITION SWITCH	BY SECURITY CONTRACTOR		
1	EA	REX	BY SECURITY CONTRACTOR		
1	EA	POWER SUPPLY	BY SECURITY CONTRACTOR		

Note:
Operational Description by Division 28.

Hardware Set No. 07

Door #(s):

1.0B 5.1

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	EU MORTISE LOCK	L9092TEU 06N	626	SCH
1	EA	PRIMUS CORE	20-740-XP	626	SCH
1	EA	SURFACE CLOSER	4111 CUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
3	EA	SILENCER	SR64	GRY	IVE
1	EA	DOOR POSITION SWITCH	BY SECURITY CONTRACTOR		
1	EA	REX	BY SECURITY CONTRACTOR		
1	EA	POWER SUPPLY	BY SECURITY CONTRACTOR		

Note:
Operational Description by Division 28.

Hardware Set No. 08

Door #(s):

1.0A	10.10	2.10.2	4.10.1	4.9	9.14B
9.18	9.8A	9.8B			

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	EU MORTISE LOCK	L9092TEU 06N	626	SCH
1	EA	PRIMUS CORE	20-740-XP	626	SCH
1	EA	SURFACE CLOSER	4011/4111 AS REQ'D	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	EA	FLOOR STOP	FS13	626	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	SET	SEALS	2525B	BRN	NGP
1	EA	DOOR POSITION SWITCH	BY SECURITY CONTRACTOR		
1	EA	REX	BY SECURITY CONTRACTOR		
1	EA	POWER SUPPLY	BY SECURITY CONTRACTOR		

Note:
Operational Description by Division 28.

Hardware Set No. 09

Door #(s):

2.10.1	2.11.1	5.2

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	EU MORTISE LOCK	L9092TEU 06N	626	SCH
1	EA	PRIMUS CORE	20-740-XP	626	SCH
1	EA	SURFACE CLOSER	4111 CUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	SET	SEALS	2525B	BRN	NGP
1	EA	REX	BY SECURITY CONTRACTOR		
1	EA	DOOR POSITION SWITCH	BY SECURITY CONTRACTOR		
1	EA	POWER SUPPLY	BY SECURITY CONTRACTOR		

Note:
Operational Description by Division 28.

Hardware Set No. 10

Door #(s):

2.11.2 9.11A 9.14A

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	EU MORTISE LOCK	L9092TEU 06N	626	SCH
1	EA	PRIMUS CORE	20-740-XP	626	SCH
1	EA	OH STOP	100S	630	GLY
1	EA	SURFACE CLOSER	4011/4111 AS REQ'D	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	EA	FLOOR STOP	FS13	626	IVE
1	SET	SEALS	2525B	BRN	NGP
1	EA	DOOR POSITION SWITCH	BY SECURITY CONTRACTOR		
1	EA	REX	BY SECURITY CONTRACTOR		
1	EA	POWER SUPPLY	BY SECURITY CONTRACTOR		

Note:
Operational Description by Division 28.

Hardware Set No. 11

Door #(s):

9.4.1A

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
6	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
2	EA	POWER TRANSFER	EPT10	689	VON
1	SET	CONST LATCHING BOLT	FB51P	630	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	EU MORTISE LOCK	L9095TEU 06N	626	SCH
2	EA	PRIMUS CORE	20-740-XP	626	SCH
1	EA	COORDINATOR	COR X FL	628	IVE
2	EA	SURFACE CLOSER	4111 CUSH	689	LCN
2	EA	KICK PLATE	8400 10" X 1 1/2" LDW B4E	630	IVE
1	SET	SEALS	2525B	BRN	NGP
1	EA	SEALS	5060B	BRN	NGP
2	EA	DOOR POSITION SWITCH	BY SECURITY CONTRACTOR		
1	EA	POWER SUPPLY	BY SECURITY CONTRACTOR		

Note:
Operational Description by Division 28.

Hardware Set No. 12

Door #(s):

9.1.1	9.1.2	9.1.3	9.1.4	9.1.5	9.13
9.2.1	9.2.2	9.2.3			

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	EU MORTISE LOCK	L9095TEU 06N	626	SCH
2	EA	PRIMUS CORE	20-740-XP	626	SCH
1	EA	SURFACE CLOSER	4111 EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	SET	SEALS	2525B	BRN	NGP
1	EA	PUSH BUTTON	BY SECURITY CONTRACTOR		
1	EA	DOOR POSITION SWITCH	BY SECURITY CONTRACTOR		
1	EA	POWER SUPPLY	BY SECURITY CONTRACTOR		

Note:
Operational Description by Division 28.

Hardware Set No. 13

Door #(s):

10.3	9.12	9.16	9.17	9.3.1	9.4.1B
9.5	9.6				

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	EU MORTISE LOCK	L9095TEU 06N	626	SCH
2	EA	PRIMUS CORE	20-740-XP	626	SCH
1	EA	SURFACE CLOSER	4111 CUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	SET	SEALS	2525B	BRN	NGP
1	EA	PUSH BUTTON	BY SECURITY CONTRACTOR		
1	EA	DOOR POSITION SWITCH	BY SECURITY CONTRACTOR		
1	EA	POWER SUPPLY	BY SECURITY CONTRACTOR		

Note:
Operational Description by Division 28.

Hardware Set No. 14

Door #(s):

10.2.1 11.3.7 11.3.8

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
6	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	SET	CONST LATCHING BOLT	FB51P	630	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	STOREROOM LOCK	L9080T 06N	626	SCH
1	EA	PRIMUS CORE	20-740-XP	626	SCH
2	EA	SURFACE CLOSER	4011/4111 AS REQ'D	689	LCN
2	EA	KICK PLATE	8400 10" X 1 1/2" LDW B4E	630	IVE
2	EA	WALL STOP	WS406/407CCV	630	IVE
1	SET	SEALS	2525B	BRN	NGP
1	EA	SEALS	5060B	BRN	NGP
2	EA	DOOR POSITION SWITCH	BY SECURITY CONTRACTOR		

Hardware Set No. 15

Door #(s):

11.1.15

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	L9080T 06N	626	SCH
1	EA	PRIMUS CORE	20-740-XP	626	SCH
1	EA	SURFACE CLOSER	4011/4111 AS REQ'D	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE
1	EA	DOOR POSITION SWITCH	BY SECURITY CONTRACTOR		

Hardware Set No. 16

Door #(s):

10.9

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	L9080T 06N	626	SCH
1	EA	PRIMUS CORE	20-740-XP	626	SCH
1	EA	SURFACE CLOSER	4111 CUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
3	EA	SILENCER	SR64	GRY	IVE
1	EA	DOOR POSITION SWITCH	BY SECURITY CONTRACTOR		

Hardware Set No. 17

Door #(s):

11.1.6 11.2.17 11.2.18 11.2.19 11.3.9

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	L9080T 06N	626	SCH
1	EA	PRIMUS CORE	20-740-XP	626	SCH
1	EA	SURFACE CLOSER	4011/4111 AS REQ'D	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	SET	SEALS	2525B	BRN	NGP
1	EA	DOOR POSITION SWITCH	BY SECURITY CONTRACTOR		

Hardware Set No. 18

Door #(s):

11.0.4

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
6	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
2	EA	MANUAL FLUSH BOLT	FB358	626	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	STOREROOM LOCK	L9080T 06N	626	SCH
1	EA	PRIMUS CORE	20-740-XP	626	SCH
1	EA	SURFACE CLOSER	4011/4111 AS REQ'D	689	LCN
2	EA	KICK PLATE	8400 10" X 1 1/2" LDW B4E	630	IVE
2	EA	WALL STOP	WS406/407CCV	630	IVE
2	EA	SILENCER	SR64	GRY	IVE

Hardware Set No. 19

Door #(s):

7.3

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	L9080T 06N	626	SCH
1	EA	PRIMUS CORE	20-740-XP	626	SCH
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Set No. 20

Door #(s):

4.24 6.8

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	L9080T 06N	626	SCH
1	EA	PRIMUS CORE	20-740-XP	626	SCH
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	SET	SEALS	2525B	BRN	NGP

Hardware Set No. 21

Door #(s):

9.10 9.4.3

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	L9080T 06N	626	SCH
1	EA	PRIMUS CORE	20-740-XP	626	SCH
1	EA	OH STOP	100S	630	GLY
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Set No. 22

Door #(s):

9.4.2

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	L9080T 06N	626	SCH
1	EA	PRIMUS CORE	20-740-XP	626	SCH
1	EA	OH STOP	100S	630	GLY
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	SET	SEALS	2525B	BRN	NGP

Hardware Set No. 23

Door #(s):

1.5	1.6	11.0.3	11.2.20	2F.7	4.14
4.8	6.13	6.5	9.3.2		

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	L9080T 06N	626	SCH
1	EA	PRIMUS CORE	20-740-XP	626	SCH
1	EA	SURFACE CLOSER	4011/4111 AS REQ'D	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Set No. 24

Door #(s):

2A.12	2B.12	2C.12	2D.12	2F.12	4.4.1

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	L9080T 06N	626	SCH
1	EA	PRIMUS CORE	20-740-XP	626	SCH
1	EA	SURFACE CLOSER	4111 CUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Set No. 25

Door #(s):

10.4	11.1.12	11.1.4	11.5A	2.7	2F.15
4.17	4.25	5.4	9.7.1		

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	L9080T 06N	626	SCH
1	EA	PRIMUS CORE	20-740-XP	626	SCH
1	EA	SURFACE CLOSER	4011/4111 AS REQ'D	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	SET	SEALS	2525B	BRN	NGP

Hardware Set No. 26

Door #(s):

4.4.2	9.15	9.7.2

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	L9080T 06N	626	SCH
1	EA	PRIMUS CORE	20-740-XP	626	SCH
1	EA	SURFACE CLOSER	4111 CUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	SET	SEALS	2525B	BRN	NGP

Hardware Set No. 27

Door #(s):

6.3

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	L9080T 06N	626	SCH
1	EA	PRIMUS CORE	20-740-XP	626	SCH
1	EA	OH STOP	100S	630	GLY
1	EA	SURFACE CLOSER	4011 DEL	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	SET	SEALS	2525B	BRN	NGP

Hardware Set No. 28

Door #(s):

1.2 6.12

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	OFFICE/ENTRY LOCK	L9050T 06N	626	SCH
1	EA	PRIMUS CORE	20-740-XP	626	SCH
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Set No. 29

Door #(s):

1.1 9.11B

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	OFFICE/ENTRY LOCK	L9050T 06N	626	SCH
1	EA	PRIMUS CORE	20-740-XP	626	SCH
1	EA	OH STOP	100S	630	GLY
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Set No. 30

Door #(s):

1.3A 1.3B

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	OFFICE/ENTRY LOCK	L9050T 06N	626	SCH
1	EA	PRIMUS CORE	20-740-XP	626	SCH
1	EA	SURFACE CLOSER	4011/4111 AS REQ'D	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Set No. 31

Door #(s):

2.9.1 7.5

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	OFFICE/ENTRY LOCK	L9050T 06N	626	SCH
1	EA	PRIMUS CORE	20-740-XP	626	SCH
1	EA	SURFACE CLOSER	4011/4111 AS REQ'D	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	SET	SEALS	2525B	BRN	NGP

Hardware Set No. 32

Door #(s):

2.9.2

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	L9080T 06N	626	SCH
1	EA	PRIMUS CORE	20-740-XP	626	SCH
1	EA	OH STOP	100S	630	GLY
1	EA	SURFACE CLOSER	4011 DEL	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	SET	SEALS	2525B	BRN	NGP

Hardware Set No. 33

Door #(s):

2F.4 2F.5

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	INSTITUTION W/DB	L9482T 06N	626	SCH
1	EA	PRIMUS CORE	20-740-XP	626	SCH
1	EA	SURFACE CLOSER	4111 CUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	SET	SEALS	2525B	BRN	NGP

Hardware Set No. 34

Door #(s):

7.2

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	CLASSROOM SECURITY	L9071T 06N	626	SCH
2	EA	PRIMUS CORE	20-740-XP	626	SCH
1	EA	SURFACE CLOSER	4011/4111 AS REQ'D	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	SET	SEALS	2525B	BRN	NGP

Hardware Set No. 35

Door #(s):

1.7	10.7	2.6	2A.13	2B.13	2C.13
2D.13	2F.13	4.15.1	4.15.2	6.10	7.9
9.9					

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	FACULTY RESTROOM	L9485T 06N L583-363	626	SCH
1	EA	PRIMUS CORE	20-740-XP	626	SCH
1	EA	SURFACE CLOSER	4011/4111 AS REQ'D	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	EA	KICK PLATE	8400 6" X 1" LDW B4E	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	SET	SEALS	2525B	BRN	NGP

Hardware Set No. 36

Door #(s):

7.8

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	FACULTY RESTROOM	L9485T 06N L583-363	626	SCH
1	EA	PRIMUS CORE	20-740-XP	626	SCH
1	EA	SURFACE CLOSER	4111 CUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	SET	SEALS	2525B	BRN	NGP

Hardware Set No. 37

Door #(s):

0.8.1 0.8.2

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PRIVACY W/DEADBOLT	L9440 06N L583-363	626	SCH
1	EA	SURFACE CLOSER	4011/4111 AS REQ'D	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	SET	SEALS	2525B	BRN	NGP

Hardware Set No. 38

Door #(s):

2A.15 2B.15 2C.15 2D.15

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PASSAGE SET	L9010 06N	626	SCH
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Set No. 39

Door #(s):

2F.14

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PASSAGE SET	L9010 06N	626	SCH
1	EA	OH STOP	100S	630	GLY
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Set No. 40

Door #(s):

4.21.1 4.21.2 8.1.1

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PASSAGE SET	L9010 06N	626	SCH
1	EA	SURFACE CLOSER	4011/4111 AS REQ'D	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Set No. 41

Door #(s):

4.26.1 4.26.2 8.1.2 8.1.4

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PASSAGE SET	L9010 06N	626	SCH
1	EA	SURFACE CLOSER	4111 CUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Set No. 42

Door #(s):

7.10

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HW HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	CLASSROOM DEAD LOCK	L463T	626	SCH
1	EA	PRIMUS CORE	20-740-XP	626	SCH
1	EA	PUSH PLATE	8200 4" X 16"	630	IVE
1	EA	PULL PLATE	8302 10" 4" X 16"	630	IVE
1	EA	SURFACE CLOSER	4011/4111 AS REQ'D	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	EA	KICK PLATE	8400 6" X 1" LDW B4E	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Set No. 43

Door #(s):

4.2 4.3

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HW HINGE	5BB1HW 5 X 4.5	652	IVE
1	EA	CLASSROOM SECURITY	L9071T 06N	626	SCH
1	EA	SURFACE CLOSER	4011/4111 AS REQ'D	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Set No. 44

Door #(s):

4.20.1 4.20.2

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	CONT. HINGE	HT700 SECWDHM	630	IVE
1	EA	ANTI LIGATURE PASSAGE SET	MRX-A-01- LESS INSIDE TRIM	630	TOW
1	EA	SHEAR LOCK	GF3000 DSM/MBS	335	SCE
1	EA	H-SEC SURFACE CLOSER	4511T	689	LCN
1	EA	FLOOR STOP	FS18S	BLK	IVE
1	EA	PUSH BUTTON	BY SECURITY CONTRACTOR		
1	EA	DOOR POSITION SWITCH	BY SECURITY CONTRACTOR		

Note:
Operational Description by Division 28.

Hardware Set No. 45

Door #(s):

4.22.1 4.22.2 4.22.3

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	CONT. HINGE	HT700 SECWDHM	630	IVE
1	EA	ANTI LIGATURE PASSAGE SET	MRX-A-01	630	TOW
1	EA	OH STOP	100S	630	GLY
3	EA	SILENCER	SR64	GRY	IVE

Hardware Set No. 46

Door #(s):

11.0.5

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	INSTITUTION W/DB	L9482T 06N	626	SCH
2	EA	PRIMUS CORE	20-740-XP	626	SCH
1	EA	SURFACE CLOSER	4111 EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	SET	SEALS	2525B	BRN	NGP

Hardware Set No. 47

Door #(s):

11.0.7

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
6	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	SET	CONST LATCHING BOLT	FB51P	630	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	INSTITUTION W/DB	L9482T 06N	626	SCH
2	EA	PRIMUS CORE	20-740-XP	626	SCH
1	EA	SURFACE CLOSER	4111 EDA	689	LCN
1	EA	SURFACE CLOSER	4111 CUSH	689	LCN
2	EA	KICK PLATE	8400 10" X 1 1/2" LDW B4E	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	SET	SEALS	2525B	BRN	NGP
1	EA	SEALS	5060B	BRN	NGP

Hardware Set No. 48

Door #(s):

11.3.11 11.3.12

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	CONT. HINGE	112HD	628	IVE
1	EA	INSTITUTIONAL W/ DEADBOLT	L9482T 06N x L11-943	626	SCH
1	EA	PRIMUS CORE	20-740-XP	626	SCH
1	SET	SEALS	5050B	BRN	NGP
1	EA	DOOR SWEEP	101VA	CL	NGP
1	EA	THRESHOLD	513	AL	NGP
1	EA	DOOR POSITION SWITCH	BY SECURITY CONTRACTOR		

End of Section

SECTION 08 71 13 - AUTOMATIC DOOR OPERATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Power door operators for swinging doors.

B. Related Requirements:

1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.
3. Division 08 Sections “Door Hardware” for door operator interface with other door hardware components.

1.3 DEFINITIONS

A. AAADM: American Association of Automatic Door Manufacturers.

B. Activation Device: A control that, when actuated, sends an electrical signal to the door operator to open the door.

C. Double-Egress (Doors): A pair of doors that simultaneously swing with the two doors moving in opposite directions with no mullion between them.

D. Double-Swing (Doors): A pair of doors that swing with the two doors moving in opposite directions with a mullion between them; each door functioning as a single-swing door.

E. Safety Device: A control that, to avoid injury, prevents a door from opening or closing.

F. For automatic door terminology, see BHMA A156.10 andBHMA A156.19 for definitions of terms.

1.4 SUSTAINABLE DESIGN REQUIREMENTS

A. MRc2: Construction Waste Management

1. No less than the specified minimum proportion of all construction waste from the project shall be diverted from disposal in a landfill and/or incineration in

accordance with the project requirements for Construction Waste Management. See Section 018113 Sustainable Design Requirements.

B. MRc4: Recycled Content Material

1. No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the project requirements for Recycled Content Materials. All materials counted toward the computation of the proportion of the Recycled Content Materials shall comply with the standard for the minimum percentages of post-consumer waste materials and for the minimum percentage of pre-consumer waste materials. See Section 018113 Sustainable Design Requirements.
2. Contractor shall provide LEED credit verification as per section 013300 Submittal Procedures.

C. MRc5: Regionally manufactured harvested materials

1. No less than the specified proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the project site in accordance with the project requirements for Regionally Manufactured and/or Harvested Materials. See Section 018113 Sustainable Design Requirements.
2. Contractor shall provide LEED credit verification as per Section 013300 Submittal Procedures.

D. EQc4.1: Low-Emitting Materials – Sealants and Adhesives

1. All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the project requirements for Low-Emitting Materials – Sealants and Adhesives. See Section 018113 Sustainable Design Requirements.
2. Contractor shall provide LEED credit verification as per Section 013300 Submittal Procedures.

1.5 COORDINATION

A. Coordinate sizes and locations of recesses in concrete floors for recessed control mats that control automatic door operators. Concrete, reinforcement, and formwork requirements are specified elsewhere.

B. Templates: Distribute for doors, frames, and other work specified to be factory prepared and reinforced for installing automatic door operators.

C. Coordinate hardware for doors with operators to ensure proper size, thickness, hand, function, and finish.

D. Electrical System Roughing-in: Coordinate layout and installation of automatic door operators with connections to power supplies and access-control system.

E. Pneumatic System Roughing-in: Coordinate layout and installation of automatic door operators and power units with compressed-air piping.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for automatic door operators.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For automatic door operators.

1. Include plans, elevations, sections, hardware mounting heights, and attachment details.
2. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Indicate locations of activation and safety devices.
4. Include diagrams for power, signal, and control wiring.

C. Samples: For each exposed product and for each color and texture specified.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For each type of automatic door operator. For each operator for fire-rated door assemblies, certify that operator is listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for use on types and sizes of labeled fire doors required.

C. Field quality-control reports.

D. Sample Warranties: For manufacturer's special warranties.

1.8 CLOSEOUT SUBMITTALS

A. Maintenance Data: For automatic door operators, safety devices, and control systems, to include in maintenance manuals.

1.9 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer for installation and maintenance of units required for this Project.

1. Maintenance Proximity: Not more than one hours normal travel time from Installer's place of business to Project site.

B. Certified Inspector Qualifications: Certified by AAADM.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a testing agency, and marked for intended location and application.

D. Exit-Door Requirements: Comply with requirements of authorities having jurisdiction for doors with automatic door operators serving as a component of a required means of egress

1.10 COORDINATION

A. Templates: Obtain and distribute, to the parties involved, templates for doors, frames, operators, and other work specified to be factory prepared and reinforced for installing automatic door operators. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing automatic door operators to comply with indicated requirements.

B. Electrical System Roughing-in: Coordinate layout and installation of automatic door operators, including activation and safety devices, with connections to power supplies and to access-control system.

1.11 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, provide 12 months' full maintenance by skilled employees of automatic door operator Installer. Include quarterly planned and preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door operation. Provide parts and supplies the same as those used in the manufacture and installation of original equipment.

1. Engage a certified inspector to perform safety inspection after each adjustment or repair, and at end of maintenance period. Furnish completed inspection reports to Owner.
2. Perform maintenance, including emergency callback service, during normal working hours.
3. Include 24-hour-per-day, seven-day-per-week emergency callback service.

1.12 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of automatic door operators that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Faulty or sporadic operation of automatic door operator, including controls.
b. Deterioration of metals, metal finishes, and other materials beyond normal weathering or use.

2. Warranty Period: 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Besam Automated Entrance Systems, Inc.; an ASSA ABLOY Group company.
2. DORMA Architectural Hardware.
3. DORMA Automatics.
4. Horton Automatics; a division of Overhead Door Corporation.
5. KM Systems, Inc.

6. LCN Closers; an Ingersoll-Rand company.
7. Nabco Entrances, Inc.
8. SARGENT Manufacturing Company; an ASSA ABLOY Group company.
9. Sierra Automatic Doors, Inc.
10. Stanley Access Technologies; Division of The Stanley Works.

B. Source Limitations: Obtain automatic door operators, including activation and safety devices, from single source from single manufacturer.

2.2 AUTOMATIC DOOR OPERATORS, GENERAL

A. General: Provide operators of size recommended by manufacturer for door size, weight, and movement; for condition of exposure; and for long-term, maintenance-free operation under normal traffic load for occupancy type indicated; and according to UL 325. Coordinate operator mechanisms with door operation, hinges, and activation and safety devices.

1. Emergency Breakaway: Where indicated for center-pivoted doors, provide emergency breakaway feature for reverse swing of doors. Equip system to discontinue power to automatic door operator when door is in emergency breakaway position, to return door to closed position after breakaway, and to automatically reset.
2. Fire-Rated Doors: Provide door operators for fire-rated door assemblies that comply with NFPA 80 for fire-rated door components and are listed and labeled by a qualified testing agency.
3. Wind Load: Provide door operators on exterior doors that will open and close doors and maintain them in fully closed position when subjected to wind load indicated on the structural drawings.

B. Electromechanical Operating System: Self-contained unit powered by permanent-magnet dc motor; with closing speed controlled mechanically by gear train and dynamically by braking action of electric motor, connections for power and activation- and safety-device wiring, and manual operation including spring closing when power is off.

C. Hinges: See Division Section "Door Hardware" for hinge type for each door that door operator shall accommodate.

D. Housing for Overhead Concealed Operators: Fabricated from minimum 0.125-inch-(3.2-mm-) thick, extruded or formed aluminum and extending full width of door opening including door jambs to conceal door operators and controls. Provide hinged or removable access panels for service and adjustment of door operators and controls. Secure panels to prevent unauthorized access.

E. Brackets and Reinforcements: Fabricated from aluminum with nonstaining, nonferrous shims for aligning system components.

F. Fire-Door Package: Consisting of UL-listed latch mechanism, power-reset box, and caution signage for fire-rated doors. Latch mechanism shall allow door to swing free during automatic operation; when fire is detected, latch actuator shall cause exit hardware to latch when door closes. Provide latch actuators with fail-secure design.

G. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.3 POWER DOOR OPERATORS

A. Standard: BHMA A156.10.

B. Performance Requirements:

1. Opening Force:

a. Power-Operated Doors: Not more than 50 lbf (222 N) required to manually set door in motion if power fails; not more than 15 lbf (67 N) required to open door to minimum required width.
b. Power-Operated Swinging Doors: Not more than 30 lbf (133 N) required to manually open door if power fails.
c. Breakaway Device for Power-Operated Doors: Not more than 50 lbf (222 N) required for breakaway door or panel to open.

2. Entrapment-Prevention Force: Not more than 40 lbf (178 N) required to prevent stopped door in the last 10 degrees of opening from moving in the direction of opening; not more than 30 lbf (133 N) required to prevent stopped door from moving in direction of closing.

C. Configuration: Operator to control pair of swinging doors.

1. Traffic Pattern: One way.
2. Operator Mounting: Overhead concealed.

D. Operation: Power opening and power-assisted spring closing. Provide time delay for door to remain open before initiating closing cycle as required by BHMA A156.10.

E. Operating System: Electromechanical.

F. Microprocessor Control Unit: Solid-state controller.

G. Features:

1. Adjustable opening and closing speed.
2. Adjustable opening force.
3. Adjustable backcheck.
4. Adjustable hold-open time from zero to 30 seconds.
5. Adjustable time delay.
6. Adjustable acceleration.
7. Adjustable limit switch.
8. Obstruction recycle.
9. Automatic door re-open if stopped while closing.
10. On-off/hold-open switch to control electric power to operator; key operated.

H. Controls: Activation and safety devices according to BHMA standards.

1. Activation Device: Motion sensor mounted on ingress side of door header to detect pedestrians in activating zone and to open door.

2. Activation Device: Control mat installed on ingress side of door to detect pedestrians in activating zone and to open door.
3. Safety Device: Presence sensor mounted on door header to detect pedestrians in presence zone and to prevent door from closing.

I. Exposed Finish: Class I, clear anodic finish.

2.4 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

1. Extrusions: ASTM B 221 (ASTM B 221M).
2. Sheet: ASTM B 209 (ASTM B 209M).

B. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304, stretcher-leveled standard of flatness, in manufacturer's standard thickness.

C. Brass Sheet: ASTM B 36/B 36M, Alloy UNS No. C26000 (cartridge brass, 70 percent copper), in manufacturer's standard thickness.

D. Bronze Sheet: ASTM B 36/B 36M, Alloy UNS No. C28000 (muntz metal, 60 percent copper) or Alloy UNS No. C23000 (red brass, 85 percent copper), in manufacturer's standard thickness.

E. Expanded Aluminum Mesh: Expanded aluminum sheet according to the geometry of ASTM F 1267.

F. Polycarbonate Sheet: ASTM C 1349, Appendix X1, Type II, coated, mar-resistant, UV-stabilized polycarbonate with coating on both surfaces.

G. Fasteners and Accessories: Corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

2.5 CONTROLS

A. General: Provide controls, including activation and safety devices, according to BHMA standards; for condition of exposure; and for long-term, maintenance-free operation under normal traffic load for occupancy type indicated. Coordinate activation and safety devices with door operation and door operator mechanisms.

B. Push-Plate Switch: Momentary-contact door control switch with flat push-plate actuator with contrasting-colored, engraved message.

1. Configuration: Round push plate with 4-by-4-inch junction box.

a. Mounting: Surface mounted on wall.

2. Push-Plate Material: Stainless steel as selected by Architect from manufacturer's full range.
3. Message: International symbol of accessibility.

C. If required, insert another type of sensing device or switch; verify availability with manufacturers.

D. Electrical Interlocks: Unless units are equipped with self-protecting devices or circuits, provide electrical interlocks to prevent activation of operator when door is locked, latched, or bolted.

2.6 FABRICATION

A. Factory fabricate automatic door operators to comply with indicated standards.

B. Form aluminum shapes before finishing.

C. Fabricate exterior components to drain condensation and water passing joints within operator enclosure to the exterior.

D. Use concealed fasteners to greatest extent possible. Where exposed fasteners are required, use countersunk Phillips flat-head machine screws, finished to match operator.

E. Provide metal cladding, completely covering visible surfaces before shipment to Project site. Fabricate cladding with concealed fasteners and connection devices, with accurately fitted joints with ends coped or mitered to produce hairline joints free of burrs and distortion, and with allowance for thermal expansion at exterior doors.

2.7 ACCESSORIES

A. Signage: As required by cited BHMA standard for type of door and its operation.

1. Application Process: Operator manufacturer's standard process.
2. Provide sign materials with instructions for field application when operators are installed.

2.8 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying strippable, temporary protective covering before shipping.

C. Apply organic and anodic finishes to formed metal after fabrication unless otherwise indicated.

D. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within range of approved Samples and are assembled or installed to minimize contrast.

2.9 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances, door and frame preparation and reinforcements, and other conditions affecting performance of automatic door operators.

B. Examine roughing-in for electrical systems to verify actual locations of power connections before automatic door operator installation.

C. Examine roughing-in for compressed-air piping systems to verify actual locations of piping connections before automatic door operator installation.

D. Verify that full-height finger guards are installed at each door with pivot hinges where door has a clearance at hinge side greater than 1/4 inch (6 mm) and less than 3/4 inch (19 mm) with door in any position.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install automatic door operators according to manufacturer's written instructions and cited BHMA standard for type of door operation and direction of pedestrian travel, including signage, controls, wiring, remote power units if any, and connection to building's power supply.

1. Do not install damaged components. Fit joints to produce hairline joints free of burrs and distortion.
2. Install operators true in alignment with established lines and door geometry without warp or rack. Anchor securely in place.
3. Power Door Operator Installation Standard: BHMA A156.10.
4. Low-Energy Door Operator Installation Standard: BHMA A156.19.

B. Power Connection: See Division 26 Sections for connection to electrical power distribution system

C. Activation and Safety Devices: Install devices and wiring according to manufacturer's written instructions and cited BHMA standard for type of operator and direction of pedestrian travel. Connect activation- and safety-device wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

D. Access-Control System: Connect operators to access-control system.

E. Signage: Apply on both sides of each door as required by cited BHMA standard for type of door operator and direction of pedestrian travel.

3.3 FIELD QUALITY CONTROL

A. Certified Inspector: Engage a Certified Inspector to test and inspect components, assemblies, and installations, including connections.

B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Test and inspect each automatic door operator installation, using AAADM inspection forms, to determine compliance of installed systems with applicable BHMA standards.

C. Automatic door operators will be considered defective if they do not pass tests and inspections.

3.4 ADJUSTING

A. Adjust automatic door operators to function smoothly, and lubricate as recommended by manufacturer; comply with requirements of applicable BHMA standards.

1. Adjust operators on exterior doors for weathertight closure.

B. After completing installation of automatic door operators, inspect exposed finishes on doors and operators. Repair damaged finish to match original finish.

C. Readjust automatic door operators and controls after repeated operation of completed installation equivalent to three days' use by normal traffic (100 to 300 cycles).

D. Occupancy Adjustment: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.5 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of automatic door operator Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

1. Engage a Certified Inspector to perform safety inspection after each adjustment or repair and at end of maintenance period. Furnish completed inspection reports to Owner.
2. Perform maintenance, including emergency callback service, during normal working hours.
3. Include 24-hour-per-day, 7-day-per-week, emergency callback service.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain automatic door operators.

END OF SECTION 08 71 13

SECTION 08 80 00 - GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:

1. Windows.
2. Doors.
3. Storefront framing.
4. Glazed entrances.
5. Skylights.
6. Interior borrowed lites.

B. Related Sections:

1. Division 07 section “Security Joint Sealants” requirements for and locations to receive security joint sealants.
2. Division 08 Section "Security Glazing" for glazing at areas indicated to receive security glazing.

1.3 DEFINITIONS

A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

C. Interspace: Space between lites of an insulating-glass unit.

1.4 PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Delegated Design: Design glass, including comprehensive engineering analysis according to ASTM E 1300 by a qualified professional engineer, using the following design criteria:

1. Design Wind Pressures: As indicated on Drawings.

2. Design Snow Loads: As indicated on Drawings.
3. Vertical Glazing: For glass surfaces sloped 15 degrees or less from vertical, design glass to resist design wind pressure based on glass type factors for short-duration load.
4. Sloped Glazing: For glass surfaces sloped more than 15 degrees from vertical, design glass to resist each of the following combinations of loads:

    a. Outward design wind pressure minus the weight of the glass. Base design on glass type factors for short-duration load.
    b. Inward design wind pressure plus the weight of the glass plus half of the design snow load. Base design on glass type factors for short-duration load.
    c. Half of the inward design wind pressure plus the weight of the glass plus the design snow load. Base design on glass type factors for long-duration load.

5. Probability of Breakage for Sloped Glazing: For glass surfaces sloped more than 15 degrees from vertical, design glass for a probability of breakage not greater than 0.001.
6. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch (25 mm), whichever is less.
7. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

1.5 PRECONSTRUCTION TESTING

A. Preconstruction Adhesion and Compatibility Testing: Test each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.

1. Testing will not be required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.
2. Use ASTM C 1087 to determine whether priming and other specific joint-preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.
3. Test no fewer than eight Samples of each type of material, including joint substrates, shims, sealant backings, secondary seals, and miscellaneous materials.
4. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.

5. For materials failing tests, submit sealant manufacturer's written instructions for corrective measures including the use of specially formulated primers.

1.6 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable LEED Credits

1. MRc2
2. MRc4
3. MRc5
4. IEQc4.1

B. LEED Requirements

1. MRc2: CONSTRUCTION WASTE MANAGEMENT

No less than the specified portion of all construction waste from the Project shall be diverted from disposal in a landfill and/or incineration in with the Project Requirements for Construction Waste Management and Disposal. Refer to Specification Sections 017419 Construction Waste Management and Disposal and 013510 Sustainable Design Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

2. MRc4: Recycled Content Material

No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the Project Requirements for Recycled Content Materials. All materials counted towards the computations of the proportion of the Recycled Content Materials shall comply with the standard minimum percentages of post-consumer waste materials and for the minimum percentages of pre-consumer waste materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

3. MRc5: REGIONALLY MANUFACTURED HARVESTED MATERIALS

No less than the specified minimum proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the Project Site in accordance with the Project Requirements for Regionally Manufactured and/or Harvested Materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

4. IEQc4.1: Low Emitting Materials: Sealants and Adhesives

All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the Project Requirements for Low Emitting Materials – Sealants and Adhesives. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

1.7 SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.

B. Glass Samples: For each type of the following products; 12 inches (300 mm) square.

1. Coated glass.
2. Fire-resistive glazing products.
3. Insulating glass.

C. Glazing Accessory Samples: For gaskets and sealants, in 12-inch (300-mm) lengths. Install sealant Samples between two strips of material representative in color of the adjoining framing system.

D. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

E. Delegated-Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

F. Qualification Data: For installers, manufacturers of insulating-glass units with sputter-coated, low-e coatings, glass testing agency and sealant testing agency.

G. Product Certificates: For glass and glazing products, from manufacturer.

H. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for tinted glass, coated glass, insulating glass, glazing sealants and glazing gaskets.

1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.

I. Preconstruction adhesion and compatibility test report.

J. Warranties: Sample of special warranties.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved and certified by coated-glass manufacturer.

B. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

C. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.

D. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

E. Source Limitations for Glass: Obtain tinted float glass, coated float glass, laminated glass and insulating glass from single source from single manufacturer for each glass type.

F. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

G. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. GANA Publications: GANA's "Laminated Glazing Reference Manual" and GANA's "Glazing Manual."
2. AAMA Publications: AAMA GDSG-1, "Glass Design for Sloped Glazing," and AAMA TIR-A7, "Sloped Glazing Guidelines."
3. IGMA Publication for Sloped Glazing: IGMA TB-3001, "Guidelines for Sloped Glazing."
4. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."

H. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction . Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

I. Fire-Protection-Rated Glazing Labeling: Permanently mark fire-protection-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, test standard, whether glazing is for use in fire doors or other openings, whether or not glazing passes hose-stream test, whether or not glazing has a temperature rise rating of 450 deg F (250 deg C), and the fire-resistance rating in minutes.

J. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

K. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Install glazing in mockups specified in Division 08 Section " Glazed Aluminum Curtain Walls " to match glazing systems required for Project, including glazing methods.
2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

L. Preinstallation Conference: Conduct conference at Project site .

1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review temporary protection requirements for glazing during and after installation.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. Comply with insulating-glass manufacturer's written recommendations for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.10 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or below 40 deg F (4.4 deg C).

1.11 WARRANTY

A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form in which coated-glass manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.

1. Warranty Period: 10 years from date of Substantial Completion.

B. Manufacturer's Special Warranty on Laminated Glass: Manufacturer's standard form in which laminated-glass manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1. Warranty Period: 10 years from date of Substantial Completion.

C. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GLASS PRODUCTS, GENERAL

A. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.

1. Minimum Glass Thickness for Exterior Lites: Not less than 6.0 mm.
2. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout Project.

B. Strength: Where float glass is indicated, provide annealed float glass, Kind HS heat-treated float glass, or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened glass is indicated, provide Kind HS heat-treated float glass or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where fully tempered glass is indicated, provide Kind FT heat-treated float glass.

C. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:

1. For monolithic-glass lites, properties are based on units with lites 6.0 mm thick .
2. For laminated-glass lites, properties are based on products of construction indicated.
3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
4. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F (W/sq. m x K).
5. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
6. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.2 GLASS PRODUCTS

A. Clear Annealed Float Glass: ASTM C 1036, Type I, Class 1 (clear), Quality-Q3.

B. Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear), Quality-Q3.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

C. Heat-Treated Float Glass: ASTM C 1048; Type I; Quality-Q3; Class I (clear) unless otherwise indicated; of kind and condition indicated.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
2. For uncoated glass, comply with requirements for Condition A.
3. For coated vision glass, comply with requirements for Condition C (other coated glass).

D. Low-E-Coated Vision Glass: ASTM C 1376, coated by vacuum deposition (sputter-coating) process, and complying with other requirements specified.

1. Products: Subject to compliance with requirements, provide the following :

a. PPG Solarban 60.

2. Kind: Kind CV (coated vision glass), except that Kind CO (coated overhead glass) may be used where the lower edge of the glass is more than 6 feet (1.8 m) above the adjacent floor level or cannot be approached closer than 10 feet (3.0 m).
3. Coating Color: Clear.
4. Glass: Clear float.

E. Ceramic-Coated Spandrel Glass: ASTM C 1048, Type I, Condition B, Quality-Q3.

2.3 LAMINATED GLASS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Oldcastle Glass.

B. Laminated Glass: ASTM C 1172, and complying with testing requirements in 16 CFR 1201 for Category II materials, and with other requirements specified. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.

1. Construction: Laminate glass with polyvinyl butyral interlayer to comply with interlayer manufacturer's written recommendations.
2. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
3. Interlayer Color: Clear unless otherwise indicated.

C. Glass: Comply with applicable requirements in "Glass Products" Article as indicated by designations in "Laminated-Glass Types" Article.

2.4 INSULATING GLASS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Oldcastle Glass.

B. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190, and complying with other requirements specified.

1. Sealing System: Dual seal, with polyisobutylene and silicone primary and secondary.
2. Spacer: Manufacturer's standard spacer material and construction.

3. Desiccant: Molecular sieve or silica gel, or blend of both.

C. Glass: Comply with applicable requirements in "Glass Products" Article and in "Laminated Glass" Article as indicated by designations in "Insulating-Glass Types" Article and in "Insulating-Laminated-Glass Types" Article.

2.5 FIRE-PROTECTION-RATED GLAZING

A. Fire-Protection-Rated Glazing, General: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 252 for door assemblies and NFPA 257 for window assemblies.

B. Laminated Ceramic Glazing: Laminated glass made from 2 plies of clear, ceramic flat glass; 5/16-inch (8-mm) total nominal thickness; complying with testing requirements in 16 CFR 1201 for Category II materials.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Nippon Electric Glass Co., Ltd. (distributed by Technical Glass Products); FireLite Plus.
b. Schott North America, Inc.; Laminated Pyran Crystal.
c. Vetrotech Saint-Gobain; SGG Keralite FR-L.

2.6 GLAZING GASKETS

A. Dense Compression Gaskets: Molded or extruded gaskets of profile and hardness required to maintain watertight seal, made from one of the following:

1. Neoprene complying with ASTM C 864.
2. EPDM complying with ASTM C 864.
3. Silicone complying with ASTM C 1115.
4. Thermoplastic polyolefin rubber complying with ASTM C 1115.

B. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned neoprene, EPDM, silicone or thermoplastic polyolefin rubber gaskets complying with ASTM C 509, Type II, black; of profile and hardness required to maintain watertight seal.

1. Application: Use where soft compression gaskets will be compressed by inserting dense compression gaskets on opposite side of glazing or pressure applied by means of pressure-glazing stops on opposite side of glazing.

C. Lock-Strip Gaskets: Neoprene extrusions in size and shape indicated, fabricated into frames with molded corner units and zipper lock-strips, complying with ASTM C 542, black.

2.7 GLAZING SEALANTS

A. General:

1. Compatibility: Provide glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
3. VOC Content: For sealants used inside of the weatherproofing system, not more than 250 g/L when calculated according to 40 CFR 59, Subpart D.
4. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.

B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Dow Corning Corporation; 790.
b. GE Advanced Materials - Silicones; SilPruf LM SCS2700.
c. May National Associates, Inc.; Bondaflex Sil 290.
d. Pecora Corporation; 890.
e. Sika Corporation, Construction Products Division; SikaSil-C990.
f. Tremco Incorporated; Spectrem 1.

2. Applications: .

C. Glazing Sealants for Fire-Rated Glazing Products: Products that are approved by testing agencies that listed and labeled fire-resistant glazing products with which they are used for applications and fire-protection ratings indicated.

2.8 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:

1. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.

2.9 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

G. Perimeter Insulation for Fire-Resistive Glazing: Product that is approved by testing agency that listed and labeled fire-resistant glazing product with which it is used for application and fire-protection rating indicated.

2.10 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.

C. Grind smooth and polish exposed glass edges and corners.

2.11 MONOLITHIC-GLASS TYPES

A. Glass Type GL-1: Clear fully tempered float glass.

1. Thickness: 6.0 mm .
2. Provide safety glazing labeling.

2.12 INSULATING-GLASS TYPES

A. Glass Type IGU-1: Low-e-coated, insulating glass.

1. Overall Unit Thickness: 1 inch (25 mm).
2. Thickness of Each Glass Lite: 6.0 mm .
3. Outdoor Lite: Tinted heat-strengthened ultra-clear float glass .
4. Interspace Content: Air.
5. Indoor Lite: Clear heat-strengthened float glass .
6. Low-E Coating: Sputtered on second surface.
7. Visible Light Transmittance: 70 percent minimum.
8. Winter Nighttime U-Factor: 0.27 maximum.
9. Summer Daytime U-Factor: 0.27 maximum.
10. Solar Heat Gain Coefficient: 0.39 maximum.
11. Light-to-Solar Heat Gain: 1.79 minimum.

B. Glass Type IGU-2: Low-e-coated, insulating glass, fully-tempered.

1. Overall Unit Thickness: 1 inch (25 mm).
2. Thickness of Each Glass Lite: 6.0 mm .
3. Outdoor Lite: Tinted heat-strengthened ultra-clear float glass .
4. Interspace Content: Air.
5. Indoor Lite: Clear heat-strengthened float glass .
6. Low-E Coating: Sputtered on second surface.
7. Visible Light Transmittance: 70 percent minimum.
8. Winter Nighttime U-Factor: 0.27 maximum.
9. Summer Daytime U-Factor: 0.27 maximum.
10. Solar Heat Gain Coefficient: 0.39 maximum.
11. Light-to-Solar Heat Gain: 1.79 minimum.
12. Provide safety glazing labeling.

2.13 INSULATING SPANDREL GLASS TYPES

A. Glass Type IGU-4: Ceramic-coated opaque, low-E, insulating spandrel glass.

1. Coating Color: White.
2. Overall Unit Thickness: 1 inch (25 mm).
3. Minimum Thickness of Each Glass Lite: 6 mm.
4. Outdoor Lite: Heat-strengthened float glass.
5. Interspace Content: Air.
6. Indoor Lite: Fully tempered float glass.
7. Low-E Coating: Sputtered on second surface.
8. Opaque Coating Location: Third surface.
9. Winter Nighttime U-Factor: 0.29 maximum.
10. Summer Daytime U-Factor: 0.27 maximum.

2.14 INSULATING-LAMINATED-GLASS TYPES

A. Glass Type IGU-3: Ceramic-Coated Vision, Low-e-coated, insulating laminated glass.

1. Overall Unit Thickness: 1 inch (25 mm) .
2. Thickness of Outdoor Lite: 6.0 mm .
3. Outdoor Lite: Clear laminated glass with two plies of heat-strengthened float glass .

    a. Thickness of Each Glass Ply: 3.0 mm.
    b. Interlayer Thickness: 0.060 inch (1.52 mm) .

4. Interspace Content: Argon.
5. Indoor Lite: Clear heat-strengthened glass
6. Low-E Coating: Sputtered on second surface (inner surface of inner ply of outboard lite)
7. Visible Light Transmittance: 38 percent minimum.
8. Ceramic Frit Coating Location: Third surface (outer surface of inboard lite.
9. Ceramic Coating Color and Pattern: Basis of Design: Oldcastle, White Silk-Screened #5 Standard Hole Pattern 60% Coverage.
10. Winter Nighttime U-Factor: 0.24 maximum.
11. Summer Daytime U-Factor: 0.22 maximum.
12. Solar Heat Gain Coefficient: 0.28 maximum.

13. Provide safety glazing labeling.

2.15 FIRE-PROTECTION-RATED GLAZING TYPES

1. Provide safety glazing labeling.

B. Glass Type GL-2: fire-rated glazing; laminated ceramic glazing.

1. Provide safety glazing labeling.
2. Rating: as indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
2. Presence and functioning of weep systems.
3. Minimum required face and edge clearances.
4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that will leave visible marks in the completed work.

3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm).

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
2. Provide 1/8-inch (3-mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

J. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

K. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

L. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until right before each glazing unit is installed.

F. Apply heel bead of elastomeric sealant.

G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 GASKET GLAZING (DRY)

A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

E. Install gaskets so they protrude past face of glazing stops.

3.6 SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.

C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.7 LOCK-STRIP GASKET GLAZING

A. Comply with ASTM C 716 and gasket manufacturer's written instructions. Provide supplementary wet seal and weep system unless otherwise indicated.

3.8 CLEANING AND PROTECTION

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION 088000

SECTION 08 88 53 - SECURITY GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Security glazing.
   2. Glazing accessories.
   3. Tinting film.

B. Related Sections include the following:
   1. Division 11 Section “General Provisions for Detention Work”
   2. Division 11 Section “Detention Hollow Metal Doors and Frames”
   3. Division 11 Section “Detention Stainless Steel Windows”

1.3 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)
   1. ASTM F1233: Test Method for Security Glazing Materials and Systems

B. National Institute of Justice (NIJ)
   1. NIJ - 0108.01: Ballistic Resistant Protective Materials

C. H.P. White Test Procedures
   1. H.P. White TP.0500 Forced entry/Ballistic standard

D. Walker, McGough, Foltz, and Lyeria (WMFL)
   1. WMFL (Levels 1-3) forced entry procedures plus ballistics.

E. Federal Specifications (FS)
   1. FS TT-S-230A: Sealing Compound, Synthetic rubber base, single component, chemically curing for caulking, sealing and glazing in building construction
   2. FS TT-S-002303: Sealing compound, Elastomeric type, single component (for caulking, sealing, and glazing in buildings and other structures.
   3. FS MIL-P46144: Polycarbonate and plastic sheet standards

F. Flat Glass Marketing Association (FGMA)
   1. FGMA: Glazing Manual
   2. FGMA: Sealant Manual

1.4 SUBMITTALS

A. Product Data: For each security glazing type and glazing material. Include type of materials, thickness, method of test and performance.

B. Samples:
   1. Submit 2, 12" square samples of each type of glass required.
   2. Submit 3, 12" long samples of each type of glazing sealant and gasket required.
   3. Submit samples of interior applied, tinted "films" being considered for glazing.
   4. Provide full size sample of glazing type and glazing materials for the detention window sample. Coordinate size and requirements with the detention window manufacturer.

C. Certification by Manufacturer: That products supplied complies with performance requirements specified.

D. Product Test Reports: Showing compliance with specified requirements.

E. Maintenance Data: Covering cleaning and protection requirements.

F. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in the manufacture of security glass, types as specified, with minimum documented (5) years experience.

B. Installer Qualifications: Engage an experienced Installer who has specialized in installing security glazing similar to that required for this Project.

C. Indiana Building Code, Chapters 43 and 54.

D. Certified Safety Glazing: Category II products complying with test requirements of 16 CFR 1201 and ANSI Z97.1, certified by Safety Glazing Certification Council, and permanently labeled.

E. Ballistics-Resistant and Forced-Entry Resistant Performance: Provide products identical to those tested for compliance with requirements indicated per tests specified for specific glazing types.
   1. Have tests performed by qualified independent testing agency.
   2. Testing Agencies: Subject to compliance with requirements, acceptable testing agencies are:
      a. ETL Testing Laboratories, Inc.
      b. H. P. White Laboratory, Inc.
      c. Underwriters Laboratories, Inc.
      d. Warnock-Hersey International, Inc.
      e. Wiss, Janney, Elstner Associates, Inc.

F. Test data shall have been performed within the past five (5) years and shall be submitted with the shop drawing submittal.

1.6 DELIVERY, STORAGE AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1.8 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Special Warranty: Manufacturer's standard form, made out to Owner and signed by manufacturer, in which manufacturer agrees to furnish replacements for units that deteriorate from normal use by developing defects attributable to the manufacturing process, within warranty period.

C. Warranty Period: Five (5) year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Laminated Glass and Polycarbonate/Glass Laminate Products:
      a. Global Security Glazing
      b. LTI Smartglass
   2. Polycarbonate Sheet Products:
      a. Dlubak Corporation
      b. Insulgard Corporation

2.2 SECURITY GLAZING TYPES

A. Security Glazing Types: Provide types of units fabricated of the glazing products indicated with the security performance specified.

B. SG-8: Laminated Tempered Glass; 1/2” thick.
   1. Provide heat-strengthened and tempered glass which complies with ASTM C-1048, including requirements indicated by reference to kind, condition, type, quality, class and if applicable, form, finish and pattern
   2. Manufacture hear-treated glass by horizontal (roller hearth) process with roll wave distortion parallel with bottom edge of glass as installed, unless otherwise indicated.

C. SG-8R: Laminated Tempered Glass; 1/2” thick.
   1. Provide heat-strengthened and tempered glass which complies with ASTM C-1048, including requirements indicated by reference to kind, condition, type, quality, class and if applicable, form, finish and pattern

2. Manufacture hear-treated glass by horizontal (roller hearth) process with roll wave distortion parallel with bottom edge of glass as installed, unless otherwise indicated.
3. Fire Rated: 20 min.

D. SG-10: Laminated Polycarbonate; 1/2-inch nominal thickness
1. Consisting of polycarbonate mar-resistant outer layer; polycarbonate core; and polycarbonate mar-resistant outer layer. Laminated with three layers of special interlayer material.
2. Forced-Entry Resistance: 40 minute, ASTM 1915 Grade 2

E. SG-12: Glass Clad Polycarbonate; 3/4-inch nominal thickness.
1. Consisting of tempered or chemically strengthened glass, polycarbonate cores; and chemically strengthened glass. Laminated with two layers of special interlayer material.
2. Forced-Entry Resistance: 40 minute, ASTM 1915 Grade 2

F. SG-12R: Glass Clad Polycarbonate; air gap; laminated fire rated glazing. 1-5/8" inch nominal thickness.
1. Consisting of tempered or chemically strengthened glass, polycarbonate cores; and chemically strengthened glass. Laminated with two layers of special interlayer material.
2. Interior applied tinting "film" to be installed after occupancy around all control room areas.
3. Forced-Entry Resistance: 40 minute, ASTM 1915 Grade 2
4. Fire Rated: 45 min. Note: 45min rated glass is used in 20min openings.
5. Basis of design: Global Security Glazing Ultimax 45.

G. SG-16: Glass Clad Polycarbonate; 1-1/4-inch nominal thickness.
1. Consisting of tempered or chemically strengthened glass, polycarbonate cores; and chemically strengthened glass. Laminated with two layers of special interlayer material.
2. Forced-Entry Resistance: 60 minute, WMFL Level I
3. Ballistics Resistance per WMFL: 25 shots, .44 mag.

H. SG-16R: Fire Resistance Rated Glass Clad Polycarbonate; air gap; laminated fire rated glazing. 1-13/16-inch nominal thickness.
1. Consisting of tempered or chemically strengthened glass, polycarbonate cores; and chemically strengthened glass. Laminated with two layers of special interlayer material.
2. Provide applied tinting "film" at interior of all control room areas. Tint color, reflectance, and darkness to be selected by Architect from manufacturer's full range of tinting options.
3. Master and Local Control Glazing Tinting Film Selection: Provide (3) progressive in suit window tint combination mockups once glazing and lights are installed in Control Rooms. Initial mockup to provide a minimum of 4 different tint levels on each side of the Control Rooms to determine the appropriate tint combination for final installation. First and second round mockups to be 12"x12" installed samples. Final mockup to be 24"x24" installed samples.
4. Fire Rated: 20 minute minimum required.
5. Forced-Entry Resistance: ASTM F-1915 Security Grade 1(60 Minute)
6. Basis of design: Global Security Glazing Ultimax 45.

I. SG-20: Laminated Polycarbonate Unit, with mar-resistant coating; 1 1/4-inch nominal thickness.

1. Consisting of polycarbonate mar-resistant outer layer; polycarbonate core; polycarbonate core and polycarbonate mar-resistant outer layer. Laminated with three layers of special interlayer material.
2. Ballistics Resistance per WMFL: 25 shots, .44 mag.
3. Forced-Entry Resistance: 60 Min, WMFL Level I

J. SG-20R: Fire Resistance Rated Laminated Polycarbonate Unit; air gap; laminated fire rated glazing. 2-1/16" nominal thickness.
1. Consisting of polycarbonate mar-resistant outer layer; polycarbonate core; polycarbonate core and polycarbonate mar-resistant outer layer. Laminated with three layers of special interlayer material.
2. Fire Rated: 45 min
3. Ballistics Resistance per WMFL: 25 shots, .44 mag.
4. Forced-Entry Resistance: 60 Min, WMFL Level I
5. Basis of design: Global Security Glazing Ultimax 45.

K. ISG2: Exterior Low-E Insulating-Glass Units with Glass Clad Polycarbonate. 2" nominal thickness.
1. Insulating-Glass Units, General: Preassembled units consisting of sealed lites of glass separated by a dehydrated interspace, and complying with ASTM E 774 for Class CBA units and with requirements specified in this Article.
   a. Overall Unit Thickness and Thickness of Each Lite: Dimensions, if indicated, are nominal and the overall thicknesses of units are measured perpendicularly from outer surfaces of glass lites at unit's edge.
   b. Sealing System: Dual seal, with manufacturer's standard primary and secondary sealants.
   c. Spacer Specifications: Manufacturer's standard spacer material and construction.
   d. Corner Construction: Manufacturer's standard corner construction.
2. Outdoor Lite: Kind FT (fully tempered), Condition C (other coated glass) float glass.
   a. Thickness: 1/4-inch (6 mm).
   b. Tint Color: None. Basis of Design: PPG Starphire Ultra Clear.
3. Low-Emissivity Coating: Sputtered on second surface.
4. Interspace Content: Argon.
5. Interspace Dimension: 1/2-inch (12 mm).
6. Indoor Lite: Glass clad polycarbonate; 1-1/4" (19 mm) nominal thickness.
   a. Consisting of tempered or chemically strengthened glass, polycarbonate cores; and chemically strengthened glass. Laminated with two layers of special interlayer material.
   b. Forced-Entry Resistance: 60 minute, WMFL Level I
   c. Ballistics Resistance per WMFL: 25 shots, .44 mag.

2.3 GLAZING ACCESSORIES

A. General: Provide products of material, size, and shape complying with referenced glazing standard and requirements of manufacturers of glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Glazing Tape:

1. Precured, 100 percent solids, butyl polyisobutylene rubber with internal spacer rod, complying with AAMA 807.1 tape, as described in AAMA 800-86.
2. For fire rated glazing, use the glazing tape required by the test certification of the glazing and Identical to product used in test assembly to obtain fire-resistance rating.

D. Setting Blocks: Elastomeric material with a Shore A durometer hardness of 85, plus or minus 5.

E. Spacers: Elastomeric blocks or continuous extrusions with a Shore A durometer hardness required by glazing unit manufacturer to maintain glazing units in place for installation indicated.

F. Backer Rods: Flexible, nonabsorbent, compressible polyurethane foam, either open-cell or nongassing closed-cell, unless otherwise restricted by sealant manufacturer; preformed to appropriate size and shape.

G. Glazing Sealant: Black, neutral-curing silicone complying with ASTM C 920, Grade NS, Type S or M, Class 25, Uses NT, A, G, and O--as applicable to glazing substrates indicated.

2.4 TINTING FILM

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Madico Window Film/Madico, Inc.
2. LLUMAR Solar Control Window Film Martin/Martin Processing, Inc.

B. Interior applied tinted film to be installed after occupancy around all control room areas and where indicated.

C. Color to be selected by Owner under supervision of Architect from manufacturer’s standard colors.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing for glazing, with Installer present, for compliance with the following:
1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
2. Presence and functioning of weep system.
3. Minimum required face or edge clearances.
4. Effective sealing between joints of glazing-unit-framing members.
5. Check for conditions that would void the manufacturer's warranty.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean the glazing channel or other framing members to receive glass immediately before glazing. Remove coatings that are not firmly bonded to the substrate.

3.3 INSTALLATION - GENERAL

A. Expenses carried by the Architect/Engineer, Project Manager and Owner in troubleshooting Security Glass and Glazing problems, caused by inadequate workmanship or other form of poor performance on the part of a contractor, shall be borne by that Contractor.

B. Expenses carried by the Architect/Engineer, Project Manager or Owner in troubleshooting security glazing problems caused by inadequate workmanship or other form of poor performance on the part of the Contractor, shall be borne by the Contractor.

C. Comply with combined written instructions of manufacturers of glazing, sealants, gaskets, other glazing materials and tinting film, unless more stringent requirements are indicated, including those in referenced glazing publications.

D. Glazing channel dimensions, as indicated on Drawings or determined by glazing material thicknesses and by other requirements indicated, provide necessary bite on lites, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.

E. Protect glazing from edge and surface damage during handling and installation. Remove damaged glazing from Project site and legally dispose of off Project site. Damaged glazing are those with edge damage or other imperfections that, when installed, could weaken glazing and impair performance and appearance.

F. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.

G. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glazing unit manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

H. Do not block weep holes.

I. Do not exceed edge pressures stipulated by glazing unit manufacturers for installing lites.

J. Provide spacers for glazing lites where the length plus width is larger than 50 inches (1270 mm) as follows:
   1. Locate spacers directly opposite each other on both inside and outside faces of glazing lites. Install correct size and spacing to preserve required face clearances unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
   2. Provide 1/8-inch (3-mm) minimum bite of spacers on glazing lites and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

K. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

3.4 GLAZING TAPE

A. Position tapes on fixed stops so that, when compressed by glazing units, their exposed edges are flush with sightline of stops.

B. Install tapes continuously. Do not stretch tapes to make them fit opening.

C. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

D. Do not remove release paper from tape until just before each glazing unit is installed.

E. Place setting blocks at 1/4 points.

F. Rest glass on setting blocks and press against tape with sufficient pressure to ensure full contact and adhesion at perimeter.

G. Place glazing tape on free perimeter of glass in same manner described above.

H. Install removable stop, avoid displacement of tape, exert pressure on tape for full continuous contact.

I. Knife trim excess or protruding tape.

J. After installation of stops, apply fillet bead of glazing sealant along entire glazing perimeter on both sides of glazing, installed with a substantial "wash" away from the glass, providing a water-tight seal from detergents and cleaning solutions.

3.5 PROTECTION AND CLEANING

A. Protect exterior glass from breakage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for build-up of dirt, scum, alkali deposits, or stains, and remove as recommended by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents and vandalism, during construction period.

E. Wash both sides of glazing not more than 4 days before inspection for Substantial Completion. Wash glass as recommended by glass manufacturer.

END OF SECTION 08 88 53

SECTION 08 91 19 - FIXED LOUVERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Fixed, extruded-aluminum louvers.

B. Related Requirements:

1. Division 07 section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.
3. Division 23 Sections for louvers that are a part of mechanical equipment.
4. Division 26 Sections for electrical power connections for motor-operated adjustable louvers.

1.3 DEFINITIONS

A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.

B. Horizontal Louver: Louver with horizontal blades (i.e., the axes of the blades are horizontal).

C. Drainable-Blade Louver: Louver with blades having gutters that collect water and drain it to channels in jambs and mullions, which carry it to bottom of unit and away from opening.

D. Wind-Driven-Rain-Resistant Louver: Louver that provides specified wind-driven rain performance, as determined by testing according to AMCA 500-L.

1.4 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable LEED Credits

1. MRc2
2. MRc4
3. MRc5
4. IEQc4.1

B. LEED Requirements

1. MRc2: CONSTRUCTION WASTE MANAGEMENT

   No less than the specified portion of all construction waste from the Project shall be diverted from disposal in a landfill and/or incineration in with the Project Requirements for Construction Waste Management and Disposal. Refer to Specification Sections 017419 Construction Waste Management and Disposal and 013510 Sustainable Design Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

2. MRc4: Recycled Content Material

   No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the Project Requirements for Recycled Content Materials. All materials counted towards the computations of the proportion of the Recycled Content Materials shall comply with the standard minimum percentages of post-consumer waste materials and for the minimum percentages of pre-consumer waste materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

3. MRc5: REGIONALLY MANUFACTURED HARVESTED MATERIALS

   No less than the specified minimum proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the Project Site in accordance with the Project Requirements for Regionally Manufactured and/or Harvested Materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

4. IEQc4.1: Low Emitting Materials: Sealants and Adhesives

   All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the Project Requirements for Low Emitting Materials – Sealants and Adhesives. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.

B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.

1. Show weep paths, gaskets, flashing, sealant, and other means of preventing water intrusion.
2. Show mullion profiles and locations.

C. Samples: For each type of metal finish required.

1.6 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Based on evaluation of comprehensive tests performed according to AMCA 500-L by a qualified testing agency or by manufacturer and witnessed by a qualified testing agency, for each type of louver and showing compliance with performance requirements specified.

B. Windborne-debris-impact-resistance test reports.

1.7 QUALITY ASSURANCE

A. Source Limitations: Obtain louvers and vents from single source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.

B. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."
3. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

C. UL and NEMA Compliance: Provide motors and related components for motor-operated louvers that are listed and labeled by UL and comply with applicable NEMA standards. Coordinate all electrical installations to meet the needs for all electrical operations

D. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.

1.8 FIELD CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of Louvers and Vents that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
    a. Structural failures including, but not limited to, excessive deflection.
    b. Noise or vibration caused by thermal movements.
    c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
    d. Adhesive or cohesive sealant failures.
    e. Water leakage.
2. Warranty Period: 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain louvers from single source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.

2.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Louvers shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver-blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act normal to the face of the building.

1. Wind Loads: See structural drawings for structural design criteria.

B. Seismic Performance: Louvers, including attachments to other construction, shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

C. Louver Performance Ratings: Provide louvers complying with requirements specified, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width according to AMCA 500-L.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

E. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.

2.3 FIXED, EXTRUDED-ALUMINUM LOUVERS

A. Horizontal Storm-Resistant Louver :

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Air Balance Inc.; a Mestek company.
   b. Air Flow Company, Inc.
   c. Airolite Company, LLC (The).
   d. All-Lite Architectural Products.
   e. American Warming and Ventilating, Inc.; a Mestek company.
   f. Arrow United Industries; a division of Mestek, Inc.
   g. Construction Specialties, Inc.
   h. Greenheck Fan Corporation.
   i. Industrial Louvers, Inc.
   j. NCA Manufacturing, Inc.
   k. Nystrom Building Products.
   l. Reliable Products, Inc.

m. Ruskin Company; Tomkins PLC.

2. Louver Depth: As indicated on drawings.
3. Frame and Blade Nominal Thickness: Not less than 0.060 inch for blades and 0.080 inch for frames.
4. Louver Performance Ratings:
   a. Free Area: Not less than 8 sq ft (50% free area) for 48-inch- wide by 48-inch- high louver.
   b. Air Performance: Not more than 0.15-inch wg static pressure drop at 750 fpm with a 50% free-area exhaust or intake velocity.
   c. Wind-Driven Rain Performance: Not less than 95 percent effectiveness when subjected to a rainfall rate of 3 inches per hour and a wind speed of 29 mph at a core-area intake velocity of 750 fpm.
5. AMCA Seal: Mark units with AMC
6. A Certified Ratings Seal.

2.4 LOUVER SCREENS

A. General: Provide screen at each exterior louver, unless noted otherwise .

1. Screen Location for Fixed Louvers: Interior face.
2. Screening Type: Bird screening except where insect screening is indicated .

B. Secure screen frames to louver frames with stainless-steel machine screws , spaced a maximum of 6 inches from each corner and at 12 inches o.c.

C. Louver Screen Frames: Fabricate with mitered corners to louver sizes indicated.

1. Metal: Same kind and form of metal as indicated for louver to which screens are attached. Reinforce extruded-aluminum screen frames at corners with clips.
2. Finish: Same finish as louver frames to which louver screens are attached .

D. Louver Screening for Aluminum Louvers:

1. Bird Screening: Aluminum, 1/2-inch- square mesh, 0.063-inch wire.
2. Insect Screening: Aluminum, 18-by-16 mesh, 0.012-inch wire.

2.5 BLANK-OFF PANELS

A. Insulated, Blank-Off Panels: Laminated panels consisting of insulating core surfaced on back and front with metal sheets and attached to back of louver.

1. Thickness: 1 inch.
2. Metal Facing Sheets: Aluminum sheet, not less than 0.032-inch nominal thickness.
3. Insulating Core: Rigid, glass-fiber-board insulation or extruded-polystyrene foam.
4. Edge Treatment: Trim perimeter edges of blank-off panels with louver manufacturer's standard extruded-aluminum-channel frames, not less than 0.080-inch nominal thickness , with corners mitered and with same finish as panels.
5. Seal perimeter joints between panel faces and louver frames with gaskets or sealant.
6. Panel Finish: Same type of finish applied to louvers, but black color.
7. Attach blank-off panels with sheet metal screws .

2.6 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

2.7 ALUMINUM FINISHES

A. Finish louvers after assembly.

B. High-Performance Organic Finish: 3-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

C. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

D. Finishes:

1. Flouropolymer Finish:
   a. Color 1: Custom color to match metal wall panel finish.
   b. Color 2: Match precast panel, Color to be selected by Architect from manufacturer’s full range of colors.
   c. Color 3: Match brick, Color to be selected by Architect from manufacturer’s full range of colors

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and openings, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.3 INSTALLATION

A. Locate and place louvers level, plumb, and at indicated alignment with adjacent work.

B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.

C. Form closely fitted joints with exposed connections accurately located and secured.

D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

E. Protect unpainted galvanized and nonferrous-metal surfaces that are in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint or by separating surfaces with waterproof gaskets or nonmetallic flashing.

F. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Section 079200 "Joint Sealants" for sealants applied during louver installation.

3.4 ADJUSTING AND CLEANING

A. Clean exposed louver surfaces that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate during construction period.

B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.

C. Restore louvers damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.

1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

END OF SECTION 08 91 19

SECTION 09 22 16 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Metal framing assemblies capable of withstanding design loads and deflection limits specified under Division 5 Section “Cold-Formed Metal Framing” with non-structural metal framing, as determined by professional engineer responsible for the engineering services in Section 054000, at the following locations:

    a. Non-load-bearing steel framing systems for interior gypsum board assemblies.
    b. Suspension systems for interior gypsum ceilings, soffits, and grid systems.

B. Related Requirements:

1. Division 05 Section "Cold-Formed Metal Framing" for exterior and interior load-bearing and exterior non-load-bearing wall studs; floor joists; roof rafters and ceiling joists; and roof trusses.

1.3 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable LEED Credits

1. MRc2
2. MRc4
3. MRc5
4. IEQc4.1

B. LEED Requirements

1. MRc2: CONSTRUCTION WASTE MANAGEMENT

    No less than the specified portion of all construction waste from the Project shall be diverted from disposal in a landfill and/or incineration in with the Project Requirements for Construction Waste Management and Disposal. Refer to Specification Sections 017419 Construction Waste Management and Disposal and 013510 Sustainable Design Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

2. MRc4: Recycled Content Material

No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the Project Requirements for Recycled Content Materials. All materials counted towards the computations of the proportion of the Recycled Content Materials shall comply with the standard minimum percentages of post-consumer waste materials and for the minimum percentages of pre-consumer waste materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

3. MRc5: REGIONALLY MANUFACTURED HARVESTED MATERIALS

   No less than the specified minimum proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the Project Site in accordance with the Project Requirements for Regionally Manufactured and/or Harvested Materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

4. IEQc4.1: Low Emitting Materials: Sealants and Adhesives

   All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the Project Requirements for Low Emitting Materials – Sealants and Adhesives. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.5 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For dimpled steel studs and runners and firestop tracks, from ICC-ES.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 FRAMING SYSTEMS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Framing Members, General: Comply with ASTM C 754 for conditions indicated.

1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
2. Protective Coating: Coating with equivalent corrosion resistance of ASTM A 653/A 653M, G40 (Z120), hot-dip galvanized unless otherwise indicated.

C. Studs and Runners: ASTM C 645. Use either steel studs and runners or dimpled steel studs and runners.

1. Steel Studs and Runners:

a. Minimum Base-Metal Thickness: As indicated on Drawings .
b. Depth: As indicated on Drawings .

2. Dimpled Steel Studs and Runners:

a. Minimum Base-Metal Thickness: As indicated on Drawings .
b. Depth: As indicated on Drawings .

D. Slip-Type Head Joints: Where indicated, provide one of the following:

1. Single Long-Leg Runner System: ASTM C 645 top runner with 2-inch- (51-mm-) deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top runner and with continuous bridging located within 12 inches (305 mm) of the top of studs to provide lateral bracing.
2. Double-Runner System: ASTM C 645 top runners, inside runner with 2-inch- (51-mm-) deep flanges in thickness not less than indicated for studs and fastened to studs, and outer runner sized to friction fit inside runner.
3. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.

a. Products: Subject to compliance with requirements, provide one of the following:

1) Dietrich Metal Framing; SLP-TRK Slotted Deflection Track.
2) MBA Building Supplies; Slotted Deflecto Track.
3) Steel Network Inc. (The); VertiClip SLD or VertiTrack VTD Series.
4) Superior Metal Trim; Superior Flex Track System (SFT).

E. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Fire Trak Corp.; Fire Trak System attached to studs with Fire Trak Posi Klip.
b. Grace Construction Products; FlameSafe FlowTrak System.
c. Metal-Lite, Inc.; The System.
d. Steel Network Inc. (The); VertiClip SLD Series.

F. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.

1. Minimum Base-Metal Thickness: 0.033 inch (0.84 mm) .

G. Cold-Rolled Channel Bridging: Steel, 0.053-inch (1.34-mm) minimum base-metal thickness, with minimum 1/2-inch- (13-mm-) wide flanges.

1. Depth: 1-1/2 inches (38 mm) .
2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches (38 by 38 mm), 0.068-inch- (1.72-mm-) thick, galvanized steel.

H. Hat-Shaped, Rigid Furring Channels: ASTM C 645.

1. Minimum Base-Metal Thickness: As indicated on Drawings .
2. Depth: As indicated on Drawings .

I. Resilient Furring Channels: 1/2-inch- (13-mm-) deep, steel sheet members designed to reduce sound transmission.

1. Configuration: Asymmetrical or hat shaped.

J. Cold-Rolled Furring Channels: 0.053-inch (1.34-mm) uncoated-steel thickness, with minimum 1/2-inch- (13-mm-) wide flanges.

1. Depth: As indicated on Drawings .
2. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum uncoated-steel thickness of 0.033 inch (0.8 mm).
3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- (1.59-mm-) diameter wire, or double strand of 0.048-inch- (1.21-mm-) diameter wire.

K. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches (32 mm), wall attachment flange of 7/8 inch (22 mm), minimum uncoated-metal thickness of 0.018 inch (0.45 mm), and depth required to fit insulation thickness indicated.

2.3 SUSPENSION SYSTEMS

A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- (1.59-mm-) diameter wire, or double strand of 0.048-inch- (1.21-mm-) diameter wire.

B. Hanger Attachments to Concrete:

1. Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching wire hangers and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E 488 by an independent testing agency.

a. Type: Postinstalled, expansion anchor.

2. Powder-Actuated Fasteners: Suitable for application indicated, fabricated from corrosion-resistant materials with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed by construction as determined by testing according to ASTM E 1190 by an independent testing agency.

C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch (4.12 mm) in diameter.

D. Flat Hangers: Steel sheet, 1 by 3/16 inch (25 by 5 mm) by length indicated .

E. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.053 inch (1.34 mm) and minimum 1/2-inch- (13-mm-) wide flanges.

1. Depth: As indicated on Drawings.

F. Furring Channels (Furring Members):

1. Cold-Rolled Channels: 0.053-inch (1.34-mm) uncoated-steel thickness, with minimum 1/2-inch- (13-mm-) wide flanges, 3/4 inch (19 mm) deep.
2. Steel Studs and Runners: ASTM C 645.

a. Minimum Base-Metal Thickness: As indicated on Drawings .
b. Depth: As indicated on Drawings .

3. Dimpled Steel Studs and Runners: ASTM C 645.

a. Minimum Base-Metal Thickness: As indicated on Drawings .
b. Depth: As indicated on Drawings .

4. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch (22 mm) deep.

a. Minimum Base-Metal Thickness: As indicated on Drawings .

5. Resilient Furring Channels: 1/2-inch- (13-mm-) deep members designed to reduce sound transmission.

a. Configuration: Asymmetrical or hat shaped.

G. Grid Suspension System for Gypsum Board Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Armstrong World Industries, Inc.; Drywall Grid Systems.
b. Chicago Metallic Corporation; Drywall Grid System.
c. USG Corporation; Drywall Suspension System.

2.4 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.

1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

B. Isolation Strip at Exterior Walls: Provide one of the following:

1. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), nonperforated.
2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch (3.2 mm) thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.

1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

3.3 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754.

1. Portland Cement Plaster Assemblies: Also comply with requirements in ASTM C 1063 that apply to framing installation.
2. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

C. Install bracing at terminations in assemblies.

D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING FRAMED ASSEMBLIES

A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

1. Single-Layer Application: 16 inches (406 mm) o.c. unless otherwise indicated.
2. Multilayer Application: 16 inches (406 mm) o.c. unless otherwise indicated.
3. Tile Backing Panels: 16 inches (406 mm) o.c. unless otherwise indicated.

B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

C. Install studs so flanges within framing system point in same direction.

D. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.

    a. Install two studs at each jamb unless otherwise indicated.
    b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch (13-mm) clearance from jamb stud to allow for installation of control joint in finished assembly.
    c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.

3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.

    a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.

5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.

E. Direct Furring:

1. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (610 mm) o.c.

F. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by faces of adjacent framing.

3.5 INSTALLING SUSPENSION SYSTEMS

A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

1. Hangers: 48 inches (1219 mm) unless otherwise indicated o.c.
2. Carrying Channels (Main Runners): 48 inches (1219 mm) o.c.
3. Furring Channels (Furring Members): 16 inches (406 mm) o.c.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend hangers from building structure as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.

    a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.

    a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards .

3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
5. Do not attach hangers to steel roof deck.
6. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
7. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
8. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

E. Seismic Bracing: Sway-brace suspension systems with hangers used for support .

F. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

G. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet (3 mm in 3.6 m) measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 092216

SECTION 09 29 00 - GYPSUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Interior gypsum board.
2. Sound Attenuation Blankets

B. Related Requirements:

1. Division 06 Section "Sheathing" for gypsum sheathing for exterior walls.
2. Division 09 Section "Non-Structural Metal Framing" for non-structural framing and suspension systems that support gypsum board panels.
3. Division 09 Section "Tiling" for cementitious backer units installed as substrates for ceramic tile.

1.3 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable LEED Credits

1. MRc2
2. MRc4
3. MRc5
4. IEQc4.1

B. LEED Requirements

1. MRc2: CONSTRUCTION WASTE MANAGEMENT

   No less than the specified portion of all construction waste from the Project shall be diverted from disposal in a landfill and/or incineration in with the Project Requirements for Construction Waste Management and Disposal. Refer to Specification Sections 017419 Construction Waste Management and Disposal and 013510 Sustainable Design Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

2. MRc4: Recycled Content Material

   No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the Project Requirements for Recycled Content Materials. All materials counted towards the computations of the proportion of the Recycled Content Materials

shall comply with the standard minimum percentages of post-consumer waste materials and for the minimum percentages of pre-consumer waste materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

3. MRc5: REGIONALLY MANUFACTURED HARVESTED MATERIALS

   No less than the specified minimum proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the Project Site in accordance with the Project Requirements for Regionally Manufactured and/or Harvested Materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

4. IEQc4.1: Low Emitting Materials: Sealants and Adhesives

   All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the Project Requirements for Low Emitting Materials – Sealants and Adhesives. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For the following products:

1. Trim Accessories: Full-size Sample in 12-inch- (300-mm-) long length for each trim accessory indicated.

1.5 DELIVERY, STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.

2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

A. Regional Materials: Gypsum panel products shall be manufactured within 500 miles (800 km) of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.

B. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following :

1. American Gypsum.
2. CertainTeed Corp.
3. Georgia-Pacific Gypsum LLC.
4. Lafarge North America Inc.
5. National Gypsum Company.
6. PABCO Gypsum.
7. Temple-Inland.
8. USG Corporation.

B. Gypsum Board, Type X: ASTM C 1396/C 1396M.

1. Thickness: 5/8 inch (15.9 mm).
2. Long Edges: Tapered and featured (rounded or beveled) for prefilling.

C. Gypsum Ceiling Board: ASTM C 1396/C 1396M.

1. Thickness: 5/8 inch (12.7 mm).
2. Long Edges: Tapered.

D. Abuse-Resistant Gypsum Board: ASTM C 1629/C 1629M, Level 3.

1. Core: As indicated on Drawings .
2. Long Edges: Tapered.
3. Mold Resistance: ASTM D 3273, score of 10.

E. Moisture- and Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.

1. Core: As indicated .
2. Long Edges: Tapered.
3. Mold Resistance: ASTM D 3273, score of 10.

2.4 SPECIALTY GYPSUM BOARD

A. Gypsum Board, Type C: ASTM C 1396/C 1396M. Manufactured to have increased fire-resistive capability.

1. Products: Subject to compliance with requirements, provide one of the following:

a. American Gypsum; Firebloc Type C.
b. CertainTeed Corp.; ProRoc Type C.
c. Georgia-Pacific Gypsum LLC; Fireguard C.
d. Lafarge North America Inc.; Firecheck Type C.
e. National Gypsum Company; Gold Bond Fire-Shield C.
f. PABCO Gypsum; Flame Curb Type Super C.
g. Temple-Inland; Type TG-C.
h. USG Corporation; Firecode C Core.

2. Thickness: As required by fire-resistance-rated assembly indicated on Drawings.
3. Long Edges: Tapered.

2.5 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc .
2. Shapes:

a. Cornerbead.
b. Bullnose bead.
c. LC-Bead: J-shaped; exposed long flange receives joint compound.
d. L-Bead: L-shaped; exposed long flange receives joint compound.
e. Expansion (control) joint.
f. Curved-Edge Cornerbead: With notched or flexible flanges.

B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Fry Reglet Corp.
b. Gordon, Inc.
c. Pittcon Industries.

2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221 (ASTM B 221M), Alloy 6063-T5.
3. Finish: Clear anodic finish, Class II, 0,010 mm or thicker.

2.6 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

1. Interior Gypsum Board: Paper.
2. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.

a. Use setting-type compound for installing paper-faced metal trim accessories.

3. Fill Coat: For second coat, use setting-type, sandable topping compound.
4. Finish Coat: For third coat, use drying-type, all-purpose compound.

2.7 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

1. Laminating adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.

D. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

E. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Accumetric LLC; BOSS 824 Acoustical Sound Sealant.
b. Grabber Construction Products; Acoustical Sealant GSC.
c. Pecora Corporation; AC-20 FTR .
d. Specified Technologies, Inc.; Smoke N Sound Acoustical Sealant.
e. USG Corporation; SHEETROCK Acoustical Sealant.

2. Acoustical joint sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

F. Thermal Insulation: As specified in Division 07 Section "Thermal Insulation."

G. Vapor Retarder: As specified in Division 07 Section "Thermal Insulation."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc., except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
2. Fit gypsum panels around ducts, pipes, and conduits.
3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- (6.4- to 9.5-mm-) wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

I. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:

1. Wallboard Type: As indicated on Drawings .
2. Type X: As indicated on Drawings .
3. Ceiling Type: Ceiling surfaces.
4. Abuse-Resistant Type: As indicated on Drawings .
5. Moisture- and Mold-Resistant Type: As indicated on Drawings .
6. Type C: Where required for specific fire-resistance-rated assembly indicated.
7. Forced-Entry Resistant Type: As indicated on Drawings.

B. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
2. On partitions/walls, apply gypsum panels vertically (parallel to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.

    a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
    b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.

3. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:

1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches (400 mm) minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.

2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
3. Fastening Methods: Fasten base layers and face layers separately to supports with screws .

D. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.

3.4 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints according to ASTM C 840

C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners unless otherwise indicated.
2. LC-Bead: Use at exposed panel edges .

3.5 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints, rounded or beveled edges, and damaged surface areas.

C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:

1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
2. Level 2: Panels that are substrate for tile .
3. Level 3: Where indicated on Drawings .
4. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated .

    a. Primer and its application to surfaces are specified in other Division 09 Sections.

3.6 PROTECTION

A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

C. Remove and replace panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900

SECTION 09 30 13 – CERAMIC TILING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Ceramic tile.
2. Stone thresholds.
3. Crack isolation membrane.
4. Tile backing panels.
5. Metal edge strips.

B. Related Sections:

1. Division 07 Section "Security Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.

1.3 DEFINITIONS

A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.

B. Module Size: Actual tile size plus joint width indicated.

C. Face Size: Actual tile size, excluding spacer lugs.

1.4 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable LEED Credits

1. MRc2
2. MRc4
3. MRc5
4. IEQc4.1

B. LEED Requirements

1. MRc2: CONSTRUCTION WASTE MANAGEMENT

No less than the specified portion of all construction waste from the Project shall be diverted from disposal in a landfill and/or incineration in with the Project Requirements for Construction Waste Management and Disposal. Refer to

Specification Sections 017419 Construction Waste Management and Disposal and 013510 Sustainable Design Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

2. MRc4: Recycled Content Material

   No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the Project Requirements for Recycled Content Materials. All materials counted towards the computations of the proportion of the Recycled Content Materials shall comply with the standard minimum percentages of post-consumer waste materials and for the minimum percentages of pre-consumer waste materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

3. MRc5: REGIONALLY MANUFACTURED HARVESTED MATERIALS

   No less than the specified minimum proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the Project Site in accordance with the Project Requirements for Regionally Manufactured and/or Harvested Materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

4. IEQc4.1: Low Emitting Materials: Sealants and Adhesives

   All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the Project Requirements for Low Emitting Materials – Sealants and Adhesives. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.

C. Samples for Initial Selection: For each type of tile and grout indicated. Include Samples of accessories involving color selection.

D. Samples for Verification:

   1. Full-size units of each type and composition of tile and for each color and finish required.
   2. Full-size units of each type of trim and accessory for each color and finish required.
   3. Stone thresholds in 6-inch lengths.
   4. Metal edge strips in 6-inch lengths.

E. Qualification Data: For qualified Installer.

F. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.

G. Product Certificates: For each type of product, signed by product manufacturer.

H. Material Test Reports: For each tile-setting and -grouting product.

1.6 QUALITY ASSURANCE

A. Source Limitations for Tile: Obtain tile of each type and color or finish from one source or producer.

1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.

B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from one manufacturer and each aggregate from one source or producer.

C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer for each product:

1. Stone thresholds.
2. Crack isolation membrane.
3. Joint sealants.
4. Cementitious backer units.
5. Metal edge strips.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.

B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.

C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

D. Store liquid materials in unopened containers and protected from freezing.

E. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

1.9 EXTRA MATERIALS

A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.

2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.

1. Provide tile complying with Standard grade requirements unless otherwise indicated.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCA installation methods specified in tile installation schedules, and other requirements specified.

C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

D. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.

1. Where tile is indicated for installation in wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for installation indicated and has a record of successful in-service performance.

E. Factory-Applied Temporary Protective Coating: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by precoating with continuous film of petroleum paraffin wax, applied hot. Do not coat unexposed tile surfaces.

2.2 TILE PRODUCTS

A. Tile Type T-1: Not used

B. Tile Type T-2: Glazed paver and wall tile.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Dal-Tile “Veranda Solids” or comparable product by one of the following:

a. American Marazzi Tile, Inc.
b. American Olean; Division of Dal-Tile International Inc.
c. Crossville, Inc.
d. United States Ceramic Tile Company.

2. Composition: Porcelain .
3. Face Size: 20 by 20 inches .
4. Thickness: 3/8 inch .
5. Face: Plain with square
6. Finish: Crystalline glaze.
7. Tile Color: As indicated on drawings.
8. Grout Color: As selected by Architect from manufacturer's full range .

C. Tile Type T-3: Glazed paver and wall tile.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Dal-Tile “Veranda Tones” or comparable product by one of the following:

a. American Marazzi Tile, Inc.
b. American Olean; Division of Dal-Tile International Inc.
c. Crossville, Inc.
d. United States Ceramic Tile Company.

2. Composition: Porcelain .
3. Face Size: 20 by 20 inches .
4. Thickness: 3/8 inch .
5. Face: Plain with square
6. Finish: Crystalline glaze.
7. Tile Color: As indicated by manufacturer's designations
8. Grout Color: As selected by Architect from manufacturer's full range.

2.3 THRESHOLDS

A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.

1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/16 inch above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to 1/2 inch or less above adjacent floor surface.

B. Slate Thresholds: ASTM C 629, Classification II Interior, with fine, even grain and honed finish.

2.4 CRACK ISOLATION MEMBRANE

A. General: Manufacturer's standard product, selected from the following, that complies with ANSI A118.12 for standard performance and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

B. Polyethylene Sheet: Polyethylene faced on both sides with fleece webbing; 0.008-inch nominal thickness.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Schluter Systems L.P.; KERDI.

C. Latex-Portland Cement: Flexible mortar consisting of cement-based mix and latex additive.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. C-Cure; UltraCure 971.
    b. MAPEI Corporation; Mapelastic (PRP 315).
    c. TEC; a subsidiary of H. B. Fuller Company; Triple Flex Waterproofing, Crack Isolation Membrane & Mortar.

2.5 SETTING MATERIALS

A. Medium-Bed, Latex-Portland Cement Mortar: Comply with requirements in ANSI A118.4. Provide product that is approved by manufacturer for application thickness of 5/8 inch (16 mm).

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Bonsal American; an Oldcastle company.
    b. Bostik, Inc.
    c. Jamo Inc.
    d. Laticrete International, Inc.
    e. MAPEI Corporation.
    f. Mer-Kote Products, Inc.
    g. Summitville Tiles, Inc.
    h. TEC; a subsidiary of H. B. Fuller Company.

2.6 GROUT MATERIALS

A. Polymer-Modified Sanded Tile Grout: ANSI A118.7.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Boiardi Products; a QEP company.
    b. Bonsal American; an Oldcastle company.
    c. Bostik, Inc.
    d. C-Cure.
    e. Custom Building Products.
    f. Jamo Inc.
    g. Laticrete International, Inc.
    h. MAPEI Corporation.
    i. Southern Grouts & Mortars, Inc.
    j. Summitville Tiles, Inc.
    k. TEC; a subsidiary of H. B. Fuller Company.

2. Polymer Type: Acrylic resin or styrene-butadiene rubber in liquid-latex form for addition to prepackaged dry-grout mix.

B. Water-Cleanable Epoxy Grout: ANSI A118.3.

1. Manufacturer's proprietary grout for "Tufchem" tiles (T-1). :

2.7 ELASTOMERIC SEALANTS

A. General: Provide sealants, primers, backer rods, and other sealant accessories that comply with the following requirements and with the applicable requirements in Division 07 Section "Joint Sealants."

1. Use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Use primers, backer rods, and sealant accessories recommended by sealant manufacturer.

B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints unless otherwise indicated.

C. One-Part, Mildew-Resistant Silicone Sealant: ASTM C 920; Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide, intended for sealing interior ceramic tile joints and other nonporous substrates that are subject to in-service exposures of high humidity and extreme temperatures.

1. Products: Subject to compliance with requirements, provide one of the following:

a. DAP Inc.; 100 percent Silicone Kitchen and Bath Sealant.
b. Dow Corning Corporation; Dow Corning 786.
c. GE Silicones; a division of GE Specialty Materials; Sanitary 1700.
d. Laticrete International, Inc.; Latasil Tile & Stone Sealant.
e. Pecora Corporation; Pecora 898 Sanitary Silicone Sealant.
f. Tremco Incorporated; Tremsil 600 White.

2.8 MISCELLANEOUS MATERIALS

A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

B. Metal Edge Strips: Angle or L-shape with perforated anchoring leg, height to match tile and setting-bed thickness, metallic, designed specifically for flooring applications; stainless-steel, ASTM A 666, 300 Series exposed-edge material.

1. Basis-of-Design Product: Schluter "SCHIENE".

C. Metal Edge Control Joints: Trapezoidal profile with perforated anchoring legs, stainless steel type 304, connected by 7/16-inch replaceable thermoplastic rubber strip.

1. Basis-of-Design Product: Schluter "DILEX-KSN".

D. Metal Edge Cove Joints: Trapezoid-perforated stainless steel cove section anchoring leg that turns inward, secured in the mortar bond coat.

1. Basis-of-Design Product: Schluter “DILEX-HKU”, Finish EB brushed stainless steel.

E. Temporary Protective Coating: Product indicated below that is formulated to protect exposed surfaces of tile against adherence of mortar and grout; compatible with tile, mortar, and grout products; and easily removable after grouting is completed without damaging grout or tile.
1. Grout release in form of manufacturer's standard proprietary liquid coating that is specially formulated and recommended for use as temporary protective coating for tile.

F. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

G. Grout Sealer: Manufacturer's standard product for sealing grout joints and that does not change color or appearance of grout.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Bonsal American; an Oldcastle company; Grout Sealer.
b. Bostik, Inc.; CeramaSeal Grout & Tile Sealer Siloxane 220.
c. C-Cure; Penetrating Sealer 978.
d. Custom Building Products; Grout and Tile Sealer.
e. MAPEI Corporation; KER 003, Silicone Spray Sealer for Cementitious Tile Grout .
f. Southern Grouts & Mortars, Inc.; Silicone Grout Sealer.
g. Summitville Tiles, Inc.; SL-15, Invisible Seal Penetrating Grout and Tile Sealer.
h. TEC; a subsidiary of H. B. Fuller Company; TA-256 Penetrating Silicone Grout Sealer.

2.9 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.

B. Add materials, water, and additives in accurate proportions.

C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.

1. Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
2. Verify that concrete substrates for tile floors installed with thin-set mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.

    a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
    b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.

3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thin-set mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot toward drains.

C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

D. Field-Applied Temporary Protective Coating: If indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, precoat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

3.3 TILE INSTALLATION

A. Comply with TCA's "Handbook for Ceramic Tile Installation" for TCA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108

Series "Specifications for Installation of Ceramic Tile" that are referenced in TCA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

1. For the following installations, follow procedures in the ANSI A108 Series of tile installation standards for providing 95 percent mortar coverage:
   a. Tile floors in wet areas.
   b. Tile floors composed of tiles 8 by 8 inches or larger.
   c. Tile floors composed of rib-backed tiles.

B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

D. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.

1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.

E. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
1. Paver Tile: 1/8 inch .

F. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.

G. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.

1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
2. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."

H. Stone Thresholds: Install stone thresholds in same type of setting bed as adjacent floor unless otherwise indicated.

1. At locations where mortar bed (thickset) would otherwise be exposed above adjacent floor finishes, set thresholds in latex-portland cement mortar (thin set).
2. Do not extend cleavage membrane waterproofing or crack isolation membrane under thresholds set in latex-portland cement mortar. Fill joints between such thresholds and adjoining tile set on cleavage membrane waterproofing or crack isolation membrane with elastomeric sealant.

I. Metal Edge Strips: Install at locations indicated .

J. Grout Sealer: Apply grout sealer to cementitious grout joints in tile floors according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

3.4 TILE BACKING PANEL INSTALLATION

A. Install cementitious backer units and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated. Use latex-portland cement mortar for bonding material unless otherwise directed in manufacturer's written instructions.

3.5 WATERPROOFING INSTALLATION

A. Install waterproofing to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness and bonded securely to substrate.

B. Do not install tile or setting materials over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

3.6 CRACK ISOLATION MEMBRANE INSTALLATION

A. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness and bonded securely to substrate.

B. Do not install tile or setting materials over crack isolation membrane until membrane has cured.

3.7 CLEANING AND PROTECTING

A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

1. Remove epoxy and latex-portland cement grout residue from tile as soon as possible.
2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
3. Remove temporary protective coating by method recommended by coating manufacturer and that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent drain clogging.

B. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.

C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.

D. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.8 INTERIOR TILE INSTALLATION SCHEDULE

A. Interior Floor Installations, Concrete Subfloor:

1. Tile Installation F113: Thin -set mortar; TCA F113.

a. Tile Type: T-2.
b. Thin-Set Mortar: Medium-bed, latex- portland cement mortar.
c. Grout: Polymer-modified sanded grout.

B. Interior Wall Installations, Masonry :

1. Tile Installation W202: Thin-set mortar; TCA W202.

a. Tile Type: T-3.
b. Thin-Set Mortar: Latex- portland cement mortar.
c. Grout: Polymer-modified sanded grout.

C. Interior Wall Installations, Metal Studs or Furring:

1. Tile Installation W243: Thin-set mortar on gypsum board; TCA W243.

a. Tile Type: T-3.
b. Thin-Set Mortar: Latex- portland cement mortar.
c. Grout: Polymer-modified sanded grout.

END OF SECTION 093000

SECTION 09 51 13 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes acoustical panels, and exposed suspension systems for ceilings.

B. Related Requirements:

1. Division 07 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 09 Section “Security Ceiling Assemblies” for snap-in pan and security plank security ceiling systems.

C. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete.

1.3 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable LEED Credits

1. MRc2
2. MRc4
3. MRc5
4. IEQc4.1
5. IEQc4.2

B. LEED Requirements

1. MRc2: CONSTRUCTION WASTE MANAGEMENT

   No less than the specified portion of all construction waste from the Project shall be diverted from disposal in a landfill and/or incineration in with the Project Requirements for Construction Waste Management and Disposal. Refer to Specification Sections 017419 Construction Waste Management and Disposal and 013510 Sustainable Design Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

2. MRc4: Recycled Content Material

   No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the Project Requirements for Recycled Content Materials. All materials counted towards the computations of the proportion of the Recycled Content Materials

shall comply with the standard minimum percentages of post-consumer waste materials and for the minimum percentages of pre-consumer waste materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

3. MRc5: REGIONALLY MANUFACTURED HARVESTED MATERIALS

   No less than the specified minimum proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the Project Site in accordance with the Project Requirements for Regionally Manufactured and/or Harvested Materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

4. IEQc4.1: Low Emitting Materials: Sealants and Adhesives

   All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the Project Requirements for Low Emitting Materials – Sealants and Adhesives. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

5. IEQc4.2: Low Emitting Materials: Paints and Coatings

   All paints and coatings in the building interior shall comply with the Project Requirements for Low Emitting Materials – Paints and Coatings. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show layout and details of decorative ceiling canopies. Show locations of items which are to be coordinated with canopies, including lighting fixtures, mechanical systems and sprinklers.

C. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.

   1. Acoustical Panel: Set of 6-inch- square Samples of each type, color, pattern, and texture.
   2. Exposed Suspension-System Members, Moldings, and Trim: Set of 6-inch- long Samples of each type, finish, and color.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Suspended ceiling components.
2. Structural members to which suspension systems will be attached.
3. Size and location of initial access modules for acoustical panels.
4. Items penetrating finished ceiling including the following:

    a. Lighting fixtures.
    b. Air outlets and inlets.
    c. Speakers.
    d. Sprinklers.
    e. Access panels.

5. Perimeter moldings.

B. Qualification Data: For testing agency.

C. Product Test Reports: For each acoustical panel ceiling, for tests performed by manufacturer and witnessed by a qualified testing agency .

D. Evaluation Reports: For each acoustical panel ceiling suspension system and anchor and fastener type, from ICC-ES.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For finishes to include in maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Acoustical Ceiling Panels and Acoustical Metal Panels: Full-size panels equal to 1 percent of quantity installed, but not less than one box..
2. Suspension-System Components: Quantity of each exposed component equal to 1 percent of quantity installed.
3. Retention Clips: Equal to 1 percent of quantity installed.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels, acoustical metal panels, decorative ceiling canopies, suspension-system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing panels and canopoies, permit them to reach room temperature and a stabilized moisture content.

C. Handle panels and canopies carefully to avoid chipping edges or damaging units in any way.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: Comply with ASTM E 1264 for Class A materials.
2. Smoke-Developed Index: 50 or less.

2.2 ACOUSTICAL PANELS, GENERAL

A. Low-Emitting Materials: Acoustical panel ceilings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system from single source from single manufacturer.

C. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances unless otherwise indicated.

1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches away from test surface according to ASTM E 795.

D. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.

2.3 ACOUSTICAL PANELS ”ACT-3”

A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong World Industries, Inc., “Ultima Square Lay-In,” Item #1910 or comparable product by one of the following:

1. CertainTeed Corp.
2. USG Interiors, Inc.; Subsidiary of USG Corporation.

B. Classification: Provide panels complying with ASTM E 1264 for type, form, and pattern as follows:

1. Type and Form: Type IV, mineral base with membrane-faced overlay; Form 2, water felted; painted finish .
2. Pattern: E (lightly textured) .

C. Color: White .

D. LR: Not less than 0.90 .

E. NRC: Not less than 0.70 .

F. CAC: Not less than 35 .

G. Edge/Joint Detail: Square .

H. Thickness: 3/4 inch .

I. Modular Size: 24 by 24 inches .

J. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical panels treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.

K. Sag Resistance: Acoustical units designed to retain dimensional stability and not to sag in high-temperature (as high as 104 deg F and high-humidity (90 to 100% relative humidity).

2.4 ACOUSTICAL PANELS ”ACT-1”

A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong World Industries, Inc., “Ultima Tegular,” Item #1912 HRC or comparable product by one of the following:

1. CertainTeed Corp.
2. USG Interiors, Inc.; Subsidiary of USG Corporation.

B. Classification: Provide panels complying with ASTM E 1264 for type, form, and pattern as follows:

1. Type and Form: Type IV, mineral base with membrane-faced overlay; Form 2, water felted; painted finish.
2. Pattern: E (lightly textured).

C. Color: White.

D. LR: Not less than 0.90.

E. NRC: Not less than 0.70.

F. CAC: Not less than 35.

G. Edge/Joint Detail: Reveal sized to fit flange of exposed suspension-system members.

H. Thickness: 3/4 inch.

I. Modular Size: 24 by 24 inches.

J. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical panels treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.

K. Sag Resistance: Acoustical units designed to retain dimensional stability and not to sag in high-temperature (as high as 104 degrees F and 90 to 100% relative humidity).

L. Recycled Content: Units manufactured with recycled content of 65% pre-consumer, 15% post-consumer.

2.5 ACOUSTICAL PANELS ”ACT-2”

A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong World Industries, Inc., “Health Zone Ultima Square Lay-In,” Item #1935, or comparable product by one of the following:

1. CertainTeed Corp..
2. USG Interiors, Inc.; Subsidiary of USG Corporation.

B. Classification: Provide panels complying with ASTM E 1264 for type, form, and pattern as follows:

1. Type and Form: Type IV, mineral base with water-repellent membrane-faced overlay; Form 2, water felted; painted finish.
2. Pattern: E (lightly textured).

C. Color: White.

D. LR: Not less than 0.86.

E. NRC: Not less than 0.70.

F. CAC: Not less than 35.

G. Edge/Joint Detail: Square.

H. Thickness: 3/4 inch.

I. Modular Size: 24 by 24 inches.

J. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical panels treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.

K. Sag Resistance: Acoustical units designed to retain dimensional stability and not to sag in high-temperature (as high as 104 deg F and high-humidity--90 to 100% relative humidity).

2.6 METAL SUSPENSION SYSTEMS, GENERAL

A. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 80 percent at suspension systems for ACT-1, ACT-2. ACT-3.

B. Metal Suspension-System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635/C 635M.

C. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

1. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing according to ASTM E 488 or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency.

    a. Type: Postinstalled expansion anchors.
    b. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (0.005 mm) for Class SC 1 service condition.
    c. Corrosion Protection: Components fabricated from nickel-copper-alloy rods complying with ASTM B 164 for UNS No. N04400 alloy.

2. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing according to ASTM E 1190, conducted by a qualified testing and inspecting agency.

D. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:

1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
2. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635/C 635M, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.135-inch- diameter wire.

E. Retention Clips: Where indicated, provide manufacturer's standard impact-clip system designed to absorb impact forces against acoustical panels.

2.7 METAL SUSPENSION SYSTEM (at ACT-1, ACT-2, ACT-3)

A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong World Industries, Inc., “Prelude XL High Recycled Content (HRC) 15/16” Exposed Tee System” or comparable product by one of the following:

1. Chicago Metallic Corporation.
2. USG Interiors, Inc.; Subsidiary of USG Corporation.

B. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, not less than G30 coating designation; with prefinished 15/16-inch- wide metal caps on flanges.

1. Structural Classification: Heavy-duty system.
2. End Condition of Cross Runners: Override (stepped) type.
3. Face Design: Flat, flush.
4. Cap Material: Steel cold-rolled sheet.
5. Cap Finish: Painted white .

2.8 METAL EDGE MOLDINGS AND TRIM

A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong World Industries, Inc., “Prelude XL XL 15/16” Exposed Tee System“ or comparable product by one of the following:

1. Chicago Metallic Corporation.
2. Fry Reglet Corporation.
3. USG Interiors, Inc.; Subsidiary of USG Corporation.

B. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.

1. Provide manufacturer's standard edge moldings that fit acoustical panel edge details and suspension systems indicated and that match width and configuration of exposed runners unless otherwise indicated.
2. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member .
3. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

2.9 ACOUSTICAL SEALANT

A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1. Acoustical Sealant for Exposed and Concealed Joints:

a. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.
b. USG Corporation; SHEETROCK Acoustical Sealant.

2. Acoustical Sealant for Concealed Joints:

    a. Henkel Corporation; OSI Pro-Series SC-175 Acoustical Sound Sealant.
    b. Pecora Corporation; AIS-919.
    c. Tremco, Inc.; Tremco Acoustical Sealant.

B. Acoustical Sealant: Manufacturer's standard sealant complying with ASTM C 834 and effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

1. Exposed and Concealed Joints: Nonsag, paintable, nonstaining latex sealant.
2. Concealed Joints: Nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant.
3. Acoustical sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

A. General: Install acoustical panel ceilings to comply with ASTM C 636/C 636M and seismic design requirements indicated, according to manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

B. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
5. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
6. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
7. Do not attach hangers to steel deck tabs.
8. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
9. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.

C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.

D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.

1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

F. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.

1. Arrange directionally patterned acoustical panels as follows:

    a. As indicated on reflected ceiling plans.

2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension-system runners and moldings.
3. For reveal-edged panels on suspension-system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
4. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.

5. Install retention clips in areas indicated, in areas required by authorities having jurisdiction, and for fire-resistance ratings; space as recommended by panel manufacturer's written instructions unless otherwise indicated.
6. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

G. Install decorative ceiling canopies and suspension systems in accordance with manufacturer’s instructions and in compliance with authorities having jurisdiction.

1. Coordinate panel layout with mechanical, electrical and sprinkler fixtures.

3.4 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095113

SECTION 095753 - SECURITY CEILING ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Downward-locking-panel security ceiling systems.
2. Security-plank security ceiling systems.

B. Related Sections:

1. Division 03 Section "Cast-in-Place Concrete" for installing built-in anchors for attaching suspension system to concrete roof slabs and for attaching perimeter supports to walls.
2. Division 04 Section "Unit Masonry" for built-in anchors for perimeter supports in masonry construction.
3. Division 05 Section "Steel Decking" for installing hanger accessories for attaching suspension systems to steel decks.
4. Division 07 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
5. Division 09 painting Sections for field painting security-plank security ceiling systems.
6. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.
7. Division 21, 23 and 26 Sections for mechanical and electrical work penetrating security ceiling systems.

1.3 PERFORMANCE REQUIREMENTS

A. General Performance: Security ceiling systems shall withstand normal thermal movement and structural loads without failure, including permanent deformation of security ceiling system components including pans and suspension system; noise or metal fatigue caused by vibration, deflection, and displacement of security ceiling units; and permanent damage to fasteners and anchors.

B. Acoustical Performance: Provide security ceiling systems with acoustical ratings indicated, as determined according to ASTM E 1264 and the following:

1. Noise Reduction Coefficient: ASTM C 423 and ASTM E 795 in Type E-400 mounting.
2. Ceiling Attenuation Class: ASTM E 1414.

C. Structural Performance: Security ceiling systems shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1.4 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable LEED Credits

1. MRc2
2. MRc4
3. MRc5
4. IEQc4.1

B. LEED Requirements

1. MRc2: CONSTRUCTION WASTE MANAGEMENT

   No less than the specified minimum proportion of all construction waste from the project shall be diverted from disposal in a landfill and/or incineration in accordance with the project requirements for Construction Waste Management. See Section 018113 Sustainable Design Requirements.

2. MRc4: Recycled Content Material

   No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the project requirements for Recycled Content Materials. All materials counted toward the computation of the proportion of the Recycled Content Materials shall comply with the standard for the minimum percentages of post-consumer waste materials and for the minimum percentage of pre-consumer waste materials. See Section 018113 Sustainable Design Requirements.

   Contractor shall provide LEED credit verification as per section 013300 Submittal Procedures.

3. MRc5: Regionally manufactured harvested materials

   No less than the specified proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the project site in accordance with the project requirements for Regionally Manufactured and/or Harvested Materials. See Section 018113 Sustainable Design Requirements.

   Contractor shall provide LEED credit verification as per section Section 013300 Submittal Procedures.

4. EQc4.1: Low-Emitting Materials – Sealants and Adhesives

   All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the project requirements for Low-Emitting Materials – Sealants and Adhesives. See Section 018113 Sustainable Design Requirements.

   Contractor shall provide LEED credit verification as per Section 013300 Submittal Procedures.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Verification: For the following products, of size indicated below:

1. Security Ceiling Panel Units: Full cross section by 12 inches long for each type of panel.
2. Perimeter Supports, Closures, and Exposed Molding: 12 inches long for each type.
3. Suspension System: 12 inches long.

1.6 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans drawn, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Layout of panels, joint pattern, transitions.
2. Security ceiling system suspension assembly members.
3. Method of attaching hangers to building structure.
4. Size and location of access panels.
5. Ceiling-mounted items including light fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
6. Minimum Drawing Scale: 1/8 inch = 1 foot .

B. Qualification Data: For qualified Installer.

C. Welding certificates.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each security ceiling system.

E. Research/Evaluation Reports: For security ceiling system, from ICC-ES.

F. Field quality-control reports documenting inspections of installed products.

G. Other Informational Submittals:

1. Examination reports documenting inspection of substrates, areas, and conditions.
2. Anchor inspection reports documenting inspections of built-in and cast-in anchors.
3. Field quality-control certification signed by Contractor.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

B. Source Limitations: Obtain each security ceiling system from single source from single manufacturer.

C. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
3. AWS D1.3, "Structural Welding Code - Sheet Steel."
4. AWS D1.6, "Structural Welding Code - Stainless Steel."

D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate security performance and aesthetic effects and set quality standards for materials and execution.

1. Build 48-by-48-inch- square mockup of each type of security ceiling system. Include ceiling panels, suspension system, perimeter support, lighting unit, duct penetration, access panel, and accessories.
2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

E. Preinstallation Conference: Conduct conference at Project site .

F. Coordination Meetings: Conduct coordination meetings at Project site to comply with requirements in Division 01 Section "Special Project Procedures for Detention Facilities."

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical metal panels, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Handle acoustical metal panels, suspension system components, and accessories carefully to avoid damaging units and finishes in any way.

1.9 COORDINATION

A. Coordinate layout and installation of security ceiling systems with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.10 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Security Ceiling Panels: Full-size units equal to 2.0 percent of amount installed.
2. Suspension System Components: Quantity of each grid and exposed component equal to 2.0 percent of amount installed.
3. Security Fasteners: Furnish not less than 1 box for each 50 boxes or fraction thereof, of each type and size of security fastener installed.
4. Tools: Provide two sets of tools for installing and removing security fasteners, packaged for easy handling and storage.

1.11 COMMISSIONING

A. The materials, components and systems described in this section are subject to the Commissioning process. Contractor must comply with all Commissioning Requirements. Commissioning Requirements are described in Section 019113 General Commissioning Requirements and in Division 36 Commissioning. Division 36 provides an individual Commissioning specification section for each Division 2 through Division 33 specification section requiring Commissioning.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Recycled Content: Provide products made from steel with average recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

B. Steel Sheet: Uncoated or electrolytic zinc-coated, ASTM A 591/A 591M with cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.

C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, CS (Commercial Steel), Type B; with G60 zinc (galvanized) or A60 zinc-iron-alloy (galvannealed) coating designation.

D. Steel Tubing: ASTM A 513, Type B.

E. Stainless-Steel Sheet: ASTM A 666, Type 302 or 304.

F. Aluminum Sheet: ASTM B 209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, as standard with manufacturer.

G. Concealed Bolts: ASTM A 307, Grade A, unless otherwise indicated.

H. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

I. Attachment Devices: Size for 5 times the design load indicated in ASTM C 635, Table 1, Direct Hung, unless otherwise indicated.

1. Cast-in-Place and Postinstalled Expansion Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to 5 times the load imposed by security ceiling construction, as determined by testing per ASTM E 488, conducted by a qualified testing agency.

a. Type: Postinstalled expansion and Chemical anchors.
b. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (0.005 mm) for Class SC service condition (mild).
c. Corrosion Protection: Stainless-steel components complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 for bolts and nuts; ASTM A 666 or ASTM A 276, Type 304 or 316, for anchors.

d. Corrosion Protection: Components fabricated from nickel-copper-alloy rods complying with ASTM B 164 for UNS No. N04400 alloy.

2. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to 10 times the load imposed by security ceiling construction, as determined by testing per ASTM E 1190, conducted by a qualified testing and inspecting agency.

2.2 DOWNWARD-LOCKING-PANEL SECURITY CEILING SYSTEM (SCS-1)

A. Provide a complete, integrated system, including security ceiling panels, exposed suspension system, perimeter supports, and accessories.

1. Manufacturers: Subject to compliance with requirements, by one of the following:

a. Chicago Metallic Corporation; MetaLine Security Metal Ceiling System.
b. Gordon, Inc; Lockdown Suspended Metal Panel Ceiling System.
c. Steel Ceilings Inc; Defender Security Panels.
d. Chief Correctional Products.
e. Habersham Metal Products Company

B. Panels: Fabricated from a single sheet of metal, with formed upturned edges on all four sides designed to continuously engage with and lock under rectangular bulb of suspension system.

1. Steel Panels: Electrolytic zinc-coated steel with minimum uncoated sheet thickness of 0.048 inch .

a. Finish: Factory-applied, powder coating .

2. Panel Size: 24 by 24 inches .
3. Perforation Pattern: Perforated .
4. Noise Reduction Coefficient (NRC): NRC 0.95 .

C. Sound-Absorptive Pads: Provide sound-absorptive pads for placement over ceiling panels.

1. Spacer Grids: Metallic-coated-steel grid units that provide an air cushion between security ceiling panels and sound-absorptive pads and that act to improve sound absorption.
2. Support Clips: Metal clips designed to hold sound-absorptive pads above bottom face sheet.

D. Backer Plates: Unperforated units formed from metallic-coated steel sheet that reduces travel of sound through panel and that makes panel assembly comply with the following performance:

1. Ceiling Attenuation Class (CAC): CAC 40 .
2. Sound-Absorptive Pads: Provide secondary sound-absorptive pads, same as specified for primary pads, for placement over backer plates to reduce plenum sound.

E. Suspension System: ASTM C 635, heavy-duty exposed system consisting of snap-in main runners supported by hangers attached to building structure.

1. Provide system complete with main runners, splice plates, connector and alignment clips, hangers, trim, seismic- and wind-load clips and struts, and other suspension components required to support security ceiling units and other security ceiling-supported construction.
2. Main Runners and Cross Tees: Formed from metal sheet, 1-1/2 inches high, with 15/16-inch flange width and with oversized rectangular bulb for engaging panels.

    a. Material: Electrolytic zinc-coated steel, 40Z zinc coating .

3. Wire Hangers, Braces, and Ties: Zinc-coated carbon-steel wire, ASTM A 641/A 641M, Class 1 zinc coating, soft temper.

    a. Size: Select wire diameter so its stress at 3 times the hanger design load (ASTM C 635, Table 1, Direct Hung) will be less than yield stress of wire, but provide not less than 0.106-inch- diameter wire.

4. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.
5. Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.
6. Angle Hangers: Angles with legs not less than 7/8 inch wide, formed with 0.04-inch- thick, galvanized-steel sheet, G90 zinc coating, with bolted connections and 5/16-inch- diameter bolts.
7. Compression Struts: Fabricated from 3/4-inch- diameter steel tubing, designed to fit over rectangular bulb of suspension system.
8. Security Clips: Steel wire, designed to slip over suspension system and through holes in flanges of panel to prevent panel removal.

F. Perimeter Supports: Wall-mounted channel moldings and wall angles; fabricated from 0.018-inch- thick galvanized steel ; finished to match suspension system.

G. Exposed Edge Moldings and Trim: Provide exposed members as indicated or required for edges of security ceiling, fixture trim, beams, fasciae at changes in security ceiling height, and other conditions; of metal and finish matching security ceiling panels.

2.3 SECURITY-PLANK SECURITY CEILING SYSTEM (SCS-2 & SCS-3)

A. Single-Configuration Panels (SC-2): Fabricated from a single sheet of metal, with a self-locking male/female lap joint for joining panels.

1. Products: Subject to compliance with requirements, by one of the following:

    a. Chicago Metallic Corporation; SecurLine Security Plank Ceiling System.
    b. DDS Group; 7900 Security Ceiling System.
    c. Eckel Industries Inc; Eckoustic Security Ceiling.
    d. Gordon, Inc; Celline Suspended Metal Security Plank Ceiling System.
    e. Steel Ceilings Inc; Metal Plank Security Ceiling System.
    f. Habersham Metal Products Company; Detention Security Ceiling Panels
    g. Chief Correctional Products.

2. Steel Panels: Electrolytic zinc-coated steel with minimum uncoated sheet thickness of 16 Gauge

3. Panel Width: 24 inches (610 mm).
4. Panel Length: Custom lengths to fit areas indicated.
5. Perforation Pattern: Manufacturer's standard.
6. Noise Reduction Coefficient: 0.95.

B. Double-Configuration Panels: Factory-assembled units with cold-rolled steel top face sheet and metallic-coated steel bottom face sheet, welded to a truss core. Fabricate panels with a self-locking male/female lap joint for joining panels.

1. Products: Subject to compliance with requirements, by one of the following::

   a. Epic Metals Corporation; EPIC Acoustical Security Ceiling System .
   b. Habersham Metal Products Company; Detention Security Ceiling Panels

2. Panel Width: 24 inches wide by length indicated.
3. Overall Panel Thickness: As required by indicated spans .
4. Minimum Uncoated Top Face Sheet Thickness: 0.068 inch .
5. Minimum Uncoated Bottom Face Sheet Thickness: 0.068 inch .
6. Truss Core: Fabricated from 0.015-inch- thick, cold-rolled steel sheet bent into corrugated shape; welded to top and bottom face sheets at even spacings across and along length of panel.
7. Perforation Pattern for Bottom Face Sheet: Perforated .
8. Noise Reduction Coefficient (NRC): NRC 0.75 .
9. Finish of Bottom Face: Factory-applied prime paint.

C. Sound-Absorptive Pads: Provide sound-absorptive pads for placement over ceiling planks.

1. Spacer Grids: Metallic-coated-steel grid units that provide an air cushion between security ceiling panels and sound-absorptive pads and that act to improve sound absorption.
2. Support Clips: Metal clips designed to hold sound-absorptive pads above bottom face sheet.

D. Backer Plates: Unperforated units formed from metallic-coated steel sheet that reduces travel of sound through panel and that makes panel assembly comply with the following performance:

1. Ceiling Attenuation Class (CAC): CAC 40 .
2. Sound-Absorptive Pads: Provide secondary sound-absorptive pads, same as specified for primary pads, for placement over backer plates to reduce plenum sound.

E. Closures: Fabricated from minimum 0.053-inch- thick steel sheet, finished to match security ceiling panels. Fasten with security fasteners or by welding.

F. Suspension System: Heavy-duty exposed system consisting of intermediate carriers supported by secondary support system attached to building structure.

1. Intermediate Carriers: Formed from tees with a nominal 4-inch- wide exposed face or built up from back-to-back angles or channels each with a nominal 2-inch-wide exposed face; fabricated from 0.068-inch- thick, cold-rolled steel sheet.

   a. Finish: Match security ceiling panels.

2. Secondary Support System:

    a. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.

G. Perimeter Supports: Wall-mounted angles, tees, and bearing plates; fabricated from minimum 0.068-inch- thick, cold-rolled steel sheet; finished to match security ceiling panels.

H. Exposed Edge Moldings and Trim: Provide exposed members as indicated or required for edges of security ceiling, fixture trim, beams, fasciae at changes in security ceiling height, and other conditions, of metal and finish matching security ceiling panels.

2.4 SOUND-ABSORPTIVE PADS

A. Plastic-Sheet-Wrapped, Mineral-Fiber Insulation: Pads consisting of nonrigid, vinyl chloride plastic sheet encapsulating unfaced mineral-fiber insulation.

1. Plastic Sheet: Not less than 0.003 inch thick; flat black.
2. Mineral Fiber: Glass fiber or fiber made from slag (mineral wool), complying with ASTM C 553, Type I, II, or III.

    a. Recycled Content: Provide mineral fiber with recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content constitutes a minimum of 70 percent by weight.
    b. Thickness: As required to meet NRC rating.

3. Mineral-Fiber Density: As required to meet NRC rating.
4. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

    a. Flame-Spread Index: 25 or less.
    b. Smoke-Developed Index: 50 or less..

2.5 SEALANTS

A. See 07 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.

B. Acoustical Sealant for Concealed Joints: Manufacturer's standard nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant, with a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24), recommended for sealing interior concealed joints to reduce airborne sound transmission.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. OSI Sealants, Inc.; Pro-Series SC-170 Rubber Base Sound Sealant.
    b. Pecora Corporation; BA-98.
    c. Tremco, Inc.; Tremco Acoustical Sealant.

2.6 FABRICATION

A. Panels: Form metal panels from sheet metals selected for their surface flatness, smoothness, and freedom from surface blemishes where exposed to view in finished unit. Do not use materials whose exposed surfaces exhibit pitting, seam marks, roller marks, or variations in flatness exceeding those permitted by referenced standards for stretcher-leveled metal sheet.

1. Factory fabricate double-configuration security planks and join top and bottom face sheets by welding.

2.7 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in the same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.8 STEEL SHEET FINISHES

A. Surface Preparation: Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning" or SSPC-SP 8, "Pickling". After cleaning, apply a conversion coating suited to the organic coating to be applied over it.

B. Factory Prime Finish: After surface preparation and pretreatment, apply manufacturer's standard, fast-curing, lead- and chromate-free, universal primer.

C. Baked-Enamel or Powder-Coat Finish: After cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils (0.05 mm).

1. Color and Gloss: Manufacturer's standard white.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of security ceiling systems.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations of security ceiling system connections before security ceiling system installation.

C. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of security ceiling systems.

D. Inspect built-in and cast-in anchor installations before installing security ceiling systems to verify that anchor installations comply with requirements. Prepare inspection reports.

1. Remove and replace anchors where inspections indicate noncompliance with specified requirements. Reinspect after repair or replacement.
2. Perform additional inspections to determine compliance of replaced or additional work. Prepare inspection reports.

E. Verify locations and layouts of security ceiling systems with those indicated on reflected ceiling plans and Coordination Drawings.

F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Coordination: Furnish layouts for cast-in-place anchors, clips, and other security ceiling anchors whose installation is specified in other Sections.

1. Furnish cast-in-place anchors and similar devices to other trades for installation well in advance of time needed for coordinating other work.

B. Measure each security ceiling area and establish layout of security ceiling panels to balance border widths at opposite edges of each security ceiling. Avoid using less-than-half-width panels at borders and comply with layout shown on reflected ceiling plans and Coordination Drawings.

3.3 GENERAL INSTALLATION

A. Comply with CISCA's "Ceiling Systems Handbook" for installation of security ceiling systems.

B. Install perimeter supports around perimeter of security ceiling area.

1. Apply security sealant in a continuous ribbon concealed on back of vertical legs of supports before they are installed.
2. Attach supports with anchor bolts or expansion anchors spaced not more than 12 inches o.c. and not more than 3 inches from ends. Miter corners accurately.

a. Level perimeter supports with suspension system to a tolerance of 1/8 inch in 12 feet.

3. Do not use exposed fasteners, including pop rivets, on moldings and trim. If exposed fasteners are unavoidable, obtain approval from Architect for their use and use security fasteners.

C. Install accessories where indicated and as required to comply with performance requirements.

1. Sound-Absorptive Pads: For security ceiling panels indicated, provide sound-absorptive pads of width and length to completely fill inside of each security ceiling panel.

    a. Install sound-absorptive pads over metal spacer grids with support clips.

2. Backer Plates: Install plates in areas indicated on reflected ceiling plans or in room finish schedules. Lay backer plates directly on security ceiling system in manner indicated and close major openings to form complete coverage in required areas.

3.4 DOWNWARD-LOCKING-PANEL SECURITY CEILING SYSTEM INSTALLATION

A. Comply with ASTM C 636 and seismic requirements indicated, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

B. Ceiling Hangers: Suspend from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within security ceiling plenum that are not part of supporting structure or of security ceiling suspension system.
2. Splay hangers only where required to avoid obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
4. Secure wire hangers to security ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
5. Do not support security ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
6. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
7. Do not attach hangers to steel deck tabs.
8. Do not attach hangers to steel roof deck. Attach hangers to structural members.
9. Space hangers not more than 48 inches o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
10. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
11. Install compression struts extending from main runners to structure above and spaced at 48 inches o.c.

C. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

D. Panel Installation: Install panels to continuously engage with and lock under rectangular bulb of suspension system. Attach panels to perimeter supports with

security fasteners not more than 3 inches from edges of panel. Fasten through exposed face of supports into panel.

1. Align joints in adjacent courses to form uniform, straight joints parallel to room axis in both directions unless otherwise indicated.
2. Fit adjoining units to form flush, tight joints. Scribe and cut units for accurate fit at borders and around construction penetrating security ceiling.
3. Install directionally patterned panels in directions indicated.
4. Scribe and cut security ceiling panels for accurate fit at borders and at interruptions and penetrations by other work through security ceilings. Stiffen edges of cut panels as required to eliminate evidence of buckling or variations in flatness.

3.5 SECURITY-PLANK SECURITY CEILING SYSTEM INSTALLATION

A. Install security planks with long edges continuously interlocked. Adjust security planks to final position before permanently fastening. Provide minimum 1-1/2-inch end bearing.

1. Attach adjacent security planks to each other with security fasteners spaced not more than 12 inches o.c. and not more than 6 inches from ends.
2. Continuously weld ends of security planks to perimeter supports. Remove exposed projecting burrs, edges, and rough spots resulting from welding operations by grinding smooth.
3. Attach ends of security planks to perimeter supports with security fasteners not more than 3 inches from edges of security plank. Fasten through exposed face of supports into security planks.
4. Provide intermediate carriers for ends of security planks that are not supported by perimeter supports. To attach security planks to intermediate carriers, use same method as that used for attaching security planks to perimeter supports.

    a. Support intermediate carriers from structure above by secondary support system spaced at 48 inches o.c. and bolted to carriers.

B. Install each access panels within one security plank and attach by continuously welding access panel frame to security plank.

C. Provide steel angle reinforcement on each side of openings that exceed 12 inches in any direction.

3.6 FIELD QUALITY CONTROL

A. Special Inspections: Engage a qualified special inspector to perform the following special inspections:

1. Suspended ceiling system.
2. Hangers, anchors, and fasteners.
3. Insert special inspections.

B. Inspect installed products to verify compliance with requirements. Prepare inspection reports and indicate compliance with and deviations from the Contract Documents.

C. Remove and replace security ceiling systems where inspections indicate that work does not comply with specified requirements.

D. Perform additional inspections to determine compliance of replaced or additional work. Prepare inspection reports.

E. Prepare field quality-control certification that states installed products and their installation comply with requirements in the Contract Documents.

F. Field Quality-Control Testing: Engage a qualified independent testing agency to perform field quality-control testing.

G. Extent and Testing Frequency: Testing will take place in successive stages in areas described below. Proceed with installation of security ceiling systems only after test results for previously installed hangers comply with requirements.

1. Extent of Each Test Area: When installation of security ceiling suspension systems on each floor has reached 20 percent completion but no security panel units have been installed.
2. Within each test area, testing agency will select 1 of every 10 powder-actuated fasteners and postinstalled anchors used to attach hangers to concrete and will test them for 200 lbf of tension; it will also select 1 of every 2 postinstalled anchors used to attach bracing wires to concrete and will test them for 440 lbf of tension.
3. When testing discovers fasteners and anchors that do not comply with requirements, testing agency will test those fasteners and anchors not previously tested until 20 consecutively pass and then will resume initial testing frequency.

H. Fasteners and anchors will be considered defective if they do not pass tests and inspections.

I. Prepare test and inspection reports.

J. Additional Testing: Where fasteners and anchors are removed and replaced, additional testing will be performed to determine compliance with specified requirements.

3.7 CLEANING

A. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage, including dented and bent units.

B. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as that used for shop painting; comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum dry film thickness of 2 mils.

C. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 09 painting Sections.

D. Metallic-Coated Steel Surfaces: Clean field welds, bolted connections, and abraded areas and repair zinc or zinc-iron coating to comply with ASTM A 780.

END OF SECTION 095753

SECTION 09 65 13 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Resilient base.
2. Resilient molding accessories.

B. Related Sections:

1. Division 07 section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 09 Section "Resilient Sheet Flooring" for resilient sheet flooring.
3. Division 09 Section "Fluid-Applied Athletic Flooring" for resilient floor coverings for use in athletic-activity or support areas.

1.3 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable LEED Credits

1. MRc2
2. MRc4
3. MRc5
4. IEQc4.1
5. IEQc4.2
6. IEQc4.3

B. LEED Requirements

1. MRc2: CONSTRUCTION WASTE MANAGEMENT

   No less than the specified portion of all construction waste from the Project shall be diverted from disposal in a landfill and/or incineration in with the Project Requirements for Construction Waste Management and Disposal. Refer to Specification Sections 017419 Construction Waste Management and Disposal and 013510 Sustainable Design Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

2. MRc4: Recycled Content Material

   No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the

Project Requirements for Recycled Content Materials. All materials counted towards the computations of the proportion of the Recycled Content Materials shall comply with the standard minimum percentages of post-consumer waste materials and for the minimum percentages of pre-consumer waste materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

3. MRc5: REGIONALLY MANUFACTURED HARVESTED MATERIALS

   No less than the specified minimum proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the Project Site in accordance with the Project Requirements for Regionally Manufactured and/or Harvested Materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

4. IEQc4.1: Low Emitting Materials: Sealants and Adhesives

   All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the Project Requirements for Low Emitting Materials – Sealants and Adhesives. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

5. IEQc4.2: Low Emitting Materials: Paints and Coatings

   All paints and coatings in the building interior shall comply with the Project Requirements for Low Emitting Materials – Paints and Coatings. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

6. IEQc4.3: Low Emitting Materials: Flooring Systems

   All flooring finish materials installed in the building interior shall meet or exceed the project requirements for Low Emitting Materials – Flooring Systems. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Initial Selection: For each type of product indicated.

C. Samples for Verification: For each type of product indicated, in manufacturer's standard-size Samples but not less than 12 inches (300 mm) long, of each resilient product color, texture, and pattern required.

D. Product Schedule: For resilient products. Use same designations indicated on Drawings.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain resilient floor treads and rubber floor tile from same manufacturer.

B. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C).

1.7 PROJECT CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C) , in spaces to receive resilient products during the following time periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C) .

C. Install resilient products after other finishing operations, including painting, have been completed.

1.8 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Furnish not less than 10 linear feet (3 linear m) for every 500 linear feet (150 linear m) or fraction thereof, of each type, color, pattern, and size of resilient product installed.

PART 2 - PRODUCTS

2.1 RESILIENT BASE

A. Resilient Base:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Allstate Rubber Corp.; Stoler Industries.
b. Armstrong World Industries, Inc.
c. Burke Mercer Flooring Products; Division of Burke Industries, Inc.
d. Endura Rubber Flooring; Division of Burke Industries, Inc.
e. Flexco, Inc.
f. Johnsonite.
g. Mondo Rubber International, Inc.
h. Musson, R. C. Rubber Co.
i. Roppe Corporation, USA.

B. Resilient Base Standard: ASTM F 1861.

1. Material Requirement: Type TS (rubber, vulcanized thermoset) .
2. Manufacturing Method: Group I (solid, homogeneous) .
3. Style: Cove (base with toe) .

C. Minimum Thickness: 0.125 inch (3.2 mm).

D. Height: 4 inches (102 mm)

E. Lengths: Coils in manufacturer's standard length (120' coils).

F. Outside Corners: Job formed .

G. Inside Corners: Job formed .

H. Finish: Matte .

I. Colors and Patterns: As selected by Architect from manufacturers' full range of colors.

2.2 RESILIENT MOLDING ACCESSORY

A. Resilient Molding Accessory:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following :

a. Burke Mercer Flooring Products; Division of Burke Industries, Inc.
b. Flexco, Inc.
c. Johnsonite.
d. R.C.A. Rubber Company (The).
e. Roppe Corporation, USA.
f. VPI, LLC; Floor Products Division.

B. Description: Carpet edge for glue-down applications Reducer strip for resilient floor covering Joiner for tile and carpet Transition strips .

C. Material: Rubber.

D. Profile and Dimensions: As indicated.

E. Colors and Patterns: As selected by Architect from full range of industry colors.

2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.

1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

a. Cove Base Adhesives: Not more than 50 g/L.
b. Rubber Floor Adhesives: Not more than 60 g/L.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates for Resilient Stair Treads and Accessories: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer.
4. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after substrates pass testing.

a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install resilient products until they are same temperature as the space where they are to be installed.

1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.3 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Job-Formed Corners:

1. Outside Corners: Use straight pieces of maximum lengths possible. Form without producing discoloration (whitening) at bends.
2. Inside Corners: Use straight pieces of maximum lengths possible.

3.4 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of carpet and resilient floor covering that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.

B. Perform the following operations immediately after completing resilient product installation:

1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Cover resilient products until Substantial Completion.

END OF SECTION 096513

SECTION 09 65 16 - RESILIENT SHEET FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes homogeneous vinyl sheet flooring.

1.3 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable LEED Credits

1. MRc2
2. MRc4
3. MRc5
4. IEQc4.1
5. IEQc4.2
6. IEQc4.3

B. LEED Requirements

1. MRc2: CONSTRUCTION WASTE MANAGEMENT

   No less than the specified portion of all construction waste from the Project shall be diverted from disposal in a landfill and/or incineration in with the Project Requirements for Construction Waste Management and Disposal. Refer to Specification Sections 017419 Construction Waste Management and Disposal and 013510 Sustainable Design Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

2. MRc4: Recycled Content Material

   No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the Project Requirements for Recycled Content Materials. All materials counted towards the computations of the proportion of the Recycled Content Materials shall comply with the standard minimum percentages of post-consumer waste materials and for the minimum percentages of pre-consumer waste materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

3. MRc5: REGIONALLY MANUFACTURED HARVESTED MATERIALS

No less than the specified minimum proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the Project Site in accordance with the Project Requirements for Regionally Manufactured and/or Harvested Materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

4. IEQc4.1: Low Emitting Materials: Sealants and Adhesives

   All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the Project Requirements for Low Emitting Materials – Sealants and Adhesives. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

5. IEQc4.2: Low Emitting Materials: Paints and Coatings

   All paints and coatings in the building interior shall comply with the Project Requirements for Low Emitting Materials – Paints and Coatings. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

6. IEQc4.3: Low Emitting Materials: Flooring Systems

   All flooring finish materials installed in the building interior shall meet or exceed the project requirements for Low Emitting Materials – Flooring Systems. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For each type of flooring. Include flooring layouts, locations of seams, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.

   1. Show details of special patterns.

C. Samples: For each exposed product and for each color and texture specified in manufacturer's standard size, but not less than 6-by-9-inch (150-by-230-mm) sections.

   1. For heat-welding bead, manufacturer's standard-size Samples, but not less than 9 inches (230 mm) long, of each color required.

D. Samples for Initial Selection: For each type of resilient sheet flooring indicated.

E. Samples for Verification: In manufacturer's standard size, but not less than 6-by-9-inch (150-by-230-mm) sections of each different color and pattern of resilient sheet flooring required.

   1. For heat-welding bead, manufacturer's standard-size Samples, but not less than 9 inches (230 mm) long, of each color required.

F. Welded-Seam Samples: For seamless-installation technique indicated and for each resilient sheet flooring product, color, and pattern required; with seam running lengthwise and in center of 6-by-9-inch (150-by-230-mm) Sample applied to a rigid backing and prepared by Installer for this Project.

G. Product Schedule: For resilient sheet flooring. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of resilient sheet flooring to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for resilient sheet flooring installation and seaming method indicated.

1. Engage an installer who employs workers for this Project who are trained or certified by resilient sheet flooring manufacturer for installation techniques required.

B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockups for resilient sheet flooring including accessories.

a. Size: Minimum 100 sq. ft. (9.3 sq. m) for each type, color and pattern.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store resilient sheet flooring and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C). Store rolls upright.

1.9 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 85 deg F (29 deg C), in spaces to receive resilient sheet flooring during the following time periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).

C. Close spaces to traffic during resilient sheet flooring installation.

D. Close spaces to traffic for 48 hours after resilient sheet flooring installation.

E. Install resilient sheet flooring after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For resilient sheet flooring, as determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

2.2 UNBACKED VINYL SHEET FLOORING

A. Basis-of-Design Product: Subject to compliance with requirements, provide Johnsonite; A Tarkett Company; iQ or a comparable product by one of the following:

1. Armstrong World Industries, Inc.
2. Forbo Industries, Inc.
3. Mannington Mills, Inc.

B. Product Standard: ASTM F 1913.

C. Thickness: 0.080 inch (2.0 mm).

D. Wearing Surface: Smooth.

E. Sheet Width: 6.6 feet (2.0 m).

F. Seamless-Installation Method: Heat welded.

G. Colors and Patterns: As indicated on drawings.

H. Sheet material: meets ASTM F 1913 performance standards for homogeneous single layered vinyl floor covering

I. Static coefficient of friction: ASTM D 2047 > 0.6

J. Static Load Limit: ASTM F 970 – 250 psi

K. Fire Performance:

1. Flooring Radiant Panel: ASTM E 648 – Class 1
2. Smoke Density: ASTM E 662 Less than 450

2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by resilient sheet flooring manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by flooring and adhesive manufacturers to suit resilient sheet flooring and substrate conditions indicated.

1. Adhesives shall have a VOC content of 50 g/L or less.

C. Seamless-Installation Accessories:

1. Heat-Welding Bead: Manufacturer's solid-strand product for heat welding seams.

a. Color: Match flooring.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient sheet flooring.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to resilient sheet flooring manufacturer's written instructions to ensure adhesion of resilient sheet flooring.

B. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by resilient sheet flooring manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by resilient sheet flooring manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
4. Moisture Testing: Proceed with installation only after substrates pass testing according to resilient sheet flooring manufacturer's written recommendations, but not less stringent than the following:

    a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) Insert rate in 24 hours.
    b. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install resilient sheet flooring until it is the same temperature as the space where it is to be installed.

1. At least 48 hours in advance of installation, move flooring and installation materials into spaces where they will be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient sheet flooring.

3.3 RESILIENT SHEET FLOORING INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient sheet flooring.

B. Unroll resilient sheet flooring and allow it to stabilize before cutting and fitting.

C. Lay out resilient sheet flooring as follows:

1. Maintain uniformity of flooring direction.
2. Minimize number of seams; place seams in inconspicuous and low-traffic areas, at least 6 inches (152 mm) away from parallel joints in flooring substrates.
3. Match edges of flooring for color shading at seams.
4. Avoid cross seams.

D. Scribe and cut resilient sheet flooring to butt neatly and tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, and door frames.

E. Extend resilient sheet flooring into toe spaces, door reveals, closets, and similar openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on resilient sheet flooring as marked on substrates. Use chalk or other nonpermanent marking device.

G. Install resilient sheet flooring on covers for telephone and electrical ducts and similar items in installation areas. Maintain overall continuity of color and pattern between pieces of flooring installed on covers and adjoining flooring. Tightly adhere flooring edges to substrates that abut covers and to cover perimeters.

H. Adhere resilient sheet flooring to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

I. Seamless Installation:

1. Heat-Welded Seams: Comply with ASTM F 1516. Rout joints and heat weld with welding bead to permanently fuse sections into a seamless flooring. Prepare, weld, and finish seams to produce surfaces flush with adjoining flooring surfaces.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting resilient sheet flooring.

B. Perform the following operations immediately after completing resilient sheet flooring installation:

1. Remove adhesive and other blemishes from surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

C. Protect resilient sheet flooring from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Floor Polish: Remove soil, adhesive, and blemishes from flooring surfaces before applying liquid floor polish.

1. Apply three coat(s).

E. Cover resilient sheet flooring until Substantial Completion.

END OF SECTION 09 65 16

SECTION 09 67 23 - RESINOUS FLOORING AND WALL COATINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes resinous flooring systems.

B. Related Sections:

1. Division 07 Section "Joint Sealants" for sealants installed at joints in resinous flooring systems.
2. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.

1.3 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable LEED Credits

1. MRc2
2. MRc4
3. MRc5
4. IEQc4.1
5. IEQc4.2
6. IEQc4.3

B. LEED Requirements

1. MRc2: CONSTRUCTION WASTE MANAGEMENT

   No less than the specified portion of all construction waste from the Project shall be diverted from disposal in a landfill and/or incineration in with the Project Requirements for Construction Waste Management and Disposal. Refer to Specification Sections 017419 Construction Waste Management and Disposal and 013510 Sustainable Design Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

2. MRc4: Recycled Content Material

   No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the Project Requirements for Recycled Content Materials. All materials counted towards the computations of the proportion of the Recycled Content Materials shall comply with the standard minimum percentages of post-consumer waste materials and for the minimum percentages of pre-consumer waste materials.

Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

3. MRc5: REGIONALLY MANUFACTURED HARVESTED MATERIALS

   No less than the specified minimum proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the Project Site in accordance with the Project Requirements for Regionally Manufactured and/or Harvested Materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

4. IEQc4.1: Low Emitting Materials: Sealants and Adhesives

   All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the Project Requirements for Low Emitting Materials – Sealants and Adhesives. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

5. IEQc4.2: Low Emitting Materials: Paints and Coatings

   All paints and coatings in the building interior shall comply with the Project Requirements for Low Emitting Materials – Paints and Coatings. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

6. IEQc4.3: Low Emitting Materials: Flooring Systems

   All flooring finish materials installed in the building interior shall meet or exceed the project requirements for Low Emitting Materials – Flooring Systems. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation conference: conduct conference at Project site.

1. Meet with Owner, Architect, resinous coatings installer, and resinous coatings manufacturer's representative.
2. Review methods and procedures related to resinous coatings installation including but not limited to:

   a. Planned start and completion timing for each mobilization.
   b. Safety procedures.
   c. Coordination of other trades in area of work.
   d. Existing and new slab conditions.
   e. Slab testing results.
   f. Existing wall substrate conditions.

g. Surface preparation.
h. Required room temperatures.
i. Ventilation.
j. Step-by-step installation procedures.
k. Curing time and methods.
l. Protection of completed work.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product. Include manufacturer's technical data, application instructions, and recommendations for each resinous flooring component required.

B. Sustainable Design Submittals:

1. Laboratory Test Reports: For flooring products, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: For each type of resinous floor/wall system, showing extent of system, dimemsioned locations of control joints, seams, divider strips and terminations.

1. Provide enlarged details of terminations at walls, door frames, pits, curbing, etc.

D. Samples for Initial Selection: For each type of exposed finish required.

E. Samples for Verification: For each resinous flooring system required, 6 inches (150 mm) square, applied to a rigid backing by Installer for this Project.

1.6 INFORMATIONAL SUBMITTALS

A. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.

B. Provide contact information for project owners for whom installer has completed similar projects, as described under “Installer Qualifications.”

C. Material Certificates: For each resinous flooring component, from manufacturer.

D. Material Test Reports: For each resinous flooring system, by a qualified testing agency.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For resinous flooring to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer, and certified in writing by resinous flooring manufacturer as qualified to apply resinous flooring systems indicated..

1. Installer shall have completed a minimum of 10 projects within the previous 5 years, including required surface preparation and installation of reinforced seamless shower systems and resinous floor and wall coatings similar to specified systems.

B. Manufacturer Field Services: Include Manufacturer's field engineering services, as follows:

1. Review project conditions, including but not limited to ambient and substrate temperatures, humidity, and moisture content of substrates.
2. Verify that project conditions are acceptable prior to commencement of work.
3. Maintain log of environmental conditions, work procedures, resting procedures and protection measure to be included in jobsite file submittal.
4. Provide onsite representation during entire product installation, including surface preparation.

C. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Apply full-thickness mockups of each system on 48-inch- (1200-mm-) square floor or wall area selected by Architect.

a. Include 96-inch (2400-mm) length of integral cove base with inside and outside corner.

2. Simulate finished lighting conditions for Architect's review of mockups.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage and mixing with other components.

1.10 FIELD CONDITIONS

A. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring application.

B. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring application.

C. Close spaces to traffic during resinous flooring application and for 24 hours after application unless manufacturer recommends a longer period.

1.11 WARRANTY

A. Provide warranty against defects in material and workmanship for a period of one year from date of substantial completion, or date of beneficial occupancy, if earlier than date of substantial completion. Provide warranty covering 100% of material and labor costs from delamination and product failure caused by defective product or defective installation for a period of 5 years for Seamless Shower System (RES-1).

B. Single Source warranty is to be provided from the Manufacturer to cover all defects in product or defects caused by improper installation. Any defects as a result of the product or its installation will be corrected by the manufacturer/contractor at no cost to the Owner. Joint warranties not acceptable.

C. Issuance of Warranty to Owner's agent shall be a conditional precedent to receipt of final payment to the coating contractor.

D. Extent of Warranty shall be limited to the repair or replacement of defective surfaces at no cost to the Owner, and for any damage directly resulting from such defects during the warranty period. The warranty shall not include any remedy for defects caused by abuse, improper maintenance or operation, or by normal wear, tear and usage. The material manufacturer shall provide the warranty for both labor and material for this project.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Flooring products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

B. Flammability: Self-extinguishing according to ASTM D 635.

2.2 MANUFACTURERS

A. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, from single source from single manufacturer. Obtain secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from manufacturer recommended in writing by manufacturer of primary materials.

2.3 MANUFACTURERS

A. Basis-of-Design Product: Products and systems by Prime Coat Coating Systems, or comparable product and systems by one of the following:

1. Stonhard, Inc.
2. Prime Coat Coatings Systems.
3. Tnemec Company, Inc.

2.4 MATERIALS

A. VOC Content of Liquid-Applied Flooring Components: Mot more than 100 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

B. Low-Emitting Materials: Flooring system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.5 SEAMLESS SHOWER SYSTEM (SC-1)

A. Integrated system producing a monolithic surface for floors, cove base, and walls, consisting of 100% solids accelerated aliphatic amine cured epoxy with chopped strand fiberglass and Kevlar® reinforcement, and an integrated anti-microbial glaze topcoat system.

B. Basis of Design Product: “Seamless Shower System 5130”, as manufactured by Prime Coat Coatings Systems, Waukegan, IL.

C. System Components: Manufacturer’s standard components, compatible with each other, as follows:

1. Primer for Wall and Ceiling Surfaces:

   a. Resin: 100% solids plural component thixotropic epoxy
   b. Product: PC 630
   c. Application method: spray, roller, or brush
   d. Installed thickness: 6-8 mils over concrete and non-porous surfaces; 12-20 mils over CMU
   e. Number of coats: 1

2. Floor Base Coat:

   a. Resin: 100% solids plural component Bisphenol A epoxy
   b. Product: PC 310 with broadcasting aggregate PCA 322
   c. Application method: broadcast silica
   d. Installed thickness including aggregate: 40 mils
   e. Type: clear
   f. Number of coats: 1

3. Body Coat Floor Walls and Ceilings:

   a. Resin: 100% solids Fiberglass and Kevlar reinforced epoxy
   b. Product: PC 200
   c. Application method: 45:1 air-powered airless spray w/gravity-fed hopper
   d. Reinforcement: Chopped strand fiberglass and Kevlar®
   e. Installed thickness: 40-45 mils
   f. Type: pigmented
   g. Number of coats: 1

4. Top Coat All Surfaces

   a. Resin: 100% solids Bisphenol A chemically resistant epoxy

b. Product: PC 400 with PC 499 anti-microbial
c. Application method: roller or spray
d. Minimum installed thickness: 8-10 mils
e. Antimicrobial: integrated into topcoat
f. Type: pigmented
g. Floor Finish: Must meet ADA requirements. PCA 337 slip resistant aggregate to be added to floor topcoat to achieve proper slip resistant texture.

D. System Characteristics

1. Product Composition: Wall Systems must be spray applied 100% solids with Fiberglass and Kevlar strands premixed into both the Part A and Part B epoxy components. Fiberglass and Kevlar Strands must be sufficient enough to form a reinforced matrix/web within the resin providing increased tensile strength and impact resistance and high build characteristics as specified.
2. Color and Pattern: As selected by Architect from manufacturer's full range.
3. Wearing Floor Surface: Textured for slip-resistance per Architect's selection from manufacturer's full range.
4. Cove Base: 2 inch Cant-styled.
5. System Thickness: Walls: 60 mils minimum. Floors: 1/8th inch minimum.
6. VOCs: in compliance with EQ 4.2, less than 100 g/l.
7. Performance Requirements:

a. Compressive Strength Minimum: 11,700 p.s.i. (ASTM D-695-77)
b. Tensile Strength Minimum: 3,900 p.s.i. (ASTM D-638-77a)
c. Hardness minimum: 83-88 (ASTM D-2240/Shore D Durometer)
d. Abrasion Resistance Minimum: 0.03 gm/1000 revolutions (ASTM D-4060 Taber Abrader.)
e. High or Low Solids solvent based and all water based systems excluded.
f. Fiberglass Mat layup systems excluded.
g. Roller Applied systems excluded.
h. Systems less than 60 mils for walls and 1/8th inch for floors excluded.

2.6 RESINOUS EPOXY WALL COATING (SC-2)

A. Seamless Reinforced Wall System consisting of 100% solids accelerated aliphatic amine cured epoxy with chopped strand fiberglass reinforcement and an integrated Anti-microbial Glaze topcoat system.

B. Basis of Design Product: "Prime Guard 1201", as manufactured by Prime Coat Coatings Systems, Waukegan, IL.

C. .System Components: Manufacturer's standard components, compatible with each other, as follows:

1. Primer for Wall Surfaces:

a. Resin: 100% solids plural component thixotropic epoxy
b. Product: PC 630
c. Application method: spray, roller, or brush
d. Installed thickness: 6-8 mils over concrete and non-porous surfaces; 12-16 mils over CMU
e. Number of coats: 1

2. Body Coat:

a. Resin: 100% solids Fiberglass reinforced epoxy
b. Product: PC 201
c. Application method: 45:1 air-powered airless spray w/gravity-fed hopper
d. Reinforcement: Chopped stranded fiberglass
e. Installed thickness: 25-30 mils
f. Type: pigmented
g. Number of coats: 1

3. Top Coat All Surfaces

a. Resin: 100% solids Bisphenol A chemically resistant epoxy
b. Product: PC 400 with PC 499 anti-microbial
c. Application method: roller or spray
d. Minimum installed thickness: 8 - 10 mils
e. Antimicrobial: integrated into topcoat
f. Type: pigmented

D. System Characteristics

1. Product Composition: Wall Systems must be spray applied 100% solids with Fiberglass strands premixed into both the Part A and Part B epoxy components. Fiberglass strands must be sufficient enough to form a reinforced matrix/web within the resin providing increased tensile strength and impact resistance and high build characteristics as specified.
2. Color and Pattern: As selected by Architect from manufacturer's full range.
3. Wearing Floor Surface: Textured for slip-resistance per Architect's selection from manufacturer's full range.
4. System Thickness: Walls: 60 mils minimum. Floors: 1/8th inch minimum.
5. VOCs: in compliance with EQ 4.2, less than 100 g/l.
6. Performance Requirements:

a. Compressive Strength Minimum: 11,700 p.s.i. (ASTM D-695-77)
b. Tensile Strength Minimum: 3,900 p.s.i. (ASTM D-638-77a)
c. Hardness minimum: 83-88 (ASTM D-2240/Shore D Durometer)
d. Abrasion Resistance Minimum: 0.03 gm/1000 revolutions (ASTM D-4060 Taber Abrader.)
e. High or Low Solids solvent based and all water based systems excluded.
f. Fiberglass Mat layup systems excluded.
g. Roller Applied systems excluded.
h. Systems less than 45 mils excluded.

2.7 RESINOUS FLOOR AND BASE COATING (SC-5)

A. Double Broadcast Decorative Epoxy Quartz with ultra clear epoxy topcoat and ultra clear aliphatic polyester urethane final finish, producing a monolithic floor surface with integral cove base.

B. Basis of Design: "Prime Cast 2610 with PC 509 Final Finish" as manufactured by Prime Coat Coating Systems, Waukegan, IL.

C. System Components: Manufacturer's standard components, compatible with each other, as follows:

1. Primer/Base Coat:

   a. PC 320 with PC 321 broadcast color quartz aggregate
   b. Resin: epoxy
   c. Application method: squeegee and roller applied
   d. Minimum thickness: 20 mils or a spreading rate of 80 sq. ft./gallon
   e. Type: clear

2. Second Coat:

   a. PC 320 mixed with PC 321 broadcast color quartz aggregate
   b. Resin: epoxy
   c. Application: squeegee and roller applied
   d. Minimum thickness: 20 mils or a spreading rate of 80 sq. ft./gallon
   e. Type: clear

3. Topcoat:

   a. Product: PC 440
   b. Resin: Ultra violet resistant epoxy
   c. Application method: brush or roller
   d. Installed thickness: 20 mils
   e. Type: ultra clear
   f. Number of coats: 1

4. Final Finish Coat:

   a. Product: PC 509
   b. Resin: aliphatic polyester polyurethane
   c. Application method: brush or roller
   d. Installed thickness: 3-5 mils WFT
   e. Type: ultra clear
   f. Number of coats: 1

D. System Characteristics

1. Color and Pattern: As selected by Architect from manufacturer's full range.
2. Wearing Surface: Textured for slip-resistance per Architect's selection from manufacturer's full range.
3. Integral Cove Base: 2" cant-style.
4. VOCs: less than 8 g/l.
5. Resinous flooring shall withstand chemical attack by agents provided in writing by Owner, in temperatures and concentrations stated therein.
6. Resinous flooring shall withstand normal use in commercial kitchen.
7. Performance Requirements:

   a. Compressive Strength: 12,400 psi after 7 days (ASTM C-579)
   b. Tensile Strength: 2,200 psi (ASTM C-307)
   c. Flexural Strength: 4,800 psi (ASTM C-580)
   d. Hardness: 85-90 (ASTM D-2240/Shore D Durometer)
   e. Bond Strength: >400 psi (100% concrete failure per ASTM D4541)
   f. Indentation: No indentation (MIL-D-3134F)

g. Abrasion Resistance: 0.04 gm max weight loss (ASTM D-4060, Taber Abrader)
h. Flammability: Self extinguishing (ASTM D-635) Extent of burning 0. inches max.
i. Water Absorption: 0.1% (ASTM C-413)
j. Heat Resistance Limitation: 140°F/60°C (For continuous exposure) 200°F/93°C (For intermittent spills)
k. Epoxy top coat(s) must be UV resistant in accordance with ASTM G154 Acceptable standard: No ambering, color or gloss variation after hours exposure.
l. Final finish coat must be ultra clear, UV stable, and chemically resistant plural component urethane.

2.8 RESINOUS URETHANE FLOOR COATING (SC-6)

A. Resinous Urethane Flooring System with integrated cove base and consisting of 100% solids urethane slurry mixture and broadcasting aggregate with pigmented Novolac heat resistant finish and an integrated anti-microbial finish.

B. Basis of Design Product: “Prime Cast 2410” as manufactured by Prime Coat Corporation, Waukegan, IL.

C. System Components: Manufacturer’s standard components, compatible with each other, as follows:

1. Basecoat:

a. Product: PC 352 Cretecoat SL
b. Resin: urethane
c. Application method: Slurry/Broadcast
d. Minimum installed thickness: 3/16th inch with broadcast
e. Type: pigmented

2. Broadcast:

a. Product: PCA 331 aggregate
b. Application: broadcast to rejection

3. Topcoat:

a. Product: PC 421
b. Resin: novolac epoxy
c. Application method: roller
d. Minimum installed thickness: 16-20 mils
e. Type: pigmented
f. Number of coats: 1

D. System Characteristics:

1. Color and Pattern: As selected by Architect from manufacturer’s full range.
2. Wearing Surface: Textured for slip-resistance per Architect’s selection from manufacturer’s full range.
3. Integral Cove Base: 2-inch cant.
4. System Thickness: minimum 3/16th inch.

5. VOC's: less than 8 g/l.
6. Resinous flooring shall withstand chemical attack by agents provided in writing by Owner, in temperatures and concentrations stated therein.
7. Resinous flooring shall normal use in commercial kitchen.
8. Performance Requirements:

    a. Compressive Strength: 8,400 psi after 7 days (ASTM C-579)
    b. Tensile Strength: 1,100 psi (ASTM C-307)
    c. Flexural Strength: 2,300 psi (ASTM C-580)
    d. Flexural Modulus of Elasticity: 1.7 x 105 (ASTM D-790)
    e. Abrasion Resistance: .05 gm loss, 1000 gm load, 1000 cycles (ASTM D4060/CS-17)
    f. Hardness: 75-80 (ASTM D-2240/Shore D Durometer)
    g. Bond Strength: >400 psi (100% concrete failure)
    h. Indentation: No indentation (MIL-D-3134F)
    i. Flammability: Self extinguishing (ASTM E648) Extent of burning 0.25
    j. 10. Service Temperature: -100ºF to 220ºF (-73ºC to 104ºC)
    k. 11. All products must be 100% solids with zero VOCs.

2.9 RESINOUS FLOOR COATING (SC-7)

A. Solid colored aggregate reinforced epoxy flooring with integrated anti-microbial finish coat.

B. Basis of Design Product: "Prime Cast 2110", as manufactured by Prime Coatings Systems, Waukegan, IL.

C. System Components: Manufacturer's standard components, compatible with each other, as follows:

1. Broadcast Coats:

    a. PC 320 with PC 339 and PCA 322 broadcast aggregate
    b. Resin: epoxy
    c. Application method: Roller or spray applied and backrolled
    d. Minimum thickness: 20 mils or a spreading rate of 80 sq. ft./gallon
    e. Type: pigmented
    f. Number of coats: 2

2. Topcoat:

    a. Product: PC 421
    b. Resin: novolac
    c. Application method: Brush, roller or spray applied
    d. Minimum installed thickness: 20 mils
    e. Type: pigmented
    f. Number of coats: 1

D. System Characteristics

1. Resinous flooring shall withstand chemical attack by agents provided in writing by Owner, in temperatures and concentrations stated therein.
2. Resinous flooring shall normal use in commercial kitchen.
3. Performance Requirements:

a. Compressive Strength: 12,400 psi after 7 days (ASTM C-579)
b. Tensile Strength: 2,200 psi (ASTM C-307)
c. Flexural Strength: 4,800 psi (ASTM C-580)
d. Hardness: 85-90 (ASTM D-2240/Shore D Durometer)
e. Bond Strength: >400 psi (100% concrete failure per ASTM D4541)
f. Indentation: No indentation (MIL-D-3134F)
g. Abrasion Resistance: 0.04 gm max weight loss (ASTM D-4060, Taber)
h. Flammability: Self extinguishing (ASTM D-635) Extent of burning 0.25 inches max.
i. Water Absorption: 0.1% (ASTM C-413)
j. Heat Resistance Limitation: 140°F/60°C (For continuous exposure) 200°/93°C (For intermittent spills)
k. All products must be 100% solids with zero VOCs.

4. Integral Cove Base: 2" cant-style.

2.10 ACCESSORIES

A. Patching and Fill Material: Resinous product of or approved by resinous flooring manufacturer and recommended by manufacturer for application indicated.

PART 3 - EXECUTION

3.1 PREPARATION

A. General: Prepare and clean substrates according to resinous flooring manufacturer's written instructions for substrate indicated. Provide clean, dry substrate for resinous flooring application.

B. Concrete Substrates: Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring. Verify that concrete surfaces have been properly cured not less than twenty-eight (28) days.

1. Mechanically remove all finishes, mastics, adhesives and other compounds down to sound substrate. Demolition shall be in accordance with manufacturer's recommendations and written procedures. (Note: If during the demolition a setting bed is found beneath the existing flooring materials, manufacturer will provide written recommendation whether to remove it or leave it in place. If removal is required, installer will provide a change order to replace the setting bed with manufacturer's recommended material to provide proper sloping for drainage and to insure proper adhesion of the specified coating system.)

2. Roughen concrete substrates as follows:

a. Shot-blast surfaces to a classification of CSP-5 with an apparatus that abrades the concrete surface, contains the dispensed shot within the apparatus, and recirculates the shot by vacuum pickup.
b. Visually inspect shot blasted or grinded surfaces to make sure that profiled surfaces are free of contaminants. Areas that are stained or visually contaminated shall be treated with a 15% by volume solution of aqueous tri-sodium phosphate (TSP) or other de-greasing agent as recommended

by the coatings manufacturer. Rinse and dry all floor surfaces scheduled to receive high performance floor system finish prior to commencement of resinous flooring application.

c. Remove and legally dispose of all debris and contaminants produced by the shot blasting process. Steel media resulting from the shot blasted floor slab surface shall be removed from cracks, slab edges, construction joints, and corners by magnets, magnetic broom, air blast, vacuum, or stiff bristle broom.

d. Comply with ASTM C 811 requirements unless manufacturer's written instructions are more stringent.

3. Repair damaged and deteriorated concrete according to resinous flooring manufacturer's written instructions.

4. Verify that concrete substrates are dry and moisture-vapor emissions are within acceptable levels according to manufacturer's written instructions.

a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with application of resinous flooring only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) of slab area in 24 hours.

5. Alkalinity and Adhesion Testing: Verify that concrete substrates have pH within acceptable range. Perform tests recommended by manufacturer. Proceed with application only after substrates pass testing.

C. Concrete Masonry Substrates

1. Provide sound masonry surfaces with joints struck clean and tightly filled to provide a uniform appearance.

a. Remove all mortar spatter, protruding mortar edges, and excess mortar.
b. Grind all rough edges smooth.
c. Clean as specified under Division 04 Section “Unit Masonry.”

D. Resinous Materials: Mix components and prepare materials according to resinous flooring manufacturer's written instructions.

E. Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.

F. Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer's written instructions.

3.2 APPLICATION

A. General: Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.

1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.
2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.

3. At substrate expansion and isolation joints, provide joint as necessary in resinous flooring in compliance with manufacturer's directions and engineering details for each joint type.

    a. Apply backer rod and elastomeric joint filler into isolation or expansion joints in compliance with manufacturer's directions.

B. Installation of SC-1 Seamless Shower System

1. Flexible Membrane: (required on all concrete slabs that are above grade or above occupied spaces) Install one full coat of PC 620 at 30 mils WFT on required and prepared concrete slabs and run it up the wall the distance of cove base.
2. Cove Base: Prime the interface of wall and floor areas where cove base will be installed with PC 100 at 4-6 mils. (Note: areas receiving the above membrane will not need to be primed.) Allow to cure. Trowel apply cove base and threshold [if applicable] by using a mixture of 100% solids epoxy PC 310 and aggregates PCA 322 to make mortar system, and allow to set.
3. Floor Broadcast Coat: Apply one full coat of PC 310K at 20 mils, or 80 square feet per mixed gallon. While resin is open, broadcast PCA 322 aggregate into base coat to rejection and allow to dry. Sweep off/vacuum up all excess aggregate.
4. Primer/Filler Coat for walls and ceilings only: Mix primer/thixotropic block fill PC 630 components with a Jiffy Mixer for a minimum of 2 minutes, then apply by roller or spray to floors, walls and ceilings. Note: Wall areas that are porous, i.e. concrete masonry units require a minimum of 12-20 mils while less porous substrates such as ceilings and floors require a minimum thickness of 6-8 mils.
5. Build Coat all surfaces: Mix PC 200 fiberglass/Kevlar®-reinforced body coat with a Jiffy Mixer for a minimum of 2 minutes and spray apply to all surfaces with a 45:1 air-powered airless spray rig with gravity-fed hopper at and allow curing. Minimum thickness of 45 mils required on walls and floors. Minimum of 20-25 mils on ceilings.
6. Final Finish/Glaze Coat: After build coat is fully cured, abrade all surfaces to remove any exposed fiberglass and other imperfections. Mix PC 400 with PC 499 additive and apply to all surfaces, walls, ceilings and floors at a minimum of 8 mils to wall and ceiling surfaces and 10-12 mils on floor surfaces. Broadcast and back-roll PCA 337 slip resistant additive into final floor finish encapsulating the slip resistant additive to achieve ADA requirements.
7. The finished floor must meet ADA specifications for this project. Installer shall provide a Sullmair FSC 2000-1346 Floor tester to validate ADA requirements. Note: Achieving the required ADA coefficient of friction may require additional topcoat material or slip resistant additives.

C. Installation of SC-2 Resinous Epoxy Wall Coating

1. Primer/Filler Coat: Mix primer/thixotropic block fill PC 630 components with a Jiffy Mixer for a minimum of 2 minutes, then apply by roller or spray to floors, walls and ceilings. Note: Wall areas that are porous, i.e. concrete masonry units require a minimum of 12-16 mils while less porous substrates such as concrete and drywall require a minimum thickness of 6-8 mils.
2. Build Coat all surfaces: Mix PC 201 fiberglass-reinforced body coat with a Jiffy Mixer for a minimum of 2 minutes and spray apply to all surfaces with a 45:1 air-powered airless spray rig with gravity-fed hopper at and allow curing. Minimum thickness of 25-30 mils.

3. Final Finish/Glaze Coat: After build coat is fully cured, abrade all surfaces to remove any exposed fiberglass and other imperfections. Mix PC 400 with PC 499 additive and apply one full coat at 8-10 mils.

D. Installation of SC-5 Resinous Floor and Base Coating

1. Flexible Membrane: (required on all concrete slabs above grade or above occupied spaces). Apply one full coat of PC 620 at 30 mils and bring up the wall the distance of the required cove base.
2. Primer: Prime floor and wall interface where cove base will be attached with PC 100 at 4-6 mils and allow to set. (Note: any areas receiving the flexible membrane do not require the primer.)
3. Mix liquids Part A and Part B of PC 320 and add PCA 321 aggregate according to manufacturer's recommendations to form cove base material. Using recommended cove base trowel, install cove base material to perimeter of rooms pulling the material tight to the primed surfaces and using the trowel to close up the surface of the cove base.
4. Apply one full coat of PC 320 clear mixed liquids at a rate of one gallon per 80 feet of floor surface or 20 mils wet film thickness.
5. Broadcast to rejection PCA 321 into the open resin and allow to cure. Remove excess aggregate after film is dried by broom sweeping or vacuum.
6. Apply a second full coat of PC 320 mixed liquids at a rate of one gallon per 80 feet of floor surface or 20 mils wet film thickness.
7. Broadcast to rejection PCA 321 into the open resin and allow to cure. Remove excess aggregate after film is dried by broom sweeping or vacuum. Lightly grind/sand off any high spots or uneven spots prior to applying grout and finish coats.
8. Apply full coat of PC 440 at 20 mils to provide a smooth to the touch finish. An orange peel texture is acceptable. Note: a second coat of PC 440 may be required to provide desired surface texture.
9. Apply final finish coat of PC 509 with PC 499 at 3-5 mils WFT.
10. A total DFT of the broadcast system including aggregate shall be a minimum of 125 mils thick.

E. Installation of SC-6 Resinous Urethane Floor Coating

1. Cove Base as required: Trowel apply cove base by using a mixture of PC 310 resin and manufacturer's recommended aggregate to form required cove base as recommended cove base. Cove base type: 2 inch Cant Cove. Pull cove base material tight against wall and floor interface to form a uniform reinforced seal.
2. Pour a line of PC 352 SL Cretecoat mixed liquids and cement filler onto area to be coated and using a gauged rake, pull material back and forth in an "S" pattern to manipulate the material into an even layer at required thickness.
3. While material is wet and resin is open, broadcast to rejection PCA 331 standard broadcasting aggregate and allow to cure.
4. Vacuum up any excess aggregate and apply one full coat of PC 421 pigmented at 16-20 mils.

F. Installation of SC-7 Resinous Floor Coating

1. Flexible Membrane: (required on all concrete slabs above grade or above occupied spaces). Apply one full coat of PC 620 at 30 mils and bring up the wall the distance of the required cove base.
2. Broadcast Coats: Mix liquids Part A and Part B of PC 320 with PC 399 and add PCA 321 aggregate according to manufacturer's recommendations to form cove base material. Using recommended cove base trowel, install cove base material

to perimeter of rooms pulling the material tight to the primed surfaces and using the trowel to close up the surface of the cove base.

3. Apply one full coat of PC 320 with PC 399 mixed liquids at a rate of one gallon per 80 feet of floor surface or 20 mils wet film thickness.
4. Broadcast to rejection PCA 321 into the open resin and allow to cure. Remove excess aggregate after film is dried by broom sweeping or vacuum.
5. Apply a second full coat of PC 320 with PC 399 mixed liquids at a rate of one gallon per 80 feet of floor surface or 20 mils wet film thickness.
6. Broadcast to rejection PCA 321 into the open resin and allow to cure. Remove excess aggregate after film is dried by broom sweeping or vacuum. Lightly grind/sand off any high spots or uneven spots prior to applying grout and finish coats.
7. Apply full coat of PC 421 at 20 mils to provide a smooth to the touch finish. An orange peel texture is acceptable. Note: additional coat or anti-slip resistant broadcast medium may be required to provide desired surface texture.
8. A total DFT of the broadcast system including aggregate shall be a minimum of 125 mils thick.

3.3 CURING

A. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during curing processes.

1. Temperatures shall be maintained at 70°F – 80°F if at all possible.
2. Water leaks must be prevented as they will compromise epoxy components ability to set properly – water drips may compromise or stain finishes.
3. Steam or any airborne contamination will adversely affect curing.

3.4 FIELD QUALITY CONTROL

A. Core Sampling: At the direction of Architect and at locations designated by Architect, take one core sample per 1000 sq. ft. of resinous flooring, or portion of, to verify thickness. For each sample that fails to comply with requirements, take two additional samples. Repair damage caused by coring and correct deficiencies.

B. Material Sampling: Owner may at any time and any number of times during resinous flooring application require material samples for testing for compliance with requirements.

1. Owner will engage an independent testing agency to take samples of materials being used. Material samples will be taken, identified, sealed, and certified in presence of Contractor.
2. Testing agency will test samples for compliance with requirements, using applicable referenced testing procedures or, if not referenced, using testing procedures listed in manufacturer's product data.
3. If test results show applied materials do not comply with specified requirements, pay for testing, remove noncomplying materials, prepare surfaces coated with unacceptable materials, and reapply flooring materials to comply with requirements.

3.5 CLEANING

A. Work area shall be left clean with all trash, equipment, and leftovers removed.

B. Floor and walls may be cleaned prior to final inspection, providing complete curing has taken place. [Refer to Product Data Sheets for curing information for each product]. Generally, non-chlorinated detergents should be used for the first month after curing is complete.

C. For optimum coating performance and cleanability, manufacturer recommends the use of liquid soaps to prevent caking on epoxy surfaces caused by bar soaps.

3.6 PROTECTION

A. Protect resinous flooring from damage and wear during the remainder of construction period. Comply with manufacturer's recommendations for protective materials and their method of application. Remove temporary protection prior to final inspection. Protection from welding, impact from heavy tools and other abuse is required, including flame-resistant coverings. Use protective methods and materials, including temporary covering, recommended in writing by resinous flooring manufacturer.

END OF SECTION 09 67 23

SECTION 09 67 66 - FLUID-APPLIED ATHLETIC FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Polyurethane flooring, fluid applied over base mats.

B. Related Requirements:

1. Division 07 section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Section 096513 "Resilient Base and Accessories" for wall base and accessories installed with fluid-applied athletic flooring.

1.3 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable LEED Credits

1. MRc2
2. MRc4
3. MRc5
4. IEQc4.1
5. IEQc4.2
6. IEQc4.3

B. LEED Requirements

1. MRc2: CONSTRUCTION WASTE MANAGEMENT

   No less than the specified minimum proportion of all construction waste from the project shall be diverted from disposal in a landfill and/or incineration in accordance with the project requirements for Construction Waste Management. See Section 018113 Sustainable Design Requirements.

2. MRc4: Recycled Content Material

   No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the Project Requirements for Recycled Content Materials. All materials counted towards the computations of the proportion of the Recycled Content Materials shall comply with the standard minimum percentages of post-consumer waste materials and for the minimum percentages of pre-consumer waste materials.

Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

3. MRc5: Regionally manufactured harvested materials

   No less than the specified proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the project site in accordance with the project requirements for Regionally Manufactured and/or Harvested Materials. See Section 018113 Sustainable Design Requirements.

   Contractor shall provide LEED credit verification as per section Section 013300 Submittal Procedures.

4. EQc4.1: LOW-EMITTING MATERIALS – SEALANTS AND ADHESIVES

   All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the project requirements for Low-Emitting Materials – Sealants and Adhesives. See Section 018113 Sustainable Design Requirements.

   Contractor shall provide LEED credit verification as per Section 013300 Submittal Procedures.

5. EQc4.2 Low-Emitting Materials – Paints and Coatings

   All paints and coatings used in the building interior comply with the project requirements for Low-Emitting Materials – Paints and Coatings. See Section 018113 Sustainable Design Requirements.

   Contractor shall provide LEED credit verification as per Section 013300 Submittal Procedures.

6. IEQc4.3: Low Emitting Materials – Flooring Systems:

   All flooring finish materials installed in the building interior shall meet or exceed the project requirements for Low Emitting Materials – Flooring Systems. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

1.4 COORDINATION

A. Coordinate layout and installation of flooring with floor inserts for gymnasium equipment.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For flooring. Show installation details including layout, colors, widths, and dimensions of game lines and markers and locations of athletic equipment floor inserts.

C. Samples for Initial Selection: Manufacturer's color charts showing colors and glosses available for flooring and game-line and marker paints.

D. Samples for Verification: For each color, gloss, and texture of flooring required, 12 inches (305 mm) square, applied to a rigid backing. Include Sample sets showing the game-line- and marker-paint colors applied to the flooring.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For fluid-applied athletic flooring to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An installer who is approved, trained, or certified by fluid-applied athletic flooring manufacturer.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Comply with flooring manufacturer's written instructions for substrate temperature, ambient temperature, humidity, ventilation, and other conditions affecting flooring application.

1. Do not apply flooring until spaces are enclosed and weatherproof; wet-work in spaces is complete and dry; and overhead work, including installing mechanical systems, lighting, and athletic equipment, is complete.
2. Maintain temperatures during installation within range recommended in writing by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C), in spaces to receive flooring 48 hours before installation, during installation, and 48 hours after installation unless longer period is recommended in writing by manufacturer.
3. After installation period, maintain temperatures within range recommended in writing by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).
4. Close spaces to traffic during flooring installation.

PART 2 - PRODUCTS

2.1 FLOORING APPLIED OVER BASE MATS

A. Products: Subject to compliance with requirements, provide one of the following:

1. Aacer Flooring, LLC; MP Sport.
2. Abacus Sports Installations Ltd; Padenpor.
3. Action Floor Systems, LLC; Herculan.
4. Beynon Sports Surfaces, Inc; PolyTurf Plus Pad & Pour.

5. Surface America Incorporated; ElastoFloor Roll-Pour.

B. Description: Fluid-applied athletic flooring system consisting of resilient base mat adhered to substrate, base mat sealer, and fluid-applied polyurethane body and topcoats.

C. Flooring products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

D. Base Mat: Manufacturer's standard base mats of granulated recycled rubber in polyurethane binder.

1. Thickness: 11/32 inch (9 mm).
2. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than percent.

E. Base-Mat Adhesive: Manufacturer's standard two-component polyurethane.

1. Adhesives shall have a VOC content of 60 g/L or less.
2. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

F. Base-Mat Sealer: Manufacturer's standard two-component polyurethane compound formulated for sealing base mat.

G. Body Coat(s): Two-component, self-leveling, pigmented, polyurethane containing no rubber fillers and no mercury.

H. Topcoat (Finish Coat): Manufacturer's standard pigmented polyurethane.

I. Finishes:

1. Color: As selected by Architect from manufacturer's full range.
2. Surface Texture: Manufacturer's standard.

2.2 ACCESSORIES

A. Trowelable Leveling and Patching Compound: Latex-modified, hydraulic-cement-based formulation approved by flooring manufacturer.

B. Game-Line and Marker Paint: Complete system including primer, if any, compatible with flooring and recommended in writing by flooring and paint manufacturers for use indicated.

1. Products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances, moisture content, and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Concrete Substrates: Prepare substrates according to manufacturer's written instructions to ensure adhesion of flooring.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners. Remove contaminants using mechanical means.
2. Alkalinity Testing: Perform pH testing according to ASTM F 710. Proceed with installation only if pH readings are not less than 7.0 and not greater than 8.5.
3. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft. (18.6 sq. m), and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.

    a. Anhydrous Calcium Chloride Test: ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
    b. Relative Humidity Test: Using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.

B. Remove substrate coatings and other substances that are incompatible with flooring system components and that contain soap, wax, oil, or silicone, using mechanical methods recommended in writing by manufacturer. Do not use solvents.

C. Use trowelable leveling and patching compound to fill cracks, holes, and depressions in substrates.

D. Treat nonmoving substrate cracks and control joints to prevent cracks from telegraphing (reflecting) through flooring, according to manufacturer's written instructions.

E. Protect substrate voids and joints to prevent flooring resins from flowing into or leaking through them.

F. Move flooring installation materials into spaces where they will be installed at least 48 hours in advance of installation unless manufacturer recommends a longer period in writing.

1. Do not install flooring until it is same temperature as space where it is to be installed.

G. Sweep and vacuum clean substrates to be covered by flooring immediately before installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust. Proceed with installation only after unsatisfactory conditions have been corrected.

H. Protect walls, floor openings, athletic equipment inserts, electrical openings, door frames, and other obstructions during installation. Cover floor and wall areas at mixing stations.

3.3 FLOORING INSTALLATION, GENERAL

A. Mix and apply flooring components according to manufacturer's written instructions.

1. At substrate expansion, isolation, and other moving joints, install continuous joint of same width through flooring.

3.4 INSTALLATION OF DIRECT-APPLIED FLOORING

A. Apply primer over prepared substrate at manufacturer's recommended spreading rate.

B. Apply body coat(s) and topcoat to produce a uniform, level surface and finish.

3.5 INSTALLATION OF FLOORING APPLIED OVER BASE MATS

A. Adhesively apply resilient base mats to substrate according to manufacturer's written instructions.

1. Do not compress mats when fitting into place. Leave gap of width recommended in writing by manufacturer at butted base-mat sheets, walls, floor openings, athletic equipment inserts, electrical openings, door frames, and other obstructions.
2. Roll base mats to set them into adhesive and eliminate air pockets.
3. Repair ridges at seams, loose areas, and air pockets according to manufacturer's written instructions.

B. Apply seal coat to base mats before applying body coat(s).

C. Smooth ridges and high spots in seal coat before applying body coat(s).

D. Apply body coat(s) and topcoat to produce a uniform surface and finish.

3.6 GAME LINES AND MARKERS

A. Mask flooring at game lines and markers, and apply paint to produce sharp edges. Where crossing, break minor game line at intersection; do not overlap lines.

B. Apply game lines and markers in widths and colors according to requirements indicated on Drawings.

3.7 PROTECTION

A. Close spaces to traffic for 48 hours after flooring installation unless manufacturer recommends longer period in writing.

B. Protect flooring from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods recommended in writing by manufacturer.

1. Do not move heavy and sharp objects directly over flooring. Protect flooring with plywood or hardboard panels to prevent damage from storing or moving objects over flooring.

END OF SECTION 09 67 66

SECTION 09 68 13 - TILE CARPETING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes modular, tufted carpet tile.

B. Related Requirements:

1. Section 096513 "Resilient Base and Accessories" for resilient wall base and accessories installed with carpet tile.

1.3 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable LEED Credits

1. MRc2
2. MRc4
3. MRc5
4. IEQc4.1
5. IEQc4.2
6. IEQc4.3

B. LEED Requirements

1. MRc2: CONSTRUCTION WASTE MANAGEMENT

   No less than the specified portion of all construction waste from the Project shall be diverted from disposal in a landfill and/or incineration in with the Project Requirements for Construction Waste Management and Disposal. Refer to Specification Sections 017419 Construction Waste Management and Disposal and 013510 Sustainable Design Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

2. MRc4: Recycled Content Material

   No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the Project Requirements for Recycled Content Materials. All materials counted towards the computations of the proportion of the Recycled Content Materials shall comply with the standard minimum percentages of post-consumer waste materials and for the minimum percentages of pre-consumer waste materials. Refer to Specification Section 013510 Sustainable Project Requirements.

Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

3. MRc5: REGIONALLY MANUFACTURED HARVESTED MATERIALS

   No less than the specified minimum proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the Project Site in accordance with the Project Requirements for Regionally Manufactured and/or Harvested Materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

4. IEQc4.1: Low Emitting Materials: Sealants and Adhesives

   All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the Project Requirements for Low Emitting Materials – Sealants and Adhesives. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

5. IEQc4.2: Low Emitting Materials: Paints and Coatings

   All paints and coatings in the building interior shall comply with the Project Requirements for Low Emitting Materials – Paints and Coatings. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

6. IEQc4.3: Low Emitting Materials: Flooring Systems

   All flooring finish materials installed in the building interior shall meet or exceed the project requirements for Low Emitting Materials – Flooring Systems. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

   1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
   2. Include manufacturer's written installation recommendations for each type of substrate.

B. Sustainable Design Submittals:

   1. Product Data: For adhesives, indicating VOC content.
   2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
   3. Laboratory Test Reports: For flooring products, indicating compliance with requirements for testing and product requirements of CRI's "Green Label Plus" testing program.

4. Laboratory Test Reports: For flooring products, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: For carpet tile installation, plans showing the following:

1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
2. Carpet tile type, color, and dye lot.
3. Type of subfloor.
4. Type of installation.
5. Pattern of installation.
6. Pattern type, location, and direction.
7. Pile direction.
8. Type, color, and location of insets and borders.
9. Type, color, and location of edge, transition, and other accessory strips.
10. Transition details to other flooring materials.

D. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.

1. Carpet Tile: Full-size Sample.
2. Exposed Edge, Transition, and Other Accessory Stripping: 12-inch- (300-mm-) long Samples.

E. Samples for Initial Selection: For each type of carpet tile.

1. Include Samples of exposed edge, transition, and other accessory stripping involving color or finish selection.

F. Samples for Verification: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.

1. Carpet Tile: Full-size Sample.
2. Exposed Edge, Transition, and Other Accessory Stripping: 12-inch- (300-mm-) long Samples.

G. Product Schedule: For carpet tile. Use same designations indicated on Drawings.

H. Sustainable Product Certification: Provide ANSI/NSF 140 certification for carpet products.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For carpet tile, for tests performed by a qualified testing agency.

C. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:

1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association at the Master II Insert description certification level.

B. Fire-Test-Response Ratings: Where indicated, provide carpet tile identical to those of assemblies tested for fire response according to NFPA 253 by a qualified testing agency.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Comply with CRI's "CRI Carpet Installation Standard."

1.9 FIELD CONDITIONS

A. Comply with CRI's "CRI Carpet Installation Standard" for temperature, humidity, and ventilation limitations.

B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at levels planned for building occupants during the remainder of the construction period.

C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.

D. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.10 WARRANTY

A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.

1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
2. Failures include, but are not limited to, the following:

a. More than 10 percent edge raveling, snags, and runs.
b. Dimensional instability.
c. Excess static discharge.
d. Loss of tuft-bind strength.
e. Loss of face fiber.
f. Delamination.

3. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CARPET TILE CPT-1

A. Products: Subject to compliance with requirements, provide the following:

1. Interface: La Paz Colores, Style #146100250H.

B. Color: Garbanzo #101208.

2.2 CARPET TILE CPT-2

A. Products: Subject to compliance with requirements, provide the following :

1. Interface: Lima Colores, Style #146180250H.

B. Color: Garbanzo #101278.

2.3 CARPET TILE CPT-3

A. Products: Subject to compliance with requirements, provide the following :

1. Patcraft: Jot, Style #10295.

B. Color: Spark #00530.

2.4 CARPET TILE CPT-4

A. Products: Subject to compliance with requirements, provide the following :

1. Interface: Viva Colores, Style #146500250H.

B. Color: Verde Primavera #101126.

2.5 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that comply with flammability requirements for installed carpet tile, and are recommended by carpet tile manufacturer for releasable installation.

1. Adhesives shall have a VOC content of 50 g/L or less.
2. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

C. Metal Edge/Transition Strips: Extruded aluminum with mill finish of profile and width shown, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance.

B. Examine carpet tile for type, color, pattern, and potential defects.

C. Concrete Slabs: Verify that finishes comply with requirements specified in Section 033000 "Cast-in-Place Concrete" and that surfaces are free of cracks, ridges, depressions, scale, and foreign deposits.

1. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft. (18.6 sq. m), and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.

a. Anhydrous Calcium Chloride Test: ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
b. Relative Humidity Test: Using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
c. Perform additional moisture tests recommended in writing by adhesive and carpet tile manufacturers. Proceed with installation only after substrates pass testing.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Comply with CRI's "Carpet Installation Standards" and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch (3 mm) wide or wider, and protrusions more than 1/32 inch (0.8 mm) unless more stringent requirements are required by manufacturer's written instructions.

C. Concrete Substrates: Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by adhesive and carpet tile manufacturers.

D. Metal Substrates: Clean grease, oil, soil and rust, and prime if recommended in writing by adhesive manufacturer. Rough sand painted metal surfaces and remove loose paint. Sand aluminum surfaces, to remove metal oxides, immediately before applying adhesive.

E. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

A. General: Comply with CRI's "CRI Carpet Installation Standard," Section 18, "Modular Carpet" and with carpet tile manufacturer's written installation instructions.

B. Installation Method: Glue down; install every tile with full-spread, releasable, pressure-sensitive adhesive.

C. Maintain dye-lot integrity. Do not mix dye lots in same area.

D. Maintain pile-direction patterns indicated on Drawings.

E. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.

F. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

G. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on carpet tile as marked on subfloor. Use nonpermanent, nonstaining marking device.

H. Install pattern parallel to walls and borders.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing carpet tile:

1. Remove excess adhesive and other surface blemishes using cleaner recommended by carpet tile manufacturer.
2. Remove yarns that protrude from carpet tile surface.
3. Vacuum carpet tile using commercial machine with face-beater element.

B. Protect installed carpet tile to comply with CRI's "Carpet Installation Standard," Section 20, "Protecting Indoor Installations."

C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION 09 68 13

SECTION 09 84 33 - SOUND-ABSORBING WALL UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes shop-fabricated, acoustical panel units tested for acoustical performance, including the following:

1. Sound-absorbing wall panels.

B. Related Requirements:

1. Division 07 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 09 Section “Interior Painting” for field painting factory-primed panels.
3. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable LEED Credits

1. MRc2
2. MRc4
3. MRc5
4. MRc7
5. IEQc4.1

B. LEED Requirements

1. MRc2: CONSTRUCTION WASTE MANAGEMENT

No less than the specified portion of all construction waste from the Project shall be diverted from disposal in a landfill and/or incineration in with the Project Requirements for Construction Waste Management and Disposal. Refer to Specification Sections 017419 Construction Waste Management and Disposal and 013510 Sustainable Design Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

2. MRc4: Recycled Content Material

No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the Project Requirements for Recycled Content Materials. All materials counted

towards the computations of the proportion of the Recycled Content Materials shall comply with the standard minimum percentages of post-consumer waste materials and for the minimum percentages of pre-consumer waste materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

3. MRc5: REGIONALLY MANUFACTURED HARVESTED MATERIALS

   No less than the specified minimum proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the Project Site in accordance with the Project Requirements for Regionally Manufactured and/or Harvested Materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

4. MRc7: Certified Wood

   No less than the specified proportion of the building (permanently installed wood-based materials and products and all wood-based materials and products in construction) shall be certified by the Forest Stewardship Council (FSC) in accordance with the Project Requirements. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

5. IEQc4.1: Low Emitting Materials: Sealants and Adhesives

   All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the Project Requirements for Low Emitting Materials – Sealants and Adhesives. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

1.4 DEFINITIONS

A. NRC: Noise Reduction Coefficient.

B. SAA: Sound Absorption Average.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of panel edge, core material, and mounting indicated.

   1. Include panel edge, core material, and mounting indicated.

B. Shop Drawings: For unit assembly and installation.

   1. Include plans, elevations, sections, and mounting devices and details.
   2. Include details at panel head, base, joints, and corners; Indicate panel edge profile and core materials.
   3. Include details at cutouts and penetrations for other work.

C. Samples for Verification: For the following products:

1. Panel Edge: 12-inch- (300-mm-) long Sample(s) showing each edge profile, corner, and finish.
2. Core Material: 12-inch- (300-mm-) square Sample at corner.
3. Mounting Devices: Full-size Samples.
4. Assembled Panels: Approximately 36 by 36 inches (900 by 900 mm), including joints and mounting methods.

1.6 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Elevations and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Electrical outlets, switches, and thermostats.
2. Items penetrating or covered by units including the following:

a. Lighting fixtures.
b. Air outlets and inlets.
c. Alarms.

B. Product Certificates: For each type of unit.

C. Sample Warranty: For manufacturer's special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of unit to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials and units in unopened bundles and store in a temperature-controlled dry place with adequate air circulation.

1.10 FIELD CONDITIONS

A. Environmental Limitations: Do not install units until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work at and above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Air-Quality Limitations: Protect units from exposure to airborne odors, such as tobacco smoke, and install units under conditions free from odor contamination of ambient air.

C. Field Measurements: Verify unit locations and actual dimensions of openings and penetrations by field measurements before fabrication, and indicate them on Shop Drawings.

1.11 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace units and components that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to the following:

a. Acoustical performance.
b. Warping of core.

2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain wall units specified in this Section from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: Units shall comply with "Surface-Burning Characteristics" or "Fire Growth Contribution" Subparagraph below, or both, as determined by testing identical products by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. Surface-Burning Characteristics: Comply with ASTM E 84 or UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

a. Flame-Spread Index: 25 or less.
b. Smoke-Developed Index: 450 or less.

2. Fire Growth Contribution: Comply with acceptance criteria of local code and authorities having jurisdiction when tested according to NFPA 265 Method B Protocol or NFPA 286.

2.3 SOUND-ABSORBING WALL UNITS

A. Sound-Absorbing Wall Panel: Manufacturer's standard panel construction consisting of facing material laminated to front face, edges, and back edge border of core.

B. Sound-Absorbing Wall Panel: Manufacturer's standard panel.

1. Basis-of-Design Product: Tectum Standard Interior Wall Panel.

2. Mounting: Mounted to 1x wood furring strips with exposed fasteners, semi-rigid glass fiber insulation between furring strips. Furring strips shall be continuous behind panel edges, fully enclosing insulation.

    a. Finish Color at Exposed Edges: Match color of facing material.

3. Core: Manufacturer's standard.
4. Edge Construction: Manufacturer's standard cementitious fiberchemically hardened core with no frame.
5. Edge Profile: Beveled
6. Corner Detail in Elevation: Custom as indicated on Drawings with continuous edge profile indicated.
7. Acoustical Performance: Sound absorption NRC of 0.85 according to ASTM C 423 for Type C-20 mounting according to ASTM E 795.
8. Nominal Overall Panel Thickness: 1 inch (25 mm) .
9. Panel Width: As indicated on Drawings .
10. Panel Height: As indicated on Drawings .
11. Panel Finish: Manufacturer’s standard white primer.

2.4 MATERIALS

A. Composite Wood Products: Products shall be made without urea formaldehyde.

B. General:

1. Regional Materials: Sound-absorbing wall units shall be manufactured within 500 miles (800 km) of Project site.
2. Certified Wood: Fabricate products with wood-based components produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."

C. Core Materials:

1. Cementitious-Fiber Board: Density of not less than 20 lb/cu. ft. (320 kg/cu. m) .

    a. Fire-retardant panels made from softwood fibers, synthetic resins, and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 200 or less per ASTM E 84.

2. Wood: Manufacturer's standard clear, vertical grain, straight, kiln-dried hardwood.

    a. Fire-retardant treated by pressure process with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet (3.2 m) beyond the centerline of the burners at any time during the test.

        1) Treated material shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity.

2) Kiln-dry material after treatment to 7 to 13 percent or less for lumber and 15 percent or less for plywood.

2.5 FABRICATION

A. General: Use manufacturer's standard construction except as otherwise indicated; with dimensionally stable core; and with rigid edges to reinforce panel perimeter against warpage and damage.

B. Dimensional Tolerances of Finished Units: Plus or minus 1/16 inch (1.6 mm) for the following:

1. Thickness.
2. Edge straightness.
3. Overall length and width.
4. Squareness from corner to corner.
5. Chords, radii, and diameters.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install units in locations indicated. Unless otherwise indicated, install units with vertical surfaces and edges plumb, top edges level and in alignment with other units, faces flush, and scribed to fit adjoining work accurately at borders and at penetrations.

B. Comply with manufacturer's written instructions for installation of units using type of mounting devices indicated. Mount units securely to supporting substrate.

3.3 CLEANING

A. Clean panels on completion of installation to remove dust and other foreign materials according to manufacturer's written instructions.

END OF SECTION 09 84 33

SECTION 09 91 23 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes surface preparation and the application of paint systems on the following interior substrates, except where indicated to receive High Performance Coatings:

1. Concrete.
2. Concrete masonry units (CMU).
3. Wood.
4. Gypsum board.
5. Plaster.
6. Cotton or canvas insulation covering.
7. ASJ insulation covering.

B. Related Requirements:

1. Section 051200 "Structural Steel Framing" for shop priming structural steel.
2. Section 055000 "Metal Fabrications" for shop priming metal fabrications.
3. Section 055113 "Metal Pan Stairs" for shop priming metal pan stairs.
4. Section 055119 "Metal Grating Stairs" for shop priming metal grating stairs.
5. Section 055213 "Pipe and Tube Railings" for shop priming pipe and tube railings.
6. Section 099600 "High-Performance Coatings" for coatings indicated to be High-Performance Coatings..

1.3 DEFINITIONS

A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.

B. MPI Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

C. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

D. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.

E. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.

F. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.

G. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.4 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable LEED Credits

1. MRc2
2. MRc4
3. MRc5
4. IEQc4.2

B. LEED Requirements

1. MRc2: CONSTRUCTION WASTE MANAGEMENT

No less than the specified portion of all construction waste from the Project shall be diverted from disposal in a landfill and/or incineration in with the Project Requirements for Construction Waste Management and Disposal. Refer to Specification Sections 017419 Construction Waste Management and Disposal and 013510 Sustainable Design Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

2. MRc4: Recycled Content Material

No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the Project Requirements for Recycled Content Materials. All materials counted towards the computations of the proportion of the Recycled Content Materials shall comply with the standard minimum percentages of post-consumer waste materials and for the minimum percentages of pre-consumer waste materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

3. MRc5: REGIONALLY MANUFACTURED HARVESTED MATERIALS

No less than the specified minimum proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the Project Site in accordance with the Project Requirements for Regionally Manufactured and/or Harvested Materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

4. IEQc4.2: Low Emitting Materials: Paints and Coatings

All paints and coatings in the building interior shall comply with the Project Requirements for Low Emitting Materials – Paints and Coatings. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

B. Samples for Initial Selection: For each type of topcoat product.

C. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.

1. Submit Samples on rigid backing, 8 inches square.
2. Step coats on Samples to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

D. Product List: For each product indicated, include the following:

1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.
3. VOC content.

1.6 QUALITY ASSURANCE

A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each paint system.

a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
b. Other Items: Architect will designate items or areas required.

2. Final approval of color selections will be based on mockups.

a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.

3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).

1. Maintain containers in clean condition, free of foreign materials and residue.

2. Remove rags and waste from storage areas daily.

1.8 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following :

1. Benjamin Moore & Co.
2. Cloverdale Paint.
3. Color Wheel Paints & Coatings.
4. Columbia Paint & Coatings.
5. Duron, Inc.
6. Kelly-Moore Paints.
7. M.A.B. Paints.
8. McCormick Paints.
9. PPG Architectural Finishes, Inc.
10. Pratt & Lambert.
11. Sherwin-Williams Company (The).

2.2 PAINT, GENERAL

A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."

B. Material Compatibility:

1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.

C. VOC Content: For field applications that are inside the weatherproofing system, paints and coatings shall comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:

1. Flat Paints and Coatings: 50 g/L.
2. Nonflat Paints and Coatings: 150 g/L.
3. Dry-Fog Coatings: 400 g/L.
4. Primers, Sealers, and Undercoaters: 200 g/L.
5. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.

6. Zinc-Rich Industrial Maintenance Primers: 340 g/L.
7. Pretreatment Wash Primers: 420 g/L.
8. Shellacs, Clear: 730 g/L.
9. Shellacs, Pigmented: 550 g/L.

D. Colors: As indicated in a color schedule.

1. Twenty percent of surface area will be painted with deep tones.

2.3 SOURCE QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:

1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
2. Testing agency will perform tests for compliance with product requirements.
3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

PART 3 - EXECUTION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.
2. Masonry (Clay and CMU): 12 percent.
3. Wood: 15 percent.
4. Gypsum Board: 12 percent.
5. Plaster: 12 percent.

C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

D. Plaster Substrates: Verify that plaster is fully cured.

E. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

F. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceed that permitted in manufacturer's written instructions.

F. Cotton or Canvas Insulation Covering Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:

1. Paint the following work where exposed in equipment rooms:

a. Equipment, including panelboards.
b. Uninsulated metal piping.
c. Uninsulated plastic piping.
d. Pipe hangers and supports.
e. Metal conduit.
f. Plastic conduit.
g. Tanks that do not have factory-applied final finishes.
h. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.

2. Paint the following work where exposed in occupied spaces:

a. Equipment, including panelboards.
b. Uninsulated metal piping.
c. Uninsulated plastic piping.
d. Pipe hangers and supports.
e. Metal conduit.
f. Plastic conduit.
g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
h. Other items as directed by Architect.

3. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.

1. Contractor shall touch up and restore painted surfaces damaged by testing.
2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 INTERIOR PAINTING SCHEDULE

A. Concrete Substrates, Nontraffic Surfaces:

1. High-Performance Architectural Latex System:

a. Prime Coat: Primer, alkali resistant, water based, MPI #3.
b. Intermediate Coat: Latex, interior, high performance architectural, matching topcoat.
c. Topcoat: Latex, interior, high performance architectural, semi-gloss (Gloss Level 5), MPI #141.

B. CMU Substrates:

1. High-Performance Architectural Latex System:

a. Block Filler: Block filler, latex, interior/exterior, MPI #4.
b. Intermediate Coat: Latex, interior, high performance architectural, matching topcoat.
c. Topcoat: Latex, interior, high performance architectural, semi-gloss (Gloss Level 5), MPI #141.

C. Wood Substrates: Including sound-absorbing wall units.

1. High-Performance Architectural Latex System:

a. Prime Coat: Primer, latex, for interior wood, MPI #39.
b. Intermediate Coat: Latex, interior, high performance architectural, matching topcoat.
c. Topcoat: Latex, interior, high performance architectural, (Gloss Level 4), MPI #140.

D. Gypsum Board and Plaster Substrates:

1. High-Performance Architectural Latex System:

a. Prime Coat: Primer sealer, latex, interior, MPI #50.
b. Intermediate Coat: Latex, interior, high performance architectural, matching topcoat.
c. Topcoat: Latex, interior, high performance architectural, (Gloss Level 3), MPI #139.

E. Cotton or Canvas and ASJ Insulation-Covering Substrates: Including pipe and duct coverings .

1. Institutional Low-Odor/VOC Latex System:

a. Prime Coat: Primer sealer, latex, interior, MPI #50.
b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.

1) Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (Gloss Level 5), MPI #147.

END OF SECTION 09 91 23

SECTION 09 96 00 - HIGH-PERFORMANCE COATINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes surface preparation and the application of high-performance coating systems on the following substrates:

1. Exterior Substrates:

   a. Concrete, vertical and horizontal surfaces.
   b. Steel.
   c. Galvanized metal.
   d. Aluminum (not anodized or otherwise coated).

2. Interior Substrates:

   a. Concrete, vertical surfaces, where High Performance Coatings are indicated.
   b. Concrete masonry units (CMUs), where High Performance Coatings are indicated.
   c. Steel.
   d. Galvanized metal.
   e. Aluminum (not anodized or otherwise coated).

B. Related Requirements:

1. Section 051200 "Structural Steel Framing" for shop priming of structural steel with primers specified in this Section.
2. Section 055213 "Pipe and Tube Railings" for shop painting pipe and tube railings with coatings specified in this Section.
3. Section 099123 "Interior Painting" for general field painting of areas not indicated to receive High Performance Coatings.

1.3 DEFINITIONS

A. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.

B. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.

C. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.4 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable LEED Credits

1. MRc2
2. MRc4
3. MRc5
4. IEQc4.2

B. LEED Requirements

1. MRc2: CONSTRUCTION WASTE MANAGEMENT

No less than the specified portion of all construction waste from the Project shall be diverted from disposal in a landfill and/or incineration in with the Project Requirements for Construction Waste Management and Disposal. Refer to Specification Sections 017419 Construction Waste Management and Disposal and 013510 Sustainable Design Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

2. MRc4: Recycled Content Material

No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the Project Requirements for Recycled Content Materials. All materials counted towards the computations of the proportion of the Recycled Content Materials shall comply with the standard minimum percentages of post-consumer waste materials and for the minimum percentages of pre-consumer waste materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

3. MRc5: REGIONALLY MANUFACTURED HARVESTED MATERIALS

No less than the specified minimum proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the Project Site in accordance with the Project Requirements for Regionally Manufactured and/or Harvested Materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

4. IEQc4.2: Low Emitting Materials: Paints and Coatings

All paints and coatings in the building interior shall comply with the Project Requirements for Low Emitting Materials – Paints and Coatings. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
2. Indicate VOC content.

B. Sustainable Design Submittals:

1. Product Data: For paints and coatings, indicating VOC content.
2. Laboratory Test Reports: For paints and coatings, indicating compliance with requirements for low-emitting materials.

C. Samples for Initial Selection: For each type of topcoat product indicated.

D. Samples for Verification: For each type of coating system and each color and gloss of topcoat indicated.

1. Submit Samples on rigid backing, 8 inches (200 mm) square.
2. Apply coats on Samples in steps to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

E. Product List: Cross-reference to coating system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.6 QUALITY ASSURANCE

A. Mockups: Apply mockups of each coating system indicated to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each coating system.

a. Wall and Ceiling Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
b. Other Items: Architect will designate items or areas required.

2. Final approval of color selections will be based on mockups.

a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.

3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).

1. Maintain containers in clean condition, free of foreign materials and residue.

2. Remove rags and waste from storage areas daily.

1.8 FIELD CONDITIONS

A. Apply coatings only when temperature of surfaces to be coated and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).

B. Do not apply coatings when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

C. Do not apply exterior coatings in snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Akzo Nobel Paints
2. Benjamin Moore & Co.
3. Cloverdale Paint.
4. Frazee Paint.
5. ICI Paints.
6. Parker Paint Mfg. Co. Inc.
7. PPG Architectural Finishes, Inc.
8. Sherwin-Williams Company (The).
9. Tnemec Company, Inc.

2.2 HIGH-PERFORMANCE COATINGS, GENERAL

A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."

B. Material Compatibility:

1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
3. Products shall be of same manufacturer for each coat in a coating system.

C. VOC Content: For field applications that are inside the weatherproofing system, paints and coatings shall comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:

1. Flat Paints and Coatings: 50 g/L.
2. Nonflat Paints and Coatings: 150 g/L.
3. Primers, Sealers, and Undercoaters: 200 g/L.
4. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.

5. Zinc-Rich Industrial Maintenance Primers: 340 g/L.
6. Pretreatment Wash Primers: 420 g/L.
7. Floor Coatings: 100 g/L.
8. Shellacs, Clear: 730 g/L.
9. Shellacs, Pigmented: 550 g/L.

D. Colors: As selected by Architect from manufacturer's full range.

2.3 BLOCK FILLERS

A. Block Filler, Epoxy: MPI #116.

2.4 METAL PRIMERS

A. Primer, Epoxy, Anti-Corrosive, for Metal: MPI #101.

B. Primer, Vinyl Wash: MPI #80.

2.5 EPOXY COATINGS

A. Epoxy, Gloss: MPI #77.

B. Epoxy, High-Build, Low Gloss: MPI #108.

2.6 POLYURETHANE COATINGS

A. Polyurethane, Two-Component, Pigmented, Gloss (Gloss Level 6): MPI #72.

2.7 SOURCE QUALITY CONTROL

A. Testing of Coating Materials: Owner reserves the right to invoke the following procedure:

1. Owner will engage the services of a qualified testing agency to sample coating materials. Contractor will be notified in advance and may be present when samples are taken. If coating materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
2. Testing agency will perform tests for compliance with product requirements.
3. Owner may direct Contractor to stop applying coatings if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying coating materials from Project site, pay for testing, and recoat surfaces coated with rejected materials. Contractor will be required to remove rejected materials from previously coated surfaces if, on recoating with complying materials, the two coatings are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.
2. Masonry (Clay and CMUs): 12 percent.

C. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.

D. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and coating systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean substrates of substances that could impair bond of coatings, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce coating systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.

1. Clean surfaces with pressurized water. Use pressure range of 1500 to 4000 psi (10 350 to 27 580 kPa) at 6 to 12 inches (150 to 300 mm).
2. Abrasive blast clean surfaces to comply with SSPC-SP 7/NACE No. 4.

E. Masonry Substrates: Remove efflorescence and chalk. Do not coat surfaces if moisture content, alkalinity of surfaces, or alkalinity of mortar joints exceeds that permitted in manufacturer's written instructions.

1. Clean surfaces with pressurized water. Use pressure range of 100 to 600 psi (690 to 4140 kPa) at 6 to 12 inches (150 to 300 mm).

F. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer.

G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied coatings.

3.3 APPLICATION

A. Apply high-performance coatings according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."

1. Use applicators and techniques suited for coating and substrate indicated.
2. Coat surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, coat surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Coat backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
4. Do not apply coatings over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of the same material are to be applied. Tint undercoats to match color of finish coat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance.

D. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.

3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test coatings for dry film thickness.

1. Contractor shall touch up and restore coated surfaces damaged by testing.
2. If test results show that dry film thickness of applied coating does not comply with coating manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with coating manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from coating operation. Correct damage to work of other trades by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

3.6 EXTERIOR HIGH-PERFORMANCE COATING SCHEDULE

A. Concrete Substrates, Vertical Surfaces:

1. Pigmented Polyurethane over Epoxy System MPI EXT 3.1M:

a. Prime Coat: Epoxy, matching intermediate coat.
b. Intermediate Coat: Epoxy, gloss, MPI #77.

c. Topcoat: Polyurethane, two component, pigmented, gloss (MPI Gloss Level 6), MPI #72.

B. CMU Substrates:

1. Pigmented Polyurethane over High-Build Epoxy System MPI EXT 4.2G:

a. Block Filler: Block filler, epoxy, MPI #116.

b. Intermediate Coat: Epoxy, high build, low gloss, MPI #108.

c. Topcoat: Polyurethane, two component, pigmented, gloss (MPI Gloss Level 6), MPI #72.

C. Steel Substrates:

1. Pigmented Polyurethane over Epoxy System MPI EXT 5.1H:

a. Prime Coat: Primer, epoxy, anti-corrosive, for metal, MPI #101.

b. Intermediate Coat: Epoxy, gloss, MPI #77.

c. First and Second Topcoat: Polyurethane, two component, pigmented, gloss (MPI Gloss Level 6), MPI #72.

D. Galvanized-Metal Substrates:

1. Pigmented Polyurethane over Epoxy Primer System MPI EXT 5.3L:

a. Prime Coat: Primer, epoxy, anti-corrosive, for metal, MPI #101.

b. Intermediate Coat: Polyurethane, two component, pigmented, gloss matching topcoat.
c. Topcoat: Polyurethane, two component, pigmented, gloss (MPI Gloss Level 6), MPI #72.

E. Aluminum (Not Anodized or Otherwise Coated) Substrates:

1. Pigmented Polyurethane over Epoxy System MPI EXT 5.4B:

a. Prime Coat: Primer, vinyl wash, MPI #80.
b. Intermediate Coat: Primer, epoxy, anti-corrosive, for metal, MPI #101.
c. First and Second Topcoat: Polyurethane, two component, pigmented, gloss (MPI Gloss Level 6), MPI #72.

3.7 INTERIOR HIGH-PERFORMANCE COATING SCHEDULE

A. Concrete Substrates, Vertical Surfaces:

1. Epoxy, High-Build System MPI INT 3.1P:

a. Prime Coat: High-build epoxy, matching topcoat (reduced).
b. Intermediate Coat: High-build epoxy, matching topcoat.
c. Topcoat: High-build epoxy, low gloss (MPI Gloss Level 5), MPI #108.

B. CMU Substrates:

1. Epoxy, High-Build System MPI INT 4.2R:

a. Prime Coat: Epoxy block filler, MPI #116.
b. Intermediate Coat: High-build epoxy, matching topcoat.
c. Topcoat: High-build epoxy, low gloss (MPI Gloss Level 5), MPI #108.

C. Steel Substrates:

1. Epoxy System MPI INT 5.1L:

a. Prime Coat: Primer, epoxy, anti-corrosive, for metal, MPI #101.
b. Intermediate Coat: Epoxy, matching topcoat.
c. Topcoat: Epoxy, semi-gloss (MPI Gloss Level 5), MPI #177.

D. Galvanized-Metal Substrates:

1. Epoxy over Epoxy Primer System MPI INT 5.3D:

a. Prime Coat: Primer, epoxy, anti-corrosive, for metal, MPI #101.
b. Intermediate Coat: Epoxy, matching topcoat.
c. Topcoat: Epoxy, semi-gloss (MPI Gloss Level 5), MPI #177.

E. Aluminum (Not Anodized or Otherwise Coated) Substrates:

1. Pigmented Polyurethane System MPI INT 5.4C:

a. Prime Coat: Primer, vinyl wash, MPI #80.
b. Intermediate Coat: Epoxy, gloss, MPI #77.
c. Topcoat: Polyurethane, two-component, pigmented, gloss (MPI Gloss Level 6), MPI #72..

END OF SECTION 09 96 00

SECTION 10 12 00 - DISPLAY CASES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Display cases.

B. Related Requirements:

1. Division 07 section “Security Joint Sealants” for requirements for and locations to receive security joint sealants..
2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 SUSTAINABLE DESIGN REQUIREMENTS

A. MRc2: CONSTRUCTION WASTE MANAGEMENT

1. No less than the specified minimum proportion of all construction waste from the project shall be diverted from disposal in a landfill and/or incineration in accordance with the project requirements for Construction Waste Management. See Section 018113 Sustainable Design Requirements.

B. MRc4: Recycled Content Material

1. No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the project requirements for Recycled Content Materials. All materials counted toward the computation of the proportion of the Recycled Content Materials shall comply with the standard for the minimum percentages of post-consumer waste materials and for the minimum percentage of pre-consumer waste materials. See Section 018113 Sustainable Design Requirements.
2. Contractor shall provide LEED credit verification as per section 013300 Submittal Procedures.

C. MRc5: Regionally manufactured harvested materials

1. No less than the specified proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the project site in accordance with the project requirements for Regionally Manufactured and/or Harvested Materials. See Section 018113 Sustainable Design Requirements.
2. Contractor shall provide LEED credit verification as per Section 013300 Submittal Procedures.

D. EQc4.1: LOW-EMITTING MATERIALS – SEALANTS AND ADHESIVES

1. All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the project requirements for Low-Emitting Materials – Sealants and Adhesives. See Section 018113 Sustainable Design Requirements.
2. Contractor shall provide LEED credit verification as per Section 013300 Submittal Procedures.

E. EQc4.2: LOW-EMITTING MATERIALS – PAINTS AND COATINGS

1. All paints and coatings used in the building interior comply with the project requirements for Low-Emitting Materials – Paints and Coatings. See Section 018113 Sustainable Design Requirements.
2. Contractor shall provide LEED credit verification as per Section 013300 Submittal Procedures.

1.4 DEFINITIONS

A. Display Case: Glazed cabinet with tackboard panel back surface and adjustable shelves.

B. Tackboard Panel: A material for holding push-pins or tacks typically consisting of a facing; such as fabric, vinyl, or cork; adhered to a substrate; such as fiberboard, hardboard, particleboard.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for display cases. Include furnished specialties and accessories.

B. Shop Drawings: For display cases.

1. Include plans, elevations, sections, and attachment details.
2. Show location of seams and joints in tackboard panels.
3. Include sections of typical trim members.
4. Include diagrams for wiring of illuminated display cases.

C. Samples: For each exposed product and for each color and texture specified; not less than 8-1/2 by 11 inches (215 by 280 mm) for tackboard panels and 6 inches (150 mm) long for trim with factory finish.

D. Samples for Initial Selection: For each type of exposed finish.

1. Include Samples of tackboard panels and factory-finished trim involving color finish selection.

E. Samples for Verification: For each type of exposed finish for the following.

1. Tackboard Panel: Not less than 8-1/2 by 11 inches (215 by 280 mm), with facing and substrate indicated for final Work. Include one panel for each type, color, and texture required.

1.6 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For tackboard panels, for tests performed by a qualified testing agency.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For display cases to include in maintenance manuals.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install display cases for indoor installations until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

B. Field Measurements: Verify actual dimensions of openings for display cases by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain display cases from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 50 or less.

B. Electrical Components: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.3 DISPLAY CASE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AARCO Products, Inc.
2. Best-Rite; MooreCo, Inc.
3. Claridge Products and Equipment, Inc.
4. Nelson-Harkins Industries.
5. Newline Products, Inc.
6. Platinum Visual Systems.

B. Recessed Display Case: Factory-fabricated display case; with finished interior, operable glazed doors at front, and trim on face to cover edge of recessed opening.

1. Display Case Cabinet: Extruded aluminum.

2. Face Frame: Aluminum.
3. Aluminum Finish: Clear anodic.

a. Color: Light bronze.

C. Glazed Sliding Doors: Clear Lexon glass; unframed; with extruded-aluminum top and bottom track; supported on nylon or ball-bearing rollers; with plastic top guide and rubber bumpers. Equip each door with ground finger pull and adjustable cylinder lock with two keys.

1. Thickness: Not less than 6 mm thick.
2. Number of Doors: As indicated on Drawings.

D. Shelves: 6-mm-thick Lexon glass; supported on adjustable shelf standards and supports.

1. Shelf Depth: 8 inches (200 mm).
2. Number of Shelves: Three.

E. Adjustable Shelf Standards and Supports: BHMA A156.9, B04102; with shelf brackets, B04112; recess mounted in rear surface. Provide standards extending full height of display case.

F. Back Panel: Vinyl-fabric-faced tackboard panel.

2.4 MATERIALS

A. Composite Wood Products: Products shall be made without urea formaldehyde.

B. Vinyl Fabric: FS CCC-W-408D, Type II, burlap weave; weighing not less than 13 oz./sq. yd. (440 g/sq. m); with flame-spread index of 25 or less when tested according to ASTM E 84.

C. Extruded-Aluminum Bars and Shapes: ASTM B 221 (ASTM B 221M), Alloy 6063.

D. Aluminum Tubing: ASTM B 429/B 429M, Alloy 6063.

E. Transparent Acrylic Sheet: ASTM D 4802, Category A-1 (cell-cast sheet), with Finish 1 (smooth or polished), colorless sheet with visible light transmittance of 92 percent measured according to ASTM D 1003.

F. Fasteners: Provide screws, bolts, and other fastening devices made from same material as items being fastened, except provide hot-dip galvanized, stainless-steel, or aluminum fasteners for exterior applications. Provide types, sizes, and lengths to suit installation conditions. Use security fasteners where exposed to view per Division 11 Section “Tamper-Proof Metal Fasteners”

G. Adhesives: Do not use adhesives that contain urea formaldehyde.

2.5 FABRICATION

A. Fabricate display cases to requirements indicated for dimensions, design, and thickness and finish of materials.

B. Use metals and shapes of thickness and reinforcing required to produce flat surfaces, and to impart strength for size, design, and application indicated.

C. Fabricate cabinets and door frames with reinforced corners, mitered to a hairline fit, with no exposed fasteners.

D. Fabricate shelf standards plumb and at heights to align shelf brackets for level shelves.

2.6 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.7 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance of the Work.

B. Examine roughing-in for electrical power systems to verify actual locations of connections before installation of illuminated units.

C. Examine walls and partitions for proper backing for display cases.

D. Examine walls and partitions for suitable framing depth if recessed units will be installed.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare recesses for display cases as required by type and size of unit.

SECTION 10 14 00 - SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Plaques.
2. Dimensional characters.
3. Panel signs
4. Applied copy signs.

B. Related Sections include the following:

1. Division 01 Section "Temporary Facilities and Controls" for temporary Project identification signs and for temporary information and directional signs.
2. Division 07 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
3. Division 11 Section “Tamper Proof Metal Fasteners” for requirements for and locations to receive security fasteners.
4. Division 13 Section “Radiation Protection” for Informational Signs.
5. Division 14 Section "Electric Traction Elevators" for code-required elevator signage.
6. Division 22 Section "Identification for Plumbing Piping and Equipment" for labels, tags, and nameplates for plumbing systems and equipment.
7. Division 23 Section "Identification for HVAC Piping and Equipment" for labels, tags, and nameplates for HVAC systems and equipment.
8. Division 26 Section "Identification for Electrical Systems" for labels, tags, and nameplates for electrical equipment.
9. Division 26 Section "Interior Lighting" for illuminated Exit signs.

1.3 DEFINITIONS

A. ADA-ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines."

1.4 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable LEED Credits

1. MRc2
2. MRc4
3. MRc5
4. IEQc4.1

B. LEED Requirements

1. MRc2: CONSTRUCTION WASTE MANAGEMENT

3.3 INSTALLATION

A. General: Install units in locations and at mounting heights indicated on Drawings, or if not indicated, at heights indicated below. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.

1. Mounting Height: 72 inches (1829 mm) above finished floor to top of cabinet.

B. Bulletin Boards: Attach units to wall surfaces with concealed clips, hangers, or grounds.

C. Recessed Display Cases: Attach units to wall framing with fasteners at not more than 16 inches (400 mm) o.c. Attach aluminum trim over edges of recessed display cases and conceal grounds and clips. Attach trim with fasteners at not more than 24 inches (600 mm) o.c.

D. Install display case shelving level and straight.

3.4 ADJUSTING AND CLEANING

A. Adjust doors to operate smoothly without warp or bind and so contact points meet accurately. Lubricate operating hardware as recommended by manufacturer.

B. Touch up factory-applied finishes to restore damaged areas.

END OF SECTION 101200

SECTION 10 14 00 - SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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5. Division 14 Section "Electric Traction Elevators" for code-required elevator signage.
6. Division 22 Section "Identification for Plumbing Piping and Equipment" for labels, tags, and nameplates for plumbing systems and equipment.
7. Division 23 Section "Identification for HVAC Piping and Equipment" for labels, tags, and nameplates for HVAC systems and equipment.
8. Division 26 Section "Identification for Electrical Systems" for labels, tags, and nameplates for electrical equipment.
9. Division 26 Section "Interior Lighting" for illuminated Exit signs.

1.3 DEFINITIONS

A. ADA-ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines."

1.4 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable LEED Credits

1. MRc2
2. MRc4
3. MRc5
4. IEQc4.1

B. LEED Requirements

1. MRc2: CONSTRUCTION WASTE MANAGEMENT

No less than the specified portion of all construction waste from the Project shall be diverted from disposal in a landfill and/or incineration in with the Project Requirements for Construction Waste Management and Disposal. Refer to Specification Sections 017419 Construction Waste Management and Disposal and 013510 Sustainable Design Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

2. MRc4: Recycled Content Material

   No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the Project Requirements for Recycled Content Materials. All materials counted towards the computations of the proportion of the Recycled Content Materials shall comply with the standard minimum percentages of post-consumer waste materials and for the minimum percentages of pre-consumer waste materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

3. MRc5: REGIONALLY MANUFACTURED HARVESTED MATERIALS

   No less than the specified minimum proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the Project Site in accordance with the Project Requirements for Regionally Manufactured and/or Harvested Materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

4. IEQc4.1: Low Emitting Materials: Sealants and Adhesives

   All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the Project Requirements for Low Emitting Materials – Sealants and Adhesives. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated, including details of construction relative to materials, dimensions of individual components, profiles, and finishes.

B. Shop Drawings: Show fabrication and installation details for all signs. Include plans, elevations, and large-scale sections of typical members and other components. Show anchors, grounds, layout, reinforcement, accessories, and installation details.

1. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
2. For signs supported by or anchored to permanent construction, provide setting drawings, templates, and directions for installation of anchor bolts and other anchors to be installed as a unit of Work in other Sections
3. Provide message list, typestyles, graphic elements, including tactile characters and Braille, and layout for each sign.
4. For signs supported by or anchored to permanent construction, provide setting drawings, templates, and directions for installation of anchor bolts and other anchors to be installed as a unit of Work in other Sections.
5. Templates:

a. Furnish full-size spacing templates for individually mounted dimensional letters and numbers

C. Samples for Initial Selection: Manufacturer's color charts consisting of actual units or sections of units showing the full range of colors available for the following:

1. Aluminum.
2. Acrylic sheet.

D. Samples for Verification: For each of the following products and for the full range of color, texture, and sign material indicated, of sizes indicated:

1. Plaque Casting: 6 inches square including border.
2. Dimensional Characters: Full-size Samples of each type of dimensional character (letter, number, and graphic element).
   a. Provide full-size samples of each dimensional letter type required, showing letter style, color, and material finish and method of attachment.
3. Aluminum:
   a. Samples of each finish type and color, on 6-inch-long sections of extrusions and not less than 4-inch squares of sheet or plate. Where finishes involve normal color and texture variations, include sample sets showing the full range of variations expected.
4. Acrylic Sheet: 8 by 10 inches for each color required.
   a. On each panel include a representative sample of the graphic image process required, showing graphic style, and colors and finishes of letters, numbers, and other graphic devices.

E. Sign Schedule: Refer to drawings.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and fabricator.

B. Maintenance Data: For signs to include in maintenance manuals.

C. Warranty: Special warranty specified in this Section.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

B. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

C. Source Limitations for Signs: Obtain each sign type indicated from one source from a single manufacturer.

D. Regulatory Requirements: Comply with applicable provisions in ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

1. Use only approved international symbols.

E. Graphic Content and Style: Provide sign copy that complies with the requirements indicated for size, style, spacing, content, position, material, finishes, and colors of letters, numbers, and other graphic devices as indicated.

1.8 PROJECT CONDITIONS

A. Field Measurements: Verify recess openings by field measurements before fabrication and indicate measurements on Shop Drawings.

1.9 COORDINATION

A. Awarded sign manufacturer will meet with the Owner to develop the signage package for the building. Reviewed at the meeting(s) includes, but not limited to the following:

1. Sign Size
2. Character Size
3. Character Finish/Color
4. Text/Message
5. Graphics
6. Location

B. Manufacturer shall obtain Owner's signed approval prior to any fabrication.

C. Coordinate placement of anchorage devices with templates for installing signs.

1.10 PROJECT CONDITIONS

A. Field Measurements:

1. Take field measurements prior to preparation of shop drawings and fabrication to ensure proper fitting.
2. Show recorded measurements on final shop drawings.
3. Coordinate fabrication schedule with construction progress to avoid delay.

1.11 DELIVERY,STORAGE, AND HANDLING

A. Deliver products in manufacturer's original, unopened, undamaged containers with identification labels intact.

1. Store products protected from weather, temperature, and other harmful conditions as recommended by supplier.
2. Handle products in accordance with manufacturer's instructions.

1.12 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Deterioration of metal finishes beyond normal weathering.
   b. Deterioration of embedded graphic image colors sign lamination.
2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminum Castings: ASTM B 26/B 26M, of alloy and temper recommended by sign manufacturer for casting process used and for use and finish indicated.

B. Acrylic Sheet: ASTM D 4802, Category A-1 (cell-cast sheet), Type UVA (UV absorbing).

C. Applied Vinyl: Die-cut characters from vinyl film of nominal thickness of 3 mils with pressure-sensitive adhesive backing, suitable for exterior applications.

2.2 PLAQUES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Advance Corporation; Braille-Tac Division.
2. A. R. K. Ramos.
3. Matthews International Corporation; Bronze Division.
4. Metal Arts; Div. of L&H Mfg. Co.
5. Mills Manufacturing Company.
6. Nelson-Harkins Industries.
7. Southwell Company (The).

B. Cast Plaques: Provide castings free of pits, scale, sand holes, and other defects, as follows:

1. Plaque Material: Aluminum .
2. Background Texture: Manufacturer's standard stipple texture.
3. Border Style: Raised flat band.
4. Mounting: Concealed studs for substrates encountered.

C. Plaque Schedule:

1. Plaque Type:
   a. Plaque Size: To be coordinated with Owner provided Text/Graphics
   b. Character Size: To be coordinated with Owner provided Text/Graphics
   c. Character Finish/Color: As indicated
   d. Text/Message: To be provided by Owner
   e. Location: As indicated

2.3 DIMENSIONAL CHARACTERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. ACE Sign Systems, Inc.
2. Advance Corporation; Braille-Tac Division.
3. ASI-Modulex, Inc.
4. Bunting Graphics, Inc.
5. Charleston Industries, Inc.
6. Grimco, Inc.
7. Innerface Sign Systems, Inc.
8. Metal Arts; Div. of L&H Mfg. Co.
9. Mohawk Sign Systems.
10. Nelson-Harkins Industries.
11. Signature Signs, Incorporated.
12. Southwell Company (The).

B. Cast Characters: Produce characters with smooth flat faces, sharp corners, and precisely formed lines and profiles, free of pits, scale, sand holes, and other defects. Cast lugs into back of characters and tap to receive threaded mounting studs. Alloy and temper recommended by sign manufacturer for casting process used and for use and finish indicated. Comply with the following requirements.

1. Character Material: Aluminum.
2. Color(s): Clear anadized.
3. Mounting: Concealed studs, noncorroding for substrates encountered.

C. Dimensional Character Sign Schedule: Refer to drawings

1. Sign Size: As indicated.
2. Character Size: To be determined as needed to provided Text/Graphics as noted.
3. Text/Message: As indicated.
4. Location: As indicated.

2.4 PANEL SIGNS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. ACE Sign Systems, Inc.
2. Allenite Signs; Allen Marking Products, Inc.
3. APCO Graphics, Inc.
4. ASI-Modulex, Inc.
5. Best Sign Systems Inc.
6. Bunting Graphics, Inc.
7. Gemini Incorporated.
8. Innerface Sign Systems, Inc.
9. InPro Corporation
10. Mohawk Sign Systems.
11. Nelson-Harkins Industries.

B. Interior Panel Signs: Provide smooth sign panel surfaces constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch measured diagonally from corner to corner, complying with the following requirements:

1. Laminated, Etched Photopolymer: Raised graphics with Braille 1/32 inch above surface with contrasting colors in finishes and color combinations indicated as selected by Architect from manufacturer's full range and laminated to acrylic back.
2. Edge Condition: Square cut.
3. Corner Condition: Square.
4. Mounting: Unframed.
    a. All wall and door mounted Signs to be fully chemically adhered.
    b. All wall and door mounted Signs to have any gaps around perimeter filled with security sealant.
5. Color: As selected by Architect from manufacturer's full range.
6. Tactile Characters: Characters and Grade 2 Braille raised 1/32 inch above surface with contrasting colors.
    a. Produce precisely formed characters with square cut edges free from burrs and cut marks.

C. Laminated Interior Signs: Solid phenolic panel core with graphic image covered with thermosetting resin face layer.

1. Surface Finish: Mat
2. Edge Condition: Square cut
3. Corner Condition: Square
4. Thickness: 1/4 inch

D. Changeable Message Inserts: Fabricate signs to allow insertion of changeable messages in the form of slide-in inserts printed by Owner .

1. Furnish insert material and software for creating text and symbols for PC-Windows and Macintosh computers for Owner production of paper inserts.
2. Furnish insert material cut-to-size for changeable message insert.

E. Tactile and Braille Sign: Manufacturer's standard process for producing text and symbols complying with ADA-ABA Accessibility Guidelines and with ICC/ANSI A117.1.

Text shall be accompanied by Grade 2 Braille. Produce precisely formed characters with square-cut edges free from burrs and cut marks; Braille dots with domed or rounded shape.

1. Panel Material: Photopolymer .
2. Raised-Copy Thickness: Not less than 1/32 inch.

F. Colored Coatings for Acrylic copy Sheet: For copy and background colors, provide colored coatings, including inks, dyes, and paints, that are recommended by acrylic manufacturers for optimum adherence to acrylic surface and are UV and water resistant for five years for application intended.

1. Color: As selected by Architect from manufacturer's full range

G. Panel Sign Schedule: Refer to Sign Schedule as indicated in Part 3

1. Sign Type:
   a. Sign Size: As indicated
   b. Message Panel Material: As indicated.
   c. Character Size: To be determined as needed to provided Text/Graphics as noted
   d. Text/Message: As indicated
   e. Location: As indicated.

2.5 VINYL FILM

A. Provide opaque non-reflective, die-cut vinyl film, 0.0035-inch minimum thickness, with pressure-sensitive adhesive backing, suitable for exterior as well as interior applications.

B. Available Products:

1. Letrasign:
   a. Letraset, Moonachie, NJ.
2. Gerbercal
   a. Gerber Scientific Products.

2.6 ACCESSORIES

A. Anchors and Inserts: Provide nonferrous-metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion-bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

2.7 FABRICATION

A. General: Provide manufacturer's standard signs of configurations indicated.

1. Mill joints to tight, hairline fit. Form joints exposed to weather to exclude water penetration.
2. Preassemble signs in the shop to greatest extent possible. Disassemble signs only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation, in location not exposed to view after final assembly.
3. Conceal fasteners if possible; otherwise, locate fasteners where they will be inconspicuous.

2.8 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Colors and Surface Textures: For exposed sign material that requires selection of materials with integral or applied colors, surface textures or other characteristics related to appearance, provide color matches indicated, or if not indicated, as selected by the Architect from the manufacturer's standards.

E. Aluminum Finishes: Clear Anodic Finish: Manufacturer's standard Class 1 clear anodic coating, 0.018 mm or thicker, over a satin (directionally textured) mechanical finish, complying with AAMA 611.

F. Acrylic Sheet Finishes: Colored Coatings for Acrylic Sheet: For copy and background colors, provide colored coatings, including inks, dyes, and paints, that are recommended by acrylic manufacturers for optimum adherence to acrylic surface and that are UV and water resistant for two years for application intended.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Verify that items are sized and located to accommodate signs.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Locate signs and accessories where indicated, using mounting methods of types described and complying with manufacturer's written instructions.

1. Install signs level, plumb, and at heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Interior Wall Signs: Install signs on walls adjacent to latch side of door where applicable. Where not indicated or possible, such as double doors, install signs on nearest adjacent walls. Locate to allow approach within 3 inches of sign without encountering protruding objects or standing within swing of door.

B. Wall-Mounted Signs: Comply with sign manufacturer's written instructions except where more stringent requirements apply.

1. Mechanical Fasteners: Use non-removable mechanical fasteners placed through predrilled holes. Attach signs with fasteners and anchors suitable for secure attachment to substrate as recommended in writing by sign manufacturer. Fasteners are to be security type. Refer to specification 111993.

C. Vinyl Film:

1. Soft-burnish and buff signs in compliance with manufacturer’s written instructions and SPM’s directions

2. Signs Mounted on Glass: Provide matching opaque plate on opposite side of glass to conceal mounting materials.

D. Bracket-Mounted Signs: Provide manufacturer's standard brackets, fittings, and hardware for mounting signs that project at right angles from walls and ceilings. Attach brackets and fittings securely to walls and ceilings with concealed fasteners and anchoring devices to comply with manufacturer's written instructions.

E. Dimensional Characters: Mount characters using standard fastening methods to comply with manufacturer's written instructions for character form, type of mounting, wall construction, and condition of exposure indicated. Provide heavy paper template to establish character spacing and to locate holes for fasteners.

1. Projected Mounting: Mount characters at projection distance from wall surface indicated.

F. Cast-Metal Plaques: Mount plaques using standard fastening methods to comply with manufacturer's written instructions for type of wall surface indicated.

1. Concealed Mounting: Mount plaques by inserting threaded studs into tapped lugs on back of plaque. Set in predrilled holes filled with quick-setting cement.

3.3 CLEANING AND PROTECTION

A. After installation, clean soiled sign surfaces according to manufacturer's written instructions. Protect signs from damage until acceptance by Owner.

3.4 SIGN SCHEDULE: Attachment A.

3.5 SIGN DRAWINGS: Attachment B.

END OF SECTION 101400

BUILDING SIGNAGE SCHEDULE

				DOOR TAG				SIGN				
						LOCATION						
LEVEL	ROOM NUMBER	ROOM NAME	ARCHITECTURAL DOOR NUMBER	TYPE	COLOR	PULL SIDE	PUSH SIDE	TYPE	COLOR	LOCATION	REMARKS	TEXT
BASEMENT	E002	ELECTRICAL ROOM	11.1.22	-	-				-			
BASEMENT	E003	MECHANICAL ROOM	11.1.20	-	-				-			
BASEMENT	E004	ELECTRICAL ROOM	11.1.18	-	-				-			
BASEMENT	E008	CLASSROOM	11.1.28	-	-				-			
BASEMENT	E008		11.1.29	-	-				-			
BASEMENT	E009	MECHANICAL ROOM	11.1.17	-	-				-			
BASEMENT	E009		11.1.39	-	-				-			
BASEMENT	E011	ELEVATOR	-	-	-				-			
BASEMENT	E012	STAIR 4	11.1.21	-	-			-	-	-		
BASEMENT	11.0.1	MAIN ELECTRIC ROOM	11.0.1A	1.0	-	X	-	3.0	-	WHL		ELECTRIC RM.
BASEMENT	11.0.1		11.0.1B	1.0	-	X	-	3.0	-	WHL		ELECTRIC RM.
BASEMENT	11.0.2	EMERGENCY ELECTRIC ROOM	11.0.2	1.0	-	X	-	3.0	-	WHL		EMERGENCY ELECTRIC RM.
BASEMENT	11.0.3	MDF ROOM	11.0.3	1.0	-	X	-	3.0	-	WSL		MDF
BASEMENT	11.0.4	WATER SPRINKLER ROOM	11.0.4	1.0	-	X	-	3.0	-	WHL		WATER SPRINKLER
BASEMENT	-		11.1.19	1.0	-	-	-	-	-	-		
FIRST FLOOR	0.1	ENTRY VEST.	0.1A	1.0	-	-	X	-	-	-		-
FIRST FLOOR	0.1		0.1B	1.0	-	-	X	-	-	-		-
FIRST FLOOR	0.2	SALLYPORT	0.2A	1.0	-	X	X		-			-
FIRST FLOOR	0.2		0.2B	1.0	-	X	X	4.2	-	DPL		NO VISITORS BEYOND THIS POINT
FIRST FLOOR	0.2		0.2C	1.0	-	X	X	-	-	-		-
FIRST FLOOR	0.3	STAFF SALLY	0.3A	1.0	-	X	X	3.0	-	DPL	2	MASTER CONTROL
FIRST FLOOR	0.3		0.3B	1.0	-	X	X	-	-	-		-
FIRST FLOOR	0.4	QUEUING AREA	-	-	-	-	-	4.2	-	CLG	1	SECURITY SCREENING
FIRST FLOOR	0.6	SECURITY SCREEN	0.6	1.0	-	X	X	-	-	-		-
FIRST FLOOR	-	LOBBY	-	-	-	-	-	-	-	-		-
FIRST FLOOR	0.8.1	W. TLT.	0.8.1	1.0	-	X	-	3.2	-	WSL		WOMEN
FIRST FLOOR	0.8.1	W. TLT.	0.8.1	-	-	-	-	4.0	-	DPH		VISITORS ONLY
FIRST FLOOR	0.8.2	M. TLT.	0.8.2	1.0	-	X	-	3.3	-	WSL		MEN
FIRST FLOOR	0.8.2	M. TLT.	0.8.2	-	-	-	-	4.0	-	DPH		VISITORS ONLY
FIRST FLOOR	1.0	CORRIDOR	1.0A	1.0	-	X	X	4.2	-	DPL		NO VISITORS BEYOND THIS POINT
FIRST FLOOR	1.0	CORRIDOR	1.0B	1.0	-	X	X	3.0	-	WSL		ADMINISTRATION SUPPORT
FIRST FLOOR	1.1	FACILITY ADMIN. OFFICE	1.1	1.0	-	-	X	3.1	-	DPH		"NAME & TITLE"
FIRST FLOOR	1.2	MGT. ASSOC. OFFICE	1.2	1.0	-	-	X	3.1	-	DPH		"NAME & TITLE"
FIRST FLOOR	1.3	CONF. RM.	1.3A	1.0	-	X	-	3.0	-	DPL		CONFERENCE RM.
FIRST FLOOR	1.3		1.3B	1.0	-	-	X		-	-		-
FIRST FLOOR	1.4	ADMIN. SUPPORT	-	-	-	-	-	-	-	-		-
FIRST FLOOR	1.5	SUPPLY CLOS.	1.5	-	-	-	X	3.0	-	WSH		STORAGE CLOSET
FIRST FLOOR	1.6	JAN.	1.6	1.0	-	-	X	3.0	-	WSH		JANITOR CLOSET
FIRST FLOOR	1.7	STAFF TLT.	1.7	1.0	-	-	X	3.4	-	WSH		STAFF
FIRST FLOOR	2.9.1	LT. OFFICE	2.9.1	1.0	-	-	X	3.0	-	WSH	3	LIEUTENANT
FIRST FLOOR	2.10.1	COUNSELOR OFFICE	2.10.1	1.0	-	X	-	3.1	-	WSL		"NAME & TITLE"
FIRST FLOOR	2.11.1	CASE MGR. OFFICE	2.11.1	1.0	-	X	-	3.1	-	WSL		"NAME & TITLE"
FIRST FLOOR	3.0.1	CORR.	3.0.1	1.0	-	X	X		-			
FIRST FLOOR	3.1.1	HOLD	3.1.1	1.0	-	X	-	3.0	-	WSL		HOLD 1
FIRST FLOOR	3.1.2	HOLD	3.1.2	1.0	-	X	-	3.0	-	WSL		HOLD 2
FIRST FLOOR	3.2	Y. TLT.	3.2	1.0	-	X	-	3.4	-	WSL		YOUTH
FIRST FLOOR	3.3	ADMISS. / REL. OFF.	3.3	1.0	-	-	X	3.0	-	WSH	3	ADDMISSION/RELEASE
FIRST FLOOR	3.6	SECURE VEST.	3.6A	1.0	-	X	X	-	-	-		-
FIRST FLOOR	3.6		3.6B	1.0	-	X	X	-	-	-		-
FIRST FLOOR	3.7	VEHICLE SALLY	3.7B	1.0	-	X	X	-	-	-	-	-
FIRST FLOOR	4.0.1	CORR.	4.0.1	1.0	-	X	X	-	-	-		-
FIRST FLOOR	4.0.2	CORR.	4.0.2A	1.0	-	X	-	-	-	-		-
FIRST FLOOR	4.0.2		4.0.2B	1.0	-	X	-	-	-	-		-
FIRST FLOOR	4.0.3	CORR.	4.0.3	1.0	-	X	X	3.0	-	WSH		HEALTH SERVICES
FIRST FLOOR	4.0.4	CORR.	4.0.4	1.0	-	X	X	-	-	-		
FIRST FLOOR	4.1	YOUTH WAITING	4.1	1.0	-	X	-	3.0	-	WSL		WAITING ROOM
FIRST FLOOR	4.2	NURSE EXAM RM.	4.2	1.0	-	X	-	3.0	-	WSL		EXAM 2
FIRST FLOOR	4.3	CLINICIAN EXAM RM.	4.3	1.0	-	X	-	3.0	-	WSL		EXAM 1
FIRST FLOOR	4.4.1	YOUTH TLT.	4.4.1	1.0	-	-	X	3.4	-	WSH		YOUTH
FIRST FLOOR	4.4.2	YOUTH TLT.	4.4.2	1.0	-	-	X	3.4	-	WSH		YOUTH
FIRST FLOOR	4.5	NURSE STATION	4.5A	1.0	-	X	-	-	-	-		-
FIRST FLOOR	4.5		4.5B	1.0	-	-	X	-	-	-		-
FIRST FLOOR	4.7	ADMIN. SUPPORT RM.	4.7A	1.0	-	-	X	3.0	-	WSH		HEALTH SERVICES ADMINISTRATION
FIRST FLOOR	4.7		4.7B	1.0	-	X	-	3.0	-	WSL		HEALTH SERVICES ADMINISTRATION
FIRST FLOOR	4.8	SUPPLY STOR.	4.8	1.0	-	X	-	3.0	-	WSL		STORAGE CLOSET
FIRST FLOOR	4.9	MEDICAL FILE WORKROOM	4.9	1.0	-	-	X	3.0	-	WSH		FILE ROOM

BUILDING SIGNAGE SCHEDULE

				DOOR TAG LOCATION				SIGN				
LEVEL	ROOM NUMBER	ROOM NAME	ARCHITECTURAL DOOR NUMBER	TYPE	COLOR	PULL SIDE	PUSH SIDE	TYPE	COLOR	LOCATION	REMARKS	TEXT
FIRST FLOOR	4.10.1	MED. SUPPLY RM.	4.10.1	1.0	-	-	X	3.0	-	WSH		MEDICAL SUPPLY 2
FIRST FLOOR	4.10.2	MED.SUPPLY RM.	4.10.2	1.0	-	X	-	3.0	-	WSL		MEDICAL SUPPLY 1
FIRST FLOOR	4.11	SECURE MED. RM.	4.11	1.0	-	X	-	3.0	-	WSL		SECURE MEDICATION
FIRST FLOOR	4.12	DENTAL EXAM	4.12	1.0	-	X	-	3.0	-	WHL	3	DENTAL
FIRST FLOOR	-	DENTAL DIGITAL IMAGING	-	1.0	-	-	-	-	-	-		-
FIRST FLOOR	4.14	COMP. RM.	4.14	1.0	-	X	-	-	-	-		-
FIRST FLOOR	4.15.1	STAFF TLT.	4.15.1	1.0	-	-	X	3.4	-	WSH		STAFF
FIRST FLOOR	4.15.2	STAFF TLT.	4.15.2	1.0	-	-	X	3.4	-	WSH		STAFF
FIRST FLOOR	4.16	PHYS. / PSYCH. OFFICE	4.16	1.0	-	-	X	3.0	-	WSH		OFFICE
FIRST FLOOR	4.17	JAN.	4.17	1.0	-	X	-	3.0	-	WSL		JANITOR CLOSET
FIRST FLOOR	4.18	EDUCATION SERVICES RM.	4.18	1.0	-	X	-	3.0	-	WSL		EDUCATION SERVICES
FIRST FLOOR	4.20.1	ISOLATION RM. (ADA)	4.20.1	1.0	-	X	-	-	-	-		-
FIRST FLOOR	4.20.2	ISOLATION RM.	4.20.2	1.0	-	X	-	-	-	-		-
FIRST FLOOR	4.21.1	ANTE	4.21.1	1.0	-	X	-	3.0	-	WSL	3	ISOLATION ROOM 1
FIRST FLOOR	4.21.2	ANTE	4.21.2	1.0	-	X	-	3.0	-	WSL	3	ISOLATION ROOM 2
FIRST FLOOR	4.22.1	INFIRM. RM. (ADA)	4.22.1	1.0	-	X	-	3.0	-	WSL		INFIRM RM 1
FIRST FLOOR	4.22.2	INFIRM. RM.	4.22.2	1.0	-	X	-	3.0	-	WSL		INFIRM RM 2
FIRST FLOOR	4.22.3	INFIRM. RM. (ADA)	4.22.3	1.0	-	X	-	3.0	-	WSL		INFIRM RM 3
FIRST FLOOR	4.23.1	SAFE CELL	4.23.1	1.0	-	X	-	5.0	-	DPL		SAFE CELL 1
FIRST FLOOR	4.23.2	SAFE CELL	4.23.2	1.0	-	X	-	5.0	-	DPL		SAFE CELL 2
FIRST FLOOR	4.23.3	SAFE CELL	4.23.3	1.0	-	X	-	5.0	-	DPL		SAFE CELL 3
FIRST FLOOR	4.23.4	SAFE CELL (ADA)	4.23.4	1.0	-	X	-	5.0	-	DPL		SAFE CELL 4
FIRST FLOOR	4.24	C.U.	4.24	1.0	-	X	-	3.0	-	WSL		CLEAN UTILITIES
FIRST FLOOR	4.25	S.U.	4.25	1.0	-	X	-	3.0	-	WSL		SOILED UTILITIES
FIRST FLOOR	4.26.1	SAFE SHOWER	4.26.1	1.0	-	X	-	3.0	-	WSL		SHOWER 1
FIRST FLOOR	4.26.2	SAFE SHOWER	4.26.2	1.0	-	X	-	3.0	-	WSL		SHOWER 2
FIRST FLOOR	5.1	PYSCH. OFFICE	5.1	1.0	-	X	-	3.1	-	WSL	3	"NAME & TITLE"
FIRST FLOOR	5.2	CLINICIAN OFFICE	5.2	1.0	-	X	-	3.1	-	WSL	3	"NAME & TITLE"
FIRST FLOOR	5.3	GROUP ASSESS. / INTERVENTION	5.3	1.0	-	X	-	3.0	-	WSL	3	GROUP ASSESSMENT
FIRST FLOOR	5.4	B.H. STOR.	5.4	1.0	-	-	X	3.0	-	WSH		STORAGE CLOSET
FIRST FLOOR	6	BEV. COOLER	----		-				-			
FIRST FLOOR	6.1	SERVING COUNTER	-		-	-	-	-	-			
FIRST FLOOR	6.2	HOT & COLD PREP	6.2A	1.0	-	X	X	-				
FIRST FLOOR	6.2							4.4	-	DPL		FOOD SERVICES RECEIVING
FIRST FLOOR	6.2		6.2B	1.0	-	X	X	-				
FIRST FLOOR	6.2							4.4	-	DPL		FOOD SERVICES
FIRST FLOOR	6.2		6.2C	1.0	-	X	X	3	-	WSH		FOOD SERVICES
FIRST FLOOR	6.3	AMBIENT STOR.	6.3	1.0	-	-	X	3.0	-	WSH		AMBIENT STORAGE
FIRST FLOOR	6.4	COOLER	----		-				-			
FIRST FLOOR	6.5	JAN.	6.5	1.0	-	-	X	3.0	-	WSH		JANITOR CLOSET
FIRST FLOOR	6.6	YOUTH DINING RM.	6.6A	1.0	-	X	X	-	-			
FIRST FLOOR	6.6		6.6B	1.0	-	X	X	3.0	-	WSH		DINNING ROOM
FIRST FLOOR	6.7	CLEAN CART	6.7	1.0	-	X	-	4.4	-	DPL		CLEAN CART
FIRST FLOOR	6.8	NON-FOOD STOR	6.8	1.0	-	-	X	3.0	-	WSH		NON-FOOD STORAGE
FIRST FLOOR	6.9	CAN WASH	6.9	1.0	-	X	-	4.4	-	DPL		CAN WASH
FIRST FLOOR	6.10	STAFF TLT.	6.10	1.0	-	X	-	3.4	-	WSL		STAFF
FIRST FLOOR	6.11	SANITIZ.	6.11	1.0	-	X	X	3.0	-	WSH		SANITIZE
FIRST FLOOR	6.12	F.S. OFF.	6.12	1.0	-	X	-	3.0	-	WSL		OFFICE
FIRST FLOOR	6.13	JAN.	6.13	1.0	-	-	X	3.0	-	WSL		JANITOR CLOSET
FIRST FLOOR	6.14	SOILED CART	6.14	1.0	-	X	-	4.4	-	DPL		SOILED CART
FIRST FLOOR	7.1	MASTER CONTROL	-	-	-	-	-	-	-	-		-
FIRST FLOOR	7.10	STAFF LOCKER	7.10	1.0	-	X	X	3.0	-	WSH		STAFF LOCKERS
FIRST FLOOR	7.2	STAFF MUSTER	7.2	1.0	-	X	X	3.0	-	WSH		ROLL CALL
FIRST FLOOR	7.4.1	SECURITY ELEC.	7.4.1	1.0	-	X	-	3.0	-	WSH		SECURITY ELECTRIC RM.
FIRST FLOOR	7.5	CAPT. OFFICE	7.5	1.0	-	-	X	3.1	-	WSH	3	"NAME & TITLE"
FIRST FLOOR	7.6	STAFF BREAK AREA	-	-	-	-	-	-	-	-		-
FIRST FLOOR	7.7	STAFF SALLY		-	-				-			
FIRST FLOOR	7.8	STAFF TLT.	7.8	1.0	-	X	-	3.4	-	WSL		STAFF
FIRST FLOOR	7.9	STAFF TLT.	7.9	1.0	-	-	X	3.4	-	WSH		STAFF TOILET/SHOWER
FIRST FLOOR	8.1.1	INTER.	8.1.1	1.0	-	-	X	3.0	-	WSL		C
FIRST FLOOR	8.1.2	N.C. INTER.	8.1.2	1.0	-	X	-	3.0	-	WSL		B
FIRST FLOOR	8.1.3	N.C. INTER.	8.1.3	1.0	-	X	-	3.0	-	WSL		B
FIRST FLOOR	8.1.4	N.C. INTER.	8.1.4	1.0	-	X	-	3.0	-	WSL		A
FIRST FLOOR	8.1.5	N.C. INTER.	8.1.5	1.0	-	X	-	3.0	-	WSL		A
FIRST FLOOR	8.2	VISITATION	-	-	-				-			
FIRST FLOOR	8.4.1	SEARCH	8.4.1	1.0	-	X	-	3.0	-	WSL		SEARCH 1
FIRST FLOOR	8.4.2	SEARCH	8.4.2	1.0	-	X	-	3.0	-	WSL		SEARCH 2

BUILDING SIGNAGE SCHEDULE

				DOOR TAG				SIGN				
						LOCATION						
LEVEL	ROOM NUMBER	ROOM NAME	ARCHITECTURAL DOOR NUMBER	TYPE	COLOR	PULL SIDE	PUSH SIDE	TYPE	COLOR	LOCATION	REMARKS	TEXT
FIRST FLOOR	8.6	YOUTH TLT.	8.6	1.0	-	X	-	3.4	-	WSL		YOUTH
FIRST FLOOR	8.7	CORR.	8.7A	1.0	-	X	X	4.2	-	DPL		NO VISITORS BEYOND THIS POINT
FIRST FLOOR	8.7		8.7B	1.0	-	X	X	-	-	-		-
FIRST FLOOR	10.8F	FEMALE OUTDOOR REC.	10.8F	1.0	-	X	-	-	-	-		-
FIRST FLOOR	11.1.1	STAIR A	11.1.1A	1.0	-	X	X	2.0	-	WSH		EMERGENCY EXIT STAIR
FIRST FLOOR	11.1.1		11.1.1A	-	-	-	-	2.1	-	WSL	1	STAIR A/ FLOOR 1
FIRST FLOOR	11.1.1		11.1.1B	1.0	-	X	X	4.0	-	DPH		EXIT TO GRADE
FIRST FLOOR	-	CORR.	-	-	-	-	-	-	-	-		-
FIRST FLOOR	11.1.4	JAN.	11.1.4	1.0	-	X	-	3.0	-	WSL		JANITOR CLOSET
FIRST FLOOR	11.1.5	STAIR B CORR.	11.1.5A	1.0	-	X	X	4.0	-	DPH		EXIT TO GRADE
FIRST FLOOR	11.1.5		11.1.5B	1.0	-	X	X	4.0	-	DPH		EXIT TO GRADE
FIRST FLOOR	11.1.6	MECH. RM.	11.1.6	1.0	-	X	-	3.0	-	WSL		MECHANICAL RM.
FIRST FLOOR	-	ELEVATOR	-	-	-				-			
FIRST FLOOR	11.1.8	MECH. RM.	11.1.8	1.0	-	X	X	4.4	-	DPL		MECHANICAL RM.
FIRST FLOOR	11.1.9	ELEC. RM.	11.1.9	1.0	-	X	X	4.4	-	DPL		ELECTRIC RM.
FIRST FLOOR	11.1.10	STAIR B	11.1.10A	1.0	-	X	X	2.0	-	WHH	3,4	EMERGENCY EXIT STAIR
FIRST FLOOR	11.1.10		11.1.10B	1.0	-	X	X	2.0	-	WHH	3,4	EMERGENCY EXIT STAIR
FIRST FLOOR	11.1.10		-	-		-	-	2.1	-	-	1,5	STAIR B/ FLOOR 1
FIRST FLOOR	11.1.14	CORR.	11.1.14	1.0	-	X	X	4.0	-	ADH	2	EXIT TO OSTC
FIRST FLOOR	11.1.15	MECH.	11.1.15	1.0	-	X	-	3.0	-	WSL		MECHANICAL RM.
FIRST FLOOR		SECURE DOCK (COVERED)		-	-				-			
FIRST FLOOR		OPEN DOCK (COVERED)		-	-				-			
FIRST FLOOR		SECURE DOCK (COVERED)		-	-				-			
FIRST FLOOR	11.5	SUPPLY STOR.	11.5A	1.0	-	X	X	3.0	-	WSH		SUPPLY STORAGE
FIRST FLOOR	11.5		11.5B	1.0	-	X	X	4.2	-	ADL		RECEIVING
FIRST FLOOR	2F.0.1	SALLY	2F.0.1A	1.0	-	X	X	4.1	-	ADL	2	F
FIRST FLOOR	2F.0.1		2F.0.1B	1.0	-	X	X	-	-	-		-
FIRST FLOOR	2F1.1	BEDROOM	2F1.1	1.0	-	X	-	5.0	-	DPL		2
FIRST FLOOR	2F.1.2	BEDROOM	2F.1.2	1.0	-	X	-	5.0	-	DPL		3
FIRST FLOOR	2F.1.3	BEDROOM	2F.1.3	1.0	-	X	-	5.0	-	DPL		4
FIRST FLOOR	2F.1.4	BEDROOM	2F.1.4	1.0	-	X	-	5.0	-	DPL		5
FIRST FLOOR	2F.1.5	BEDROOM	2F.1.5	1.0	-	X	-	5.0	-	DPL		6
FIRST FLOOR	2F.1.6	BEDROOM	2F.1.6	1.0	-	X	-	5.0	-	DPL		7
FIRST FLOOR	2F.1.7	BEDROOM	2F.1.7	1.0	-	X	-	5.0	-	DPL		8
FIRST FLOOR	2F.1.8	BEDROOM	2F.1.8	1.0	-	X	-	5.0	-	DPL		9
FIRST FLOOR	2F.1.9	BEDROOM	2F.1.9	1.0	-	X	-	5.0	-	DPL		10
FIRST FLOOR	2F.2	ADA BEDROOM	2F.2	1.0	-	X	-	5.0	-	DPL		1
FIRST FLOOR	2F.0.3	CORR.	2F.0.3	1.0	-	X	X	4.1	-	ADL	2	F
FIRST FLOOR	2F.3A	FEMALE DAYROOM	2F.3A	1.0	-	X	-	-	-	-		-
FIRST FLOOR	2F.3B		2F.3B	1.0	-	X	-	-	-	-		-
FIRST FLOOR	2F.3C		2F.3C	1.0	-	X	-	-	-	-		-
FIRST FLOOR	2F.3D		2F.3D	1.0	-	X	-	-	-	-		-
FIRST FLOOR	2F.3E		2F.3E	1.0	-	X	-	-	-	-		-
FIRST FLOOR	2F.4	GROUP ACTIVITY	2F.4	1.0	-	X	-	3.0	-	WSL	3	GROUP ACTIVITY
FIRST FLOOR	2F.5	READING / WRITING	2F.5	1.0	-	X	-	3.0	-	WSL	3	READING/WRITING
FIRST FLOOR	2F.6	SHOWER	-	-	-			5.1	-	DPL	1	A
FIRST FLOOR	2F.6		-	-	-			5.1		DPL	1	B
FIRST FLOOR	2F.6		-	-	-			5.1		DPL	1	C
FIRST FLOOR	2F.7	STOR.	2F.7	1.0	-	X	-	3.0	-	WSL		STORAGE CLOSET
FIRST FLOOR	-	STAFF STATION	-	-	-	-	-	-	-	-		-
FIRST FLOOR	2F.12	JAN.	2F.12	1.0	-	X	-	3.0	-	WSL		JANITOR CLOSET
FIRST FLOOR	2F.13	STAFF TLT.	2F.13	1.0	-	-	X	3.4	-	WSH		STAFF
FIRST FLOOR	2F.14	YOUTH LAUNDRY	2F.14	1.0	-	X	-	5.1	-	DPL		LAUNDRY
FIRST FLOOR	2F.15	C.U.	2F.15	1.0	-	X	-	3.0	-	WSL		CLEAN UTILITIES
FIRST FLOOR	N/A	EXISTING STAIR TO BASEMENT @ COLUMN GRID 'H.E' AND '6.E'	-	-				4.4	-	DPL		MAIN ELECTRICAL ROOM
SECOND FLOOR	2.6	STAFF TLT.	2.6	1.0	-	-	X	3.4	-	WSH		STAFF
SECOND FLOOR	2.7	STOR / C.U.	2.7	1.0	-	-	X	3.0	-	WSH		STORAGE/CLEAN UTILITIES
SECOND FLOOR	2.8	LOCAL CONTROL	-	-	-	-	-	-	-	-		-
SECOND FLOOR	2.9.2	LT. OFFICE	2.9.2	1.0	-	-	X	3.0	-	WSH	3	LIEUTENANT
SECOND FLOOR	2.10.2	COUNSELOR OFFICE	2.10.2	1.0	-	-	X	3.0	-	WSH	3	COUNSELOR
SECOND FLOOR	2.11.2	CASE MGR OFFICE	2.11.2	1.0	-	-	X	3.0	-	WSH	3	CASE MANAGER
SECOND FLOOR	7.4.2	SEC. ELEC.	7.4.2	1.0	-	-	X	3.0	-	WSH		SECURITY ELECTRIC RM.
SECOND FLOOR	9.1.1	CLASSROOM 1	9.1.1	1.0	-	-	X	3.0	-	WSL	3	CLASSROOM 1
SECOND FLOOR	9.1.2	CLASSROOM 2	9.1.2	1.0	-	-	X	3.0	-	WSL	3	CLASSROOM 2
SECOND FLOOR	9.1.3	CLASSROOM 3	9.1.3	1.0	-	-	X	3.0	-	WSL	3	CLASSROOM 3
SECOND FLOOR	9.1.4	SCIENCE LAB	9.1.4	1.0	-	-	X	3.0	-	WSL	3	SCIENCE LAB

BUILDING SIGNAGE SCHEDULE

				DOOR TAG				SIGN				
						LOCATION						
LEVEL	ROOM NUMBER	ROOM NAME	ARCHITECTURAL DOOR NUMBER	TYPE	COLOR	PULL SIDE	PUSH SIDE	TYPE	COLOR	LOCATION	REMARKS	TEXT
SECOND FLOOR	9.1.5	ART ROOM	9.1.5	1.0	-	-	X	3.0	-	WSL	3	ART ROOM
SECOND FLOOR	9.2.1	CLASSROOM 4	9.2.1	1.0	-	-	X	3.0	-	WSL	3	CLASSROOM 4
SECOND FLOOR	9.2.2	CLASSROOM 5	9.2.2	1.0	-	-	X	3.0	-	WSL	3	CLASSROOM 5
SECOND FLOOR	9.2.3	CLASSROOM 6	9.2.3	1.0	-	-	X	3.0	-	WSL	3	CLASSROOM 6
SECOND FLOOR	9.3.1	COMPUTER LAB	9.3.1	1.0	-	-	X	3.0	-	WSL	3	COMPUTER LAB
SECOND FLOOR	9.3.2	STOR.	9.3.2	1.0	-	X	-	-	-	-		-
SECOND FLOOR	9.4.1	MEDIA CENTER	9.4.1A	1.0	-	X	X		-	WHL	3	MEDIA CENTER
SECOND FLOOR	9.4.1		9.4.1B	1.0	-	X	X	3.0	-	WSL	3	MEDIA CENTER
SECOND FLOOR	9.4.2	STOR.	9.4.2	1.0	-	X	-	-	-	-		-
SECOND FLOOR	9.4.3	STOR.	9.4.3	1.0	-	X	-	-	-	-		-
SECOND FLOOR	9.5	SPEC ED TEST OFF	9.5	1.0	-	X	-	3.0	-	WSL	3	TESTING
SECOND FLOOR	9.6	ASSESSMENT OFFICE	9.6	1.0	-	X	-	3.0	-	WSL	3	ASSESSMENTS
SECOND FLOOR	9.7.1	YOUTH TLT.	9.7.1	1.0	-	X	-	3.4	-	WSL		YOUTH
SECOND FLOOR	9.7.2	YOUTH TLT.	9.7.2	1.0	-	X	-	3.4	-	WSL		YOUTH
SECOND FLOOR	9.8	TEACHER WORKROOM	9.8A	1.0	-	X	X	3.0	-	WSL	3	TEACHER WORKROOM
SECOND FLOOR	9.8		9.8B	1.0	-	X	X	3.0	-	WSL	3	TEACHER WORKROOM
SECOND FLOOR	9.9	STAFF TLT.	9.9	1.0	-	-	X	3.4	-	WSH		STAFF
SECOND FLOOR	9.10	GEN. STOR.	9.10	1.0	-	X	-	3.0	-	WSL		STORAGE CLOSET
SECOND FLOOR	9.11	PRINCIPAL	9.11A	1.0	-	-	X	3.1	-	WSH	3	"NAME & TITLE"
SECOND FLOOR	9.11		9.11B	1.0	-	X	-	3.0	-	WSL		PRINCIPAL
SECOND FLOOR	9.12	SPEC ED IEP MTG	9.12	1.0	-	X	-	3.0	-	WSL	3	MEETING
SECOND FLOOR	9.13	GUIDANCE CNSLR	9.13	1.0	-	X	-	3.0	-	WSL	3	GUIDANCE
SECOND FLOOR	9.14	ADMIN. SUPPORT	9.14A	1.0	-	-	X	3.0	-	WSH	3	ADMIN SUPPORT
SECOND FLOOR	9.14		9.14B	1.0	-	-	X	3.0	-	WSH	3	ADMIN SUPPORT
SECOND FLOOR	9.15	JAN.	9.15	1.0	-	X	-	3.0	-	WSL		JANITOR CLOSET
SECOND FLOOR	9.16	TITLE 1	9.16	1.0	-	X	-	3.0	-	WSL	3	TITLE 1
SECOND FLOOR	9.17	SOC WRKR	9.17	1.0	-	X	-	3.0	-	WSL	3	SOCIAL WORKER
SECOND FLOOR	9.18	BUS MGR / SCHED	9.18	1.0	-	X	-	3.1	-	WSL	3	"NAME & TITLE"
SECOND FLOOR	10.8A	OUTDOOR REC	10.8AA	1.0	-	X	-	-	-	-		-
SECOND FLOOR	10.8A		10.8AB	1.0	-	X	-	-	-	-		-
SECOND FLOOR	10.8B	OUTDOOR REC	10.8BA	1.0	-	X	-	-	-	-		-
SECOND FLOOR	10.8B		10.8BB	1.0	-	X	-	-	-	-		-
SECOND FLOOR	10.8C	OUTDOOR REC	10.8CA	1.0	-	X	-	-	-	-		-
SECOND FLOOR	10.8C		10.8CB	1.0	-	X	-	-	-	-		-
SECOND FLOOR	10.8D	OUTDOOR REC	10.8DA	1.0	-	X	-	-	-	-		-
SECOND FLOOR	10.8D		10.8DB	1.0	-	X	-	-	-	-		-
SECOND FLOOR	11.2.1	STAIR A	11.2.1	1.0	-	X	X	2.0	-	WSH		EMERGENCY EXIT STAIR
SECOND FLOOR	11.2.1		11.2.1	-	-	-	-	2.2		WSL	1	STAIR A/FLOOR 2
SECOND FLOOR	11.2.5	CORR.	11.2.5A	1.0	-	X	X	2.0	-	WHH	3,4	EMERGENCY EXIT STAIR
SECOND FLOOR	11.2.5		11.2.5B	1.0	-	X	X	2.0	-	WHH	3,4	EMERGENCY EXIT STAIR
SECOND FLOOR	11.2.5		-	-	-	-	-	2.2	-	-	1	STAIR B/FLOOR 2
SECOND FLOOR	11.2.7	ELEVATOR	-	-	-				-			
SECOND FLOOR	11.2.10	STAIR B	-	-	-	-	-	-	-	-		-
SECOND FLOOR	11.2.15	CORR.	11.2.15	1.0	-	X	X	2.0	-	WSL		EMERGENCY EXIT STAIR
SECOND FLOOR	11.2.16	SALLY	11.2.16	1.0	-	X	X	2.0	-	WSL		EMERGENCY EXIT STAIR
SECOND FLOOR	11.2.17	IT. CLOS.	11.2.17	1.0	-	X	-	3.0	-	WSL		IT CLOSET
SECOND FLOOR	11.2.18	ELEC.	11.2.18	1.0	-	X	-	3.0	-	WSL		ELECTRIC RM.
SECOND FLOOR	11.2.19	ELEC.	11.2.19	1.0	-	-	X	3.0	-	WSH		ELECTRIC RM.
SECOND FLOOR	11.2.20	JAN.	11.2.20	1.0	-	X	-	3.0	-	WSL		JANITOR CLOSET
SECOND FLOOR	2A.1.1	BEDROOM	2A.1.1	1.0	-	X	-	5.0	-	DPL	2	1
SECOND FLOOR	2A.1.2	BEDROOM	2A.1.2	1.0	-	X	-	5.0	-	DPL	2	2
SECOND FLOOR	2A.1.3	BEDROOM	2A.1.3	1.0	-	X	-	5.0	-	DPL	2	3
SECOND FLOOR	2A.1.4	BEDROOM	2A.1.4	1.0	-	X	-	5.0	-	DPL	2	4
SECOND FLOOR	2A.1.5	BEDROOM	2A.1.5	1.0	-	X	-	5.0	-	DPL	2	5
SECOND FLOOR	2A.2	ADA BEDROOM	2A.2	1.0	-	X	-	5.0	-	DPL	2	6
SECOND FLOOR	2A.3	DAYROOM	2A.3A	1.0	-	X	-	-	-	-		-
SECOND FLOOR	2A.3		2A.3B	1.0	-	X	-	-	-	-		-
SECOND FLOOR	2A.3		2A.3C	1.0	-	X	-	-	-	-		-
SECOND FLOOR	2A.6	SHOWER	-	-	-	-	-	5.1	-	DPL	1	A
SECOND FLOOR	2A.6		-	-	-	-	-	5.1	-	DPL	1	B
SECOND FLOOR	2A.6		-	-	-	-	-	5.1	-	DPL	1	C
SECOND FLOOR	2A.12	JAN.	2A.12	1.0	-	X	-	3.0	-	WSL		JANITOR CLOSET
SECOND FLOOR	2A.13	STAFF TLT.	2A.13	1.0	-	-	X	3.5	-	WSH		STAFF
SECOND FLOOR	2A.15	LAUNDRY	2A.15	1.0	-	X	-	5.1	-	DPL		LAUNDRY
SECOND FLOOR	2A.16	SALLY	2A.16A	1.0	-	X	X	4.1	-	ADL	2	A
SECOND FLOOR	2A.16		2A.16B	1.0	-	X	X	-	-	-		
SECOND FLOOR	2A.17	STAFF STATION	-	-	-	-	-	-	-	-		-

BUILDING SIGNAGE SCHEDULE

				DOOR TAG				SIGN				
						LOCATION						
LEVEL	ROOM NUMBER	ROOM NAME	ARCHITECTURAL DOOR NUMBER	TYPE	COLOR	PULL SIDE	PUSH SIDE	TYPE	COLOR	LOCATION	REMARKS	TEXT
SECOND FLOOR	2B.1.1	BEDROOM	2B.1.1	1.0	-	X	-	5.0	-	DPL	2	1
SECOND FLOOR	2B.1.2	BEDROOM	2B.1.2	1.0	-	X	-	5.0	-	DPL	2	2
SECOND FLOOR	2B.1.3	BEDROOM	2B.1.3	1.0	-	X	-	5.0	-	DPL	2	3
SECOND FLOOR	2B.1.4	BEDROOM	2B.1.4	1.0	-	X	-	5.0	-	DPL	2	4
SECOND FLOOR	2B.1.5	BEDROOM	2B.1.5	1.0	-	X	-	5.0	-	DPL	2	4
SECOND FLOOR	2B.1.6	BEDROOM	2B.1.6	1.0	-	X	-	5.0	-	DPL	2	6
SECOND FLOOR	2B.2	ADA BEDROOM	2B.2	1.0	-	X	-	5.0	-	DPL	2	7
SECOND FLOOR	2B.3	DAYROOM	2B.3A	1.0	-	X	-	-	-	-		-
SECOND FLOOR	2B.3		2B.3B	1.0	-	X	-	-	-	-		-
SECOND FLOOR	2B.3		2B.3C	1.0	-	X	-	-	-	-		-
SECOND FLOOR	2B.3		2B.3D	1.0	-	X	-	-	-	-		-
SECOND FLOOR	2B.6	SHOWER	-	-	-	-	-	5.1	-	DPL	1	A
SECOND FLOOR	2B.6		-	-	-	-	-	5.1	-	DPL	1	B
SECOND FLOOR	2B.6		-	-	-	-	-	5.1	-	DPL	1	C
SECOND FLOOR	2B.12	JAN.	2B.12	1.0	-	X	-	3.0	-	WSL		JANITOR CLOSET
SECOND FLOOR	2B.13	STAFF TLT.	2B.13	1.0	-	-	X	3.5	-	WSH		STAFF
SECOND FLOOR	2B.15	LAUNDRY	2B.15	1.0	-	X	-	5.1	-	DPL		LAUNDRY
SECOND FLOOR	2B.16	SALLY	2B.16A	1.0	-	X	X	4.1	-	ADL	2	B
SECOND FLOOR	2B.16		2B.16B	1.0	-	X	X	-	-	-		-
SECOND FLOOR	2B.17	STAFF STATION	-	-	-	-	-	-	-	-		-
SECOND FLOOR	2C.1.1	BEDROOM	2C.1.1	1.0	-	X	-	5.0	-	DPL	2	1
SECOND FLOOR	2C.1.2	BEDROOM	2C.1.2	1.0	-	X	-	5.0	-	DPL	2	2
SECOND FLOOR	2C.1.3	BEDROOM	2C.1.3	1.0	-	X	-	5.0	-	DPL	2	3
SECOND FLOOR	2C.1.4	BEDROOM	2C.1.4	1.0	-	X	-	5.0	-	DPL	2	4
SECOND FLOOR	2C.1.5	BEDROOM	2C.1.5	1.0	-	X	-	5.0	-	DPL	2	5
SECOND FLOOR	2C.1.6	BEDROOM	2C.1.6	1.0	-	X	-	5.0	-	DPL	2	6
SECOND FLOOR	2C.2	ADA BEDROOM	2C.2	1.0	-	X	-	5.0	-	DPL	2	7
SECOND FLOOR	2C.3	DAYROOM	2C.3A	1.0	-	X	-	-	-	-		-
SECOND FLOOR	2C.3		2C.3B	1.0	-	X	-	-	-	-		-
SECOND FLOOR	2C.3		2C.3C	1.0	-	X	-	-	-	-		-
SECOND FLOOR	2C.3		2C.3D	1.0	-	X	-	-	-	-		-
SECOND FLOOR	2C.6	SHOWER	-	-	-	-	-	5.1	-	DPL	1	A
SECOND FLOOR	2C.6		-	-	-	-	-	5.1		DPL	1	B
SECOND FLOOR	2C.6		-	-	-	-	-	5.1		DPL	1	C
SECOND FLOOR	2C.12	JAN.	2C.12	1.0	-	X	-	3.0	-	WSL		JANITOR CLOSET
SECOND FLOOR	2C.13	STAFF TLT.	2C.13	1.0	-	-	X	3.5	-	WSH		STAFF
SECOND FLOOR	2C.15	LAUNDRY	2C.15	1.0	-	X	-	5.1	-	DPL		LAUNDRY
SECOND FLOOR	2C.16	SALLY	2C.16A	1.0	-	X	X	4.1	-	ADL	2	C
SECOND FLOOR	2C.16		2C.16B	1.0	-	X	X	-	-	-		-
SECOND FLOOR	2C.17	STAFF STATION	-	-	-	-	-	-	-	-		-
SECOND FLOOR	2D.1.1	BEDROOM	2D.1.1	1.0	-	X	-	5.0	-	DPL	2	1
SECOND FLOOR	2D.1.2	BEDROOM	2D.1.2	1.0	-	X	-	5.0	-	DPL	2	2
SECOND FLOOR	2D.1.3	BEDROOM	2D.1.3	1.0	-	X	-	5.0	-	DPL	2	3
SECOND FLOOR	2D.1.4	BEDROOM	2D.1.4	1.0	-	X	-	5.0	-	DPL	2	4
SECOND FLOOR	2D.1.5	BEDROOM	2D.1.5	1.0	-	X	-	5.0	-	DPL	2	5
SECOND FLOOR	2D.2	ADA BEDROOM	2.D2	1.0	-	X	-	5.0	-	DPL	2	6
SECOND FLOOR	2D.3	DAYROOM	2D.3A	1.0	-	X	-	-	-	-		-
SECOND FLOOR	2D.3		2D.3B	1.0	-	X	-	-	-	-		-
SECOND FLOOR	2D.3		2D.3C	1.0	-	X	-	-	-	-		-
SECOND FLOOR	2D.6	SHOWER	-	-	-	-	-	5.1	-	DPL	1	A
SECOND FLOOR	2D.6		-	-	-	-	-	5.1		DPL	1	B
SECOND FLOOR	2D.6		-	-	-	-	-	5.1		DPL	1	C
SECOND FLOOR	2D.12	JAN	2D.12	1.0	-	X	-	3.0	-	WSL		JANITOR CLOSET
SECOND FLOOR	2D.13	STAFF TLT.	2D.13	1.0	-	-	X	3.5	-	WSH		STAFF
SECOND FLOOR	2D.15	LAUNDRY	2D.15	1.0	-	X	-	5.1	-	DPL		LAUNDRY
SECOND FLOOR	2D.16	SALLY	2D.16A	1.0	-	X	X	4.1	-	ADL	2	D
SECOND FLOOR	2D.16		2D.16B	1.0	-	X	X	-	-	-		-
SECOND FLOOR	2D.17	STAFF STATION	-	-	-	-	-	-	-	-		-
SECOND FLOOR MEZZ.	2A.1.6	BEDROOM	2A.1.6	1.0	-	X	-	5.0	-	DPL		7
SECOND FLOOR MEZZ.	2A.1.7	BEDROOM	2A.1.7	1.0	-	X	-	5.0	-	DPL		8
SECOND FLOOR MEZZ.	2A.1.8	BEDROOM	2A.1.8	1.0	-	X	-	5.0	-	DPL		9
SECOND FLOOR MEZZ.	2A.1.9	BEDROOM	2A.1.9	1.0	-	X	-	5.0	-	DPL		10
SECOND FLOOR MEZZ.	2A.1.10	BEDROOM	2A.1.10	1.0	-	X	-	5.0	-	DPL		11
SECOND FLOOR MEZZ.	2A.1.11	BEDROOM	2A.1.11	1.0	-	X	-	5.0	-	DPL		12
SECOND FLOOR MEZZ.	2A.19	MEZZ. CORR.	2A.19A	1.0	-	X	-	-	-	-		-
SECOND FLOOR MEZZ.	2A.19		2A.19B	1.0	-	X	-	-	-	-		-
SECOND FLOOR MEZZ.	2A.19		2A.19C	1.0	-	X	-	-	-	-		-

BUILDING SIGNAGE SCHEDULE

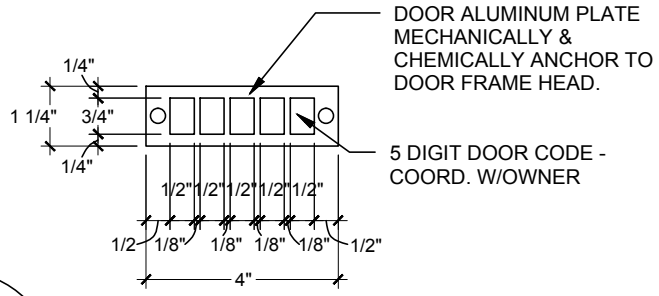
				DOOR TAG				SIGN				
						LOCATION						
LEVEL	ROOM NUMBER	ROOM NAME	ARCHITECTURAL DOOR NUMBER	TYPE	COLOR	PULL SIDE	PUSH SIDE	TYPE	COLOR	LOCATION	REMARKS	TEXT
SECOND FLOOR MEZZ.	2B.1.7	BEDROOM	2B.1.7	1.0	-	X	-	5.0	-	DPL		8
SECOND FLOOR MEZZ.	2B.1.8	BEDROOM	2B.1.8	1.0	-	X	-	5.0	-	DPL		9
SECOND FLOOR MEZZ.	2B.1.9	BEDROOM	2B.1.9	1.0	-	X	-	5.0	-	DPL		10
SECOND FLOOR MEZZ.	2B.1.10	BEDROOM	2B.1.10	1.0	-	X	-	5.0	-	DPL		11
SECOND FLOOR MEZZ.	2B.1.11	BEDROOM	2B.1.11	1.0	-	X	-	5.0	-	DPL		12
SECOND FLOOR MEZZ.	2B.1.12	BEDROOM	2B.1.12	1.0	-	X	-	5.0	-	DPL		13
SECOND FLOOR MEZZ.	2B.1.13	STORAGE	2B.1.13	1.0	-	X	-	3.0	-	WSL		STORAGE CLOSET
SECOND FLOOR MEZZ.	2B.19	MEZZ. CORR.	2B.19A	1.0	-	X	-	-	-	-		-
SECOND FLOOR MEZZ.	2B.19		2B.19B	1.0	-	X	-	-	-	-		-
SECOND FLOOR MEZZ.	2B.19		2B.19C	1.0	-	X	-	-	-	-		-
SECOND FLOOR MEZZ.	2B.19		2B.19D	1.0	-	X	-	-	-	-		-
SECOND FLOOR MEZZ.	2C.1.7	BEDROOM	2C.1.7	1.0	-	X	-	5.0	-	DPL		8
SECOND FLOOR MEZZ.	2C.1.8	BEDROOM	2C.1.8	1.0	-	X	-	5.0	-	DPL		9
SECOND FLOOR MEZZ.	2C.1.9	BEDROOM	2C.1.9	1.0	-	X	-	5.0	-	DPL		10
SECOND FLOOR MEZZ.	2C.1.10	BEDROOM	2C.1.10	1.0	-	X	-	5.0	-	DPL		11
SECOND FLOOR MEZZ.	2C.1.11	BEDROOM	2C.1.11	1.0	-	X	-	5.0	-	DPL		12
SECOND FLOOR MEZZ.	2C.1.12	BEDROOM	2C.1.12	1.0	-	X	-	5.0	-	DPL		13
SECOND FLOOR MEZZ.	2C.1.13	STORAGE	2C.1.13	1.0	-	X	-	3.0	-	WSL		STORAGE CLOSET
SECOND FLOOR MEZZ.	2C.19	MEZZ. CORR.	2C.19A	1.0	-	X	-	-	-	-		-
SECOND FLOOR MEZZ.	2C.19		2C.19B	1.0	-	X	-	-	-	-		-
SECOND FLOOR MEZZ.	2C.19		2C.19C	1.0	-	X	-	-	-	-		-
SECOND FLOOR MEZZ.	2C.19		2C.19D	1.0	-	X	-	-	-	-		-
SECOND FLOOR MEZZ.	2D.1.6	BEDROOM	2D.1.6	1.0	-	X	-	5.0	-	DPL		7
SECOND FLOOR MEZZ.	2D.1.7	BEDROOM	2D.1.7	1.0	-	X	-	5.0	-	DPL		8
SECOND FLOOR MEZZ.	2D.1.8	BEDROOM	2D.1.8	1.0	-	X	-	5.0	-	DPL		9
SECOND FLOOR MEZZ.	2D.1.9	BEDROOM	2D.1.9	1.0	-	X	-	5.0	-	DPL		10
SECOND FLOOR MEZZ.	2D.1.10	BEDROOM	2D.1.10	1.0	-	X	-	5.0	-	DPL		11
SECOND FLOOR MEZZ.	2D.1.11	BEDROOM	2D.1.11	1.0	-	X	-	5.0	-	DPL		12
SECOND FLOOR MEZZ.	2D.19	MEZZ. CORR.	2D.19A	1.0	-	X	-	-	-	-		-
SECOND FLOOR MEZZ.	2D.19		2D.19B	1.0	-	X	-	-	-	-		-
SECOND FLOOR MEZZ.	2D.19		2D.19C	1.0	-	X	-	-	-	-		-
THIRD FLOOR	10.1	GYMNASIUM	-	1.0	-	-	-	-	-	-		-
THIRD FLOOR	10.10	REC. OFFICE	10.10	1.0	-	-	X	3.0	-	WSH	3	RECREATION OFFICE
THIRD FLOOR	10.2.1	EQ. STOR.	10.2.1	1.0	-	-	X	3.0	-	WHL		EQUIPMENT STORAGE
THIRD FLOOR	10.3	FITNESS RM.	10.3	1.0	-	X	-	3.0	-	WSL	3	FITNESS ROOM
THIRD FLOOR	10.4	YOUTH TLT.	10.4	1.0	-	X	-	3.4	-	WSL		YOUTH
THIRD FLOOR	10.7	STAFF TLT.	10.7	1.0	-	-	X	3.4	-	WSH		STAFF
THIRD FLOOR	10.9	JAN.	10.9	1.0	-	X	-	3.0	-	WSL		JANITOR CLOSET
THIRD FLOOR	11.3.1	STAIR A	11.3.1	1.0	-	X	X	2.0	-	WSH		EMERGENCY EXIT STAIR
THIRD FLOOR	11.3.1		-	-	-	-	-	2.2	-	WSL	1	STAIR A/ FLOOR 3
THIRD FLOOR	11.3.3	CORR.	11.3A	1.0	-	X	X	3.0	-	WSL		GYMNASIUM
THIRD FLOOR	11.3.3		11.3B	1.0	-	X	X		-			
THIRD FLOOR	11.3.6	ELEVATOR	-	1.0	-				-			
THIRD FLOOR	11.3.7	MECH. RM.	11.3.7	1.0	-	-	X	3.0	-	WHH		MECHANICAL RM.
THIRD FLOOR	11.3.8	MECH. RM.	11.3.8	1.0	-	-	X	3.0	-	WHH		MECHANICAL RM.
THIRD FLOOR	11.3.9	ELEV. REMOTE CLOSET	11.3.9	1.0	-	X	-	3.0	-	WSL		ELEVATOR REMOTE
THIRD FLOOR	11.3.10	STAIR B	11.3.10A	1.0	-	X	X	2.0	-	DPH		EMERGENCY EXIT STAIR
THIRD FLOOR			11.3.10A	-	-	-	-	3.0	-	WSL		GYMNASIUM
THIRD FLOOR	11.3.10		11.3.10A	-	-	-	-	2.2	-	WSL	1	STAIR B/FLOOR3
THIRD FLOOR	11.3.10		11.3.10B	1.0	-	X	X		-			
MAIN ENTRANCE (GREENMOUNT AVE)	-	-	-	-				6.0		POLE MOUNTED		NO SMOKING BEYOND THIS POINT

SIGN LOCATION ABBREVIATIONS			
	MOUNT TO	ADEJACENT TO	SIDE OF DOOR
DPH	DOOR	STRIKE	PUSH
DPL	DOOR	STRIKE	PULL
WHH	WALL	HINGE	PUSH
WHL	WALL	HINGE	PULL
WSH	WALL	STRIKE	PUSH
WSL	WALL	STRIKE	PULL
ADH	WALL	ABOVE DOOR	PUSH
ADL	WALL	ABOVE DOOR	PULL
CLG	CEILING	-	-

REMARKS

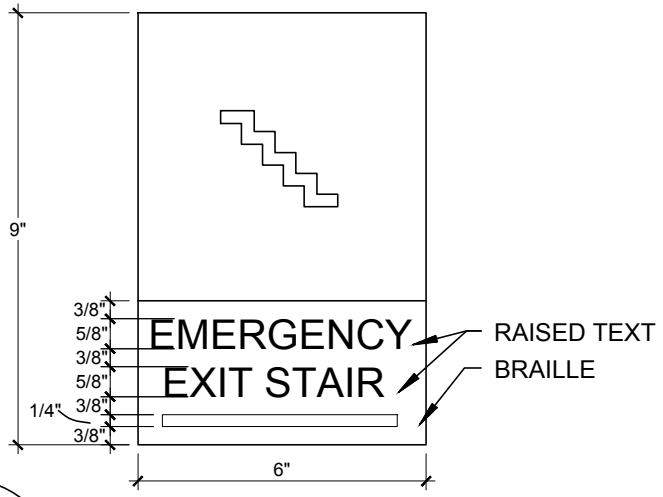
1 COORDINATE LOCATION WITH FIELD ARCHITECT
2 CONSIDER THE DOOR HOUSING SIDE OF SLIDING DOOR TO BE THE PULL SIDE FOR MOUNTING PURPOSES
3 LOCATE ON NEAREST ADJACENT WALL
4 CONSIDER THE SIDE OF DOOR FACING THE STAIRS AS PULL SIDE FOR MOUNTING PURPOSES
5 USE TEMPLATE 2.1 FOR STAIRWAY IDENTIFICATION SIGN

SIGN TYPE		
1.0	DOOR TAG PLAQUE	NON-ADA
2.0	EMERGENCY EXIT STAIRS	ADA
2.1	TEMPLATE FOR STAIRWAY ID	NON-ADA
3.0	ROOM PLAQUE	ADA
3.1	ROOM PLAQUE W/ WINDOW INSERT	
3.2	WOMEN	ADA
3.3	MEN	ADA
3.4	UNISEX	ADA
3.5	UNISEX (NON-ADA)	NON-ADA
4.0	SINGLE LINE TEXT PLAQUE	NON-ADA
4.1	SINGE LETTER TEXT PLAQUE	NON-ADA
4.2	MULTI-LINE TEXT PLAQUE	NON-ADA
4.3	SUSPENDED MULTI-LINE TEXT PLAQUE	NON-ADA
5.0	BEDROOM NUMBER SIGNS	NON-ADA
5.1	SINGLE LINE ADHESIVE VINLY LETTERING	NON-ADA



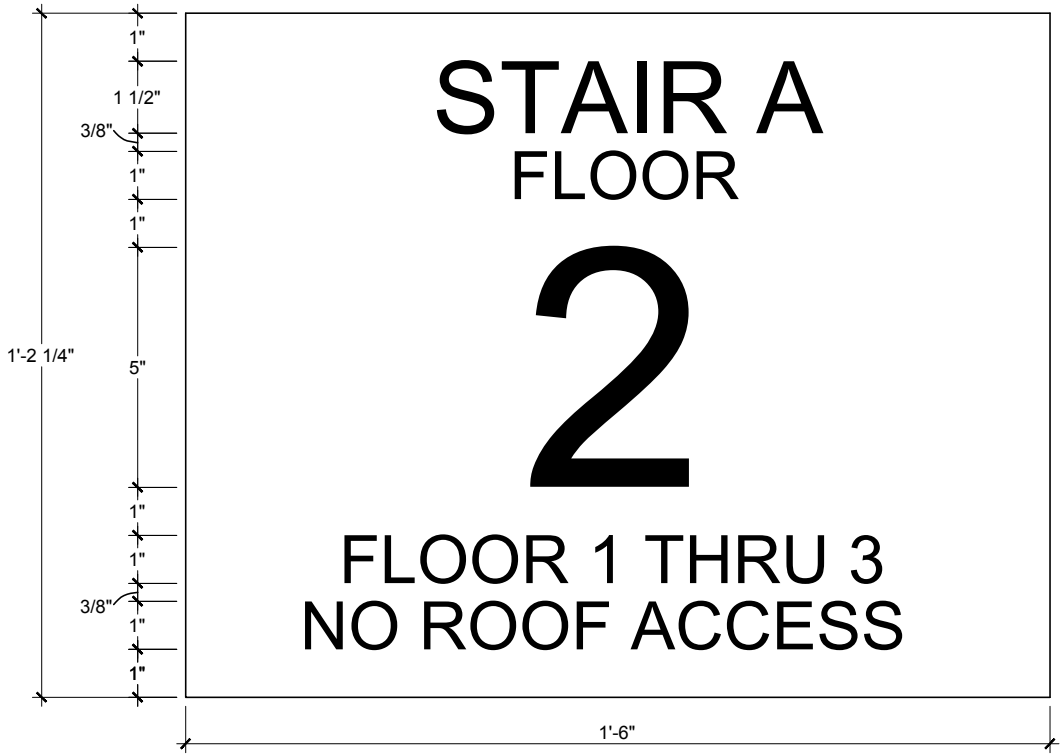
1.0

DOOR TAG PLAQUE (NON-ADA)



2.0

EXIT SIGN PLAQUE (ADA)



2.1

EXIT SIGN PLAQUE (NON-ADA)

2.2

EXIT SIGN PLAQUE (NON-ADA)

3.0

ROOM PLAQUE (ADA)

3.1

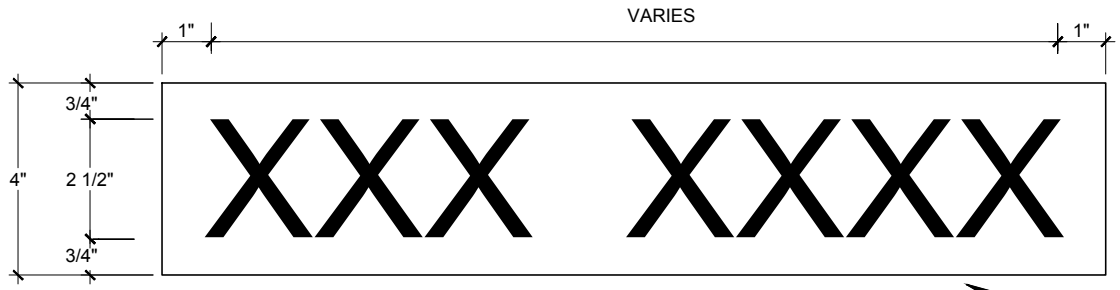
WINDOW INSERT PLAQUE

3.2 ROOM PLAQUE (ADA)

3.3 ROOM PLAQUE (ADA)

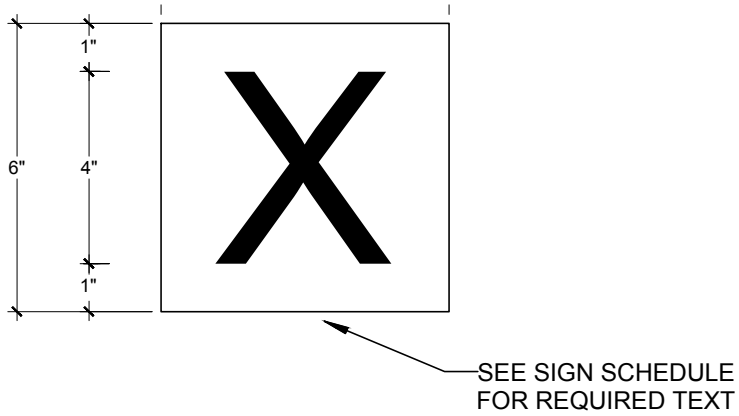
3.4 ROOM PLAQUE (ADA)

3.5 ROOM PLAQUE (NON-ADA)



4.0

SINGLE LINE TEXT, SOLID PLAQUE (NON-ADA)



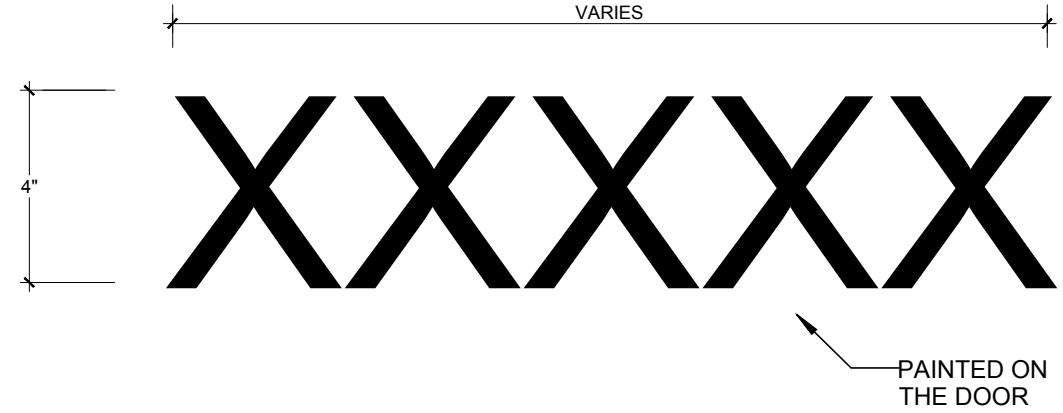
4.1

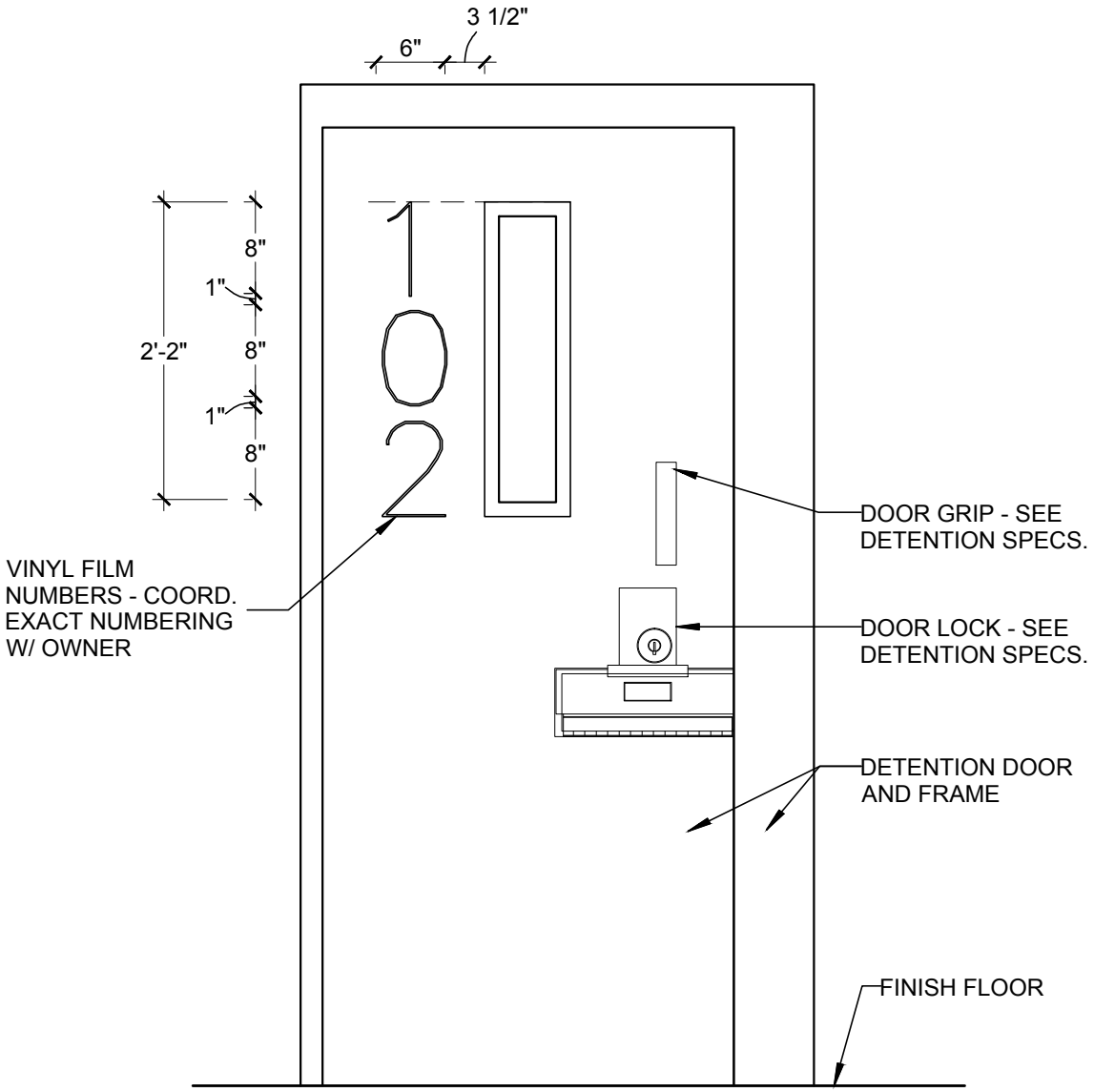
SINGLE LINE TEXT, SOLID PLAQUE (NON-ADA)

4.2 NOT USED

4.3

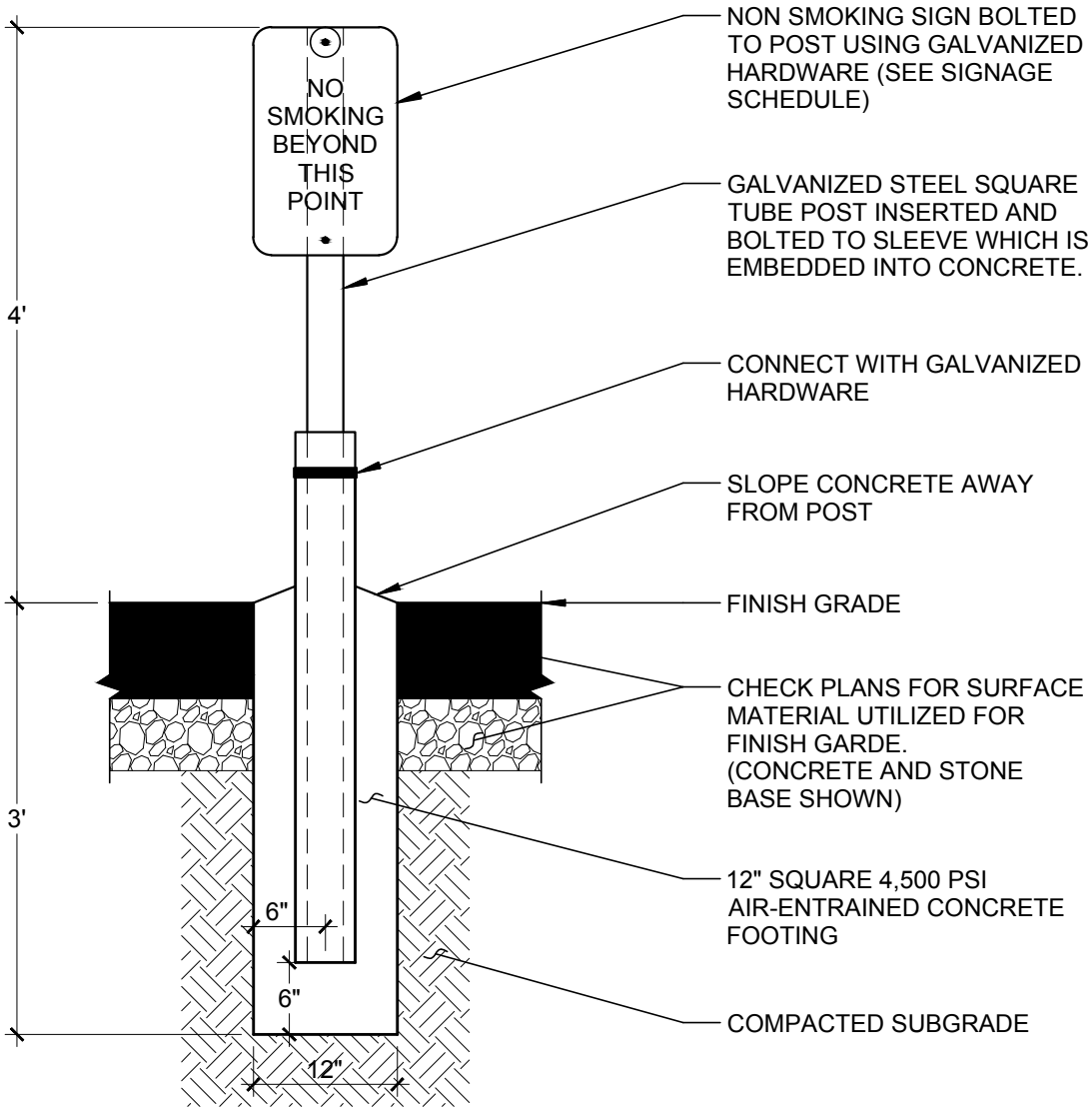
4.4





5.0

HOUSING CELL DOOR NUMBER SIGN (NON-ADA)



6.0

NON SMOKING METAL SIGN

SECTION 10 21 16.17 - PHENOLIC-CORE SHOWER AND DRESSING COMPARTMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Solid, phenolic-core compartments.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for supports that attach floor-and-ceiling-anchored compartments to the overhead structural system.
2. Section 061053 "Miscellaneous Rough Carpentry" for blocking and overhead support of floor-and-ceiling-anchored compartments.
3. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable LEED Credits

1. MRc2
2. MRc4
3. MRc5
4. IEQc4.1

B. LEED Requirements

1. MRc2: CONSTRUCTION WASTE MANAGEMENT

   No less than the specified portion of all construction waste from the Project shall be diverted from disposal in a landfill and/or incineration in with the Project Requirements for Construction Waste Management and Disposal. Refer to Specification Sections 017419 Construction Waste Management and Disposal and 013510 Sustainable Design Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

2. MRc4: Recycled Content Material

   No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the Project Requirements for Recycled Content Materials. All materials counted towards the computations of the proportion of the Recycled Content Materials

shall comply with the standard minimum percentages of post-consumer waste materials and for the minimum percentages of pre-consumer waste materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

3. MRc5: REGIONALLY MANUFACTURED HARVESTED MATERIALS

   No less than the specified minimum proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the Project Site in accordance with the Project Requirements for Regionally Manufactured and/or Harvested Materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

4. IEQc4.1: Low Emitting Materials: Sealants and Adhesives

   All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the Project Requirements for Low Emitting Materials – Sealants and Adhesives. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Sustainable Design Submittals:

   1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.

C. Shop Drawings: For shower and dressing compartments.

   1. Include plans, elevations, sections, and attachment details.
   2. Show locations of cutouts for compartment-mounted accessories.
   3. Show locations of centerlines of drains.
   4. Show ceiling grid, ceiling-mounted items, and overhead support or bracing locations.

D. Samples for Initial Selection: For each type of compartment material indicated.

   1. Include Samples of hardware and accessories for material and color selection.

E. Samples for Verification: For the following products, in manufacturer's standard sizes unless otherwise indicated:

   1. Each type of material, color, and finish required for compartments, prepared on 6-inch- (152-mm-) square Samples of same thickness and material indicated for the Work.

2. Each type of hardware and accessory.
3. Curtain Fabric: 12-inch- (305-mm-) square swatch or larger as required to show complete pattern repeat, from dye lot used for the Work, with specified treatments applied. Mark top and face of material.

1.5 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of shower and dressing compartment.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For shower and dressing compartments to include in maintenance manuals.

1.7 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of fixtures, drains, walls, columns, ceilings, and other construction contiguous with shower and dressing compartments by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E 84 or UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 450 or less.

B. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 20 percent.

C. Accessibility Standard: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1 for shower and dressing compartments designated as accessible.

2.2 PHENOLIC-CORE COMPARTMENTS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Bobrick Washroom Equipment, Inc; Sierra Series or a comparable product by one of the following:

1. Accurate Partitions Corp.; ASI Group.
2. General Partitions Mfg. Corp.
3. Global Partitions; ASI Group.
4. Metpar Corp.

B. Configuration: As indicated on Drawings.

C. Enclosure Style: Floor and ceiling anchored .

D. Panel and Pilaster Construction: Solid phenolic-core panel material with melamine facing on both sides fused together during panel manufacture (not separately laminated) and with eased and polished edges. Provide minimum 3/4-inch- (19-mm-) thick pilasters and minimum 1/2-inch- (13-mm-) thick panels.

E. Door Construction: Match panels; 3/4-inch (19-mm) minimum thickness. Equip door and pilasters with manufacturer's standard no-sightline system.

F. Pilaster Shoes and Sleeves (Caps): Formed from stainless-steel sheet, not less than 0.031-inch (0.79-mm) nominal thickness and 3 inches (76 mm) high, finished to match hardware.

G. Brackets (Fittings):

1. Full-Height (Continuous) Type: Manufacturer's standard design; clear-anodized aluminum.
2. Stirrup Type: Ear or U-brackets; stainless steel.
3. Dressing-Compartment Brackets: Match toilet-compartment brackets specified in Section 102113.17 "Phenolic-Core Toilet Compartments."

H. Phenolic-Panel Finish:

1. Facing Sheet Finish: One color and pattern in each room.
2. Color and Pattern: As selected by Architect from manufacturer's full range, with manufacturer's standard through-color core matching face sheet.

2.3 MATERIALS

A. Aluminum Castings: ASTM B 26/B 26M.

B. Aluminum Extrusions: ASTM B 221 (ASTM B 221M).

C. Stainless-Steel Sheet: ASTM A 666, Type 304, stretcher-leveled standard of flatness.

D. Stainless-Steel Castings: ASTM A 743/A 743M.

2.4 ACCESSORIES

A. Door Hardware and Accessories: Manufacturer's standard design, heavy-duty, operating hardware and accessories.

1. Material: Stainless steel.
2. Hinges: Manufacturer's standard, continuous, cam type that swings to a closed or partially open position, allowing emergency access by lifting door.
3. Latch and Keeper: Manufacturer's standard, surface-mounted latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible.

4. Door Bumper: Manufacturer's standard, rubber-tipped bumper at outswinging doors.
5. Door Pull: Manufacturer's standard unit at outswinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible.

B. Overhead Bracing: Manufacturer's standard, continuous, extruded-aluminum headrail or cap with antigrip profile; in manufacturer's standard finish.

2.5 FABRICATION

A. Floor-and-Ceiling-Anchored Compartments: Manufacturer's standard, corrosion-resistant anchoring assemblies at pilasters and walls, with leveling adjustment at tops and bottoms of pilasters. Provide shoes and sleeves (caps) at pilasters to conceal anchorage.

B. Door Sizes and Swings: Unless otherwise indicated, provide 24-inch- (610-mm-) wide, inswinging doors for standard shower and dressing compartments, and 36-inch- (914-mm-) wide, outswinging doors with a minimum 32-inch- (813-mm-) wide, clear opening for compartments designated as accessible.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Comply with manufacturer's written installation instructions. Install compartments rigid, straight, level, and plumb. Secure compartments in position with manufacturer's recommended anchoring devices.

1. Clearances for Dressing Compartments: Maximum 1/2 inch (13 mm) between pilasters and panels; 1 inch (25 mm) between panels and walls.

2. Full-Height (Continuous) Brackets for Dressing Compartments: Secure panels to walls and to pilasters with full-height brackets.

a. Locate bracket fasteners so holes for wall anchors occur in masonry or tile joints.
b. Align brackets at pilasters with brackets at walls.

B. Floor-and-Ceiling-Anchored Compartments: Secure pilasters to supporting construction, and level, plumb, and tighten. Hang doors and adjust so doors are level and aligned with panels when doors are in closed position.

3.2 ADJUSTING

A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on inswinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on outswinging doors to return doors to fully closed position.

END OF SECTION 10 21 16.17

SECTION 10 22 13 - WIRE MESH PARTITIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Heavy-duty wire mesh partitions.

B. Related Requirements:
   1. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations indicated to receive security fasteners.
   2. Division 28 Section "Access Control" for security access system equipment.
   3. Division 28 Sections for integration with Building Security system including Central Control.

1.3 DEFINITIONS

A. Intermediate Crimp: Wires pass over one and under the next adjacent wire in both directions, with wires crimped before weaving and with extra crimps between the intersections.

B. Lock Crimp: Deep crimps at points of the intersection that lock wires securely in place.

1.4 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable LEED Credits

   1. MRc2
   2. MRc4
   3. MRc5
   4. IEQc4.1

B. LEED Requirements

   1. MRc2: CONSTRUCTION WASTE MANAGEMENT

      No less than the specified portion of all construction waste from the Project shall be diverted from disposal in a landfill and/or incineration in with the Project Requirements for Construction Waste Management and Disposal. Refer to Specification Sections 017419 Construction Waste Management and Disposal and 013510 Sustainable Design Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

2. MRc4: Recycled Content Material

   No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the Project Requirements for Recycled Content Materials. All materials counted towards the computations of the proportion of the Recycled Content Materials shall comply with the standard minimum percentages of post-consumer waste materials and for the minimum percentages of pre-consumer waste materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

3. MRc5: REGIONALLY MANUFACTURED HARVESTED MATERIALS

   No less than the specified minimum proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the Project Site in accordance with the Project Requirements for Regionally Manufactured and/or Harvested Materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

4. IEQc4.1: Low Emitting Materials: Sealants and Adhesives

   All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the Project Requirements for Low Emitting Materials – Sealants and Adhesives. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

   1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.

C. Shop Drawings:

   1. Include plans, elevations, sections, details, and attachments to other work.

D. Setting Drawings: For anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry.

E. Samples for Initial Selection: For units with factory-applied color finishes.

F. Samples for Verification: 12-by-12-inch (300-by-300-mm) panel constructed of specified frame members and wire mesh. Show method of finishing members at intersections.

G. Delegated-Design Submittal: For wire mesh partitions indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Welding certificates.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For wire mesh partition hardware to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

B. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.3, "Structural Welding Code - Sheet Steel."

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver wire mesh items with cardboard protectors on perimeters of panels and doors and with posts wrapped to provide protection during transit and Project-site storage. Use vented plastic.

1.10 FIELD CONDITIONS

A. Field Measurements: Verify actual dimensions of construction contiguous with wire mesh units by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Acorn Wire & Iron Works, Inc.
2. American Woven Wire Corporation.
3. Central Wire and Iron.
4. Folding Guard Corporation.
5. G-S Company (The).
6. Kenco Wire and Iron Products Inc.
7. Lakeside Wire and Iron Company.
8. Miller Wire Works, Inc.
9. Newark Wire Works Inc.
10. Standard Wire & Steel Works.

B. Wire Crafters, LLC.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design wire mesh units.

B. Structural Performance: Wire mesh units shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.

1. Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m) at any location on a panel.
2. Total load of 200 lbf (0.89 kN) applied uniformly over each panel.
3. Concentrated load and total load need not be assumed to act concurrently.
4. .

C. Seismic Performance: Wire mesh units shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

2.3 MATERIALS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Steel Wire: ASTM A 510 (ASTM A 510M).

C. Steel Plates, Channels, Angles, and Bars: ASTM A 36/A 36M.

D. Steel Sheet: Cold-rolled steel sheet, ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.

E. Steel Pipe: ASTM A 53/A 53M, Schedule 40, unless another weight is indicated or required by structural loads.

F. Steel Tubing: ASTM A 500/A 500M, cold-formed structural-steel tubing or ASTM A 513, Type 5, mandrel-drawn mechanical tubing.

G. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with G60 (Z180) zinc (galvanized) or A60 (ZF180) zinc-iron-alloy (galvannealed) coating designation.

H. Panel-to-Panel Fasteners: Manufacturer's standard steel bolts, nuts, and washers.

I. Post-Installed Anchors: Capable of sustaining, without failure, a load equal to 6 times the load imposed when installed in unit masonry and 4 times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.

J. Power-Driven Fasteners: ICC-ES AC70.

K. Seismic Bracing: Angles with legs not less than 1-1/4 inch (32 mm) wide, formed from 0.040-inch- (1.0-mm-) thick, metallic-coated steel sheet; with bolted connections and 1/4-inch- (6-mm-) diameter bolts.

L. Zinc-Rich Primer: Compatible with topcoat, complying with SSPC-Paint 20 or SSPC-Paint 29.

M. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

2.4 HEAVY-DUTY WIRE MESH PARTITIONS

A. Mesh: 0.192-inch- (4.9-mm-) diameter, intermediate-crimp steel wire woven into 2-inch (50-mm) diamond mesh.

B. Mesh: 0.192-inch- (4.9-mm-) diameter steel wire, resistance welded into 1-1/2-by-2-1/2-inch (38-mm-by-65-mm) rectangular mesh.

C. Vertical and Horizontal Panel Framing: 1-1/2-by-3/4-by-1/8-inch (38-by-19-by-3.2-mm) cold-rolled steel channels; with holes for 3/8-inch- (9.5-mm-) diameter bolts not more than 12 inches (300 mm) o.c.

D. Horizontal Panel Stiffeners: Two cold-rolled steel channels, 1 by 1/2 by 1/8 inch (25 by 13 by 3.2 mm), bolted or riveted toe to toe through mesh.

E. Top Capping Bars: 3-by-1-inch (76-by-25-mm) steel channels.

F. Posts for 90-Degree Corners: 1-1/2-by-1-1/2-by-1/8-inch (38-by-38-by-3.2-mm) steel angles or tubes or 2-by-2-by-0.075-inch (50-by-50-by-1.9-mm) cold-rolled steel angles or tubes, with holes for 3/8-inch- (9.5-mm-) diameter bolts aligning with bolt holes in vertical framing; with 1/4-inch (6.4-mm) steel base plates.

G. Posts for Other-Than-90-Degree Corners: 2-inch- (50-mm) OD by 1/8-inch (3.2-mm) steel pipe or round tube, with holes for 3/8-inch- (9.5-mm-) diameter bolts aligning with bolt holes in vertical framing; with 1/4-inch (6.4-mm) steel base plates.

H. Adjustable Corner Posts: Two 1-1/2-by-3/4-by-1/8-inch (38-by-19-by-3.2-mm) cold-rolled, steel channels or 2-by-2-by-0.075-inch (50-by-50-by-1.9-mm) steel tubes connected by steel hinges at 36 inches (900 mm) o.c. attached to posts; with 1/4-inch- (6-mm-) diameter bolt holes aligning with bolt holes in vertical framing; with 1/4-inch (6.4-mm) steel base plates.

I. Line Posts: 3-inch-by-4.1-lb (76-mm-by-1.9-kg) or 3-1/2-by-1-1/4-by-1/8-inch (89-by-32-by-3.2-mm) steel channels; with 1/4-inch (6.4-mm) steel base plates.

J. Three- and Four-Way Intersection Posts: 2-by-2-by-0.075-inch (50-by-50-by-1.9-mm) steel tubes, with holes for 3/8-inch- (9.5-mm-) diameter bolts aligned for bolting to adjacent panels; with 1/4-inch (6.4-mm) steel base plates.

K. Floor Shoes: Metal, not less than 2 inches (50 mm) high; sized to suit vertical framing, drilled for attachment to floor, and with set screws for leveling adjustment.

L. Sliding Doors: Fabricated from same mesh as partitions, with framing fabricated from 1-1/2-by-3/4-by-1/8-inch (38-by-19-by-3.2-mm) steel channels, banded with 1-1/2-by-1/8-inch (38-by-3.2-mm) flat steel bar cover plates on four sides.

1. Hardware: Two, four-wheel roller-bearing carriers, box track, and bottom guide channel for each door.

2. Cylinder Lock: Mortise type with cylinder specified in Section 087100 "Door Hardware"
3. Doors: Fabricated from same mesh as partitions, with framing fabricated from 1-1/2-by-3/4-by-1/8-inch (38-by-19-by-3.2-mm) steel channels, banded with 1-1/2-by-1/8-inch (38-by-3.2-mm) flat steel bar cover plates on four sides.

M. Accessories:

1. Sheet Metal Base: 0.060-inch- (1.5-mm-) thick, steel sheet.
2. Adjustable Filler Panels: 0.060-inch- (1.5-mm-) thick steel sheet, capable of filling openings from 2 to 12 inches (50 to 300 mm).
3. Wall Clips: Manufacturer's standard, cold-rolled steel sheet; allowing up to 1 inch (25 mm) of adjustment.

N. Finish: Powder-coated finish unless otherwise indicated.

1. Color: As selected by Architect from manufacturer's full range.

2.5 FABRICATION

A. General: Fabricate wire mesh items from components of sizes not less than those indicated. Use larger-sized components as recommended by wire mesh item manufacturer. Furnish bolts, hardware, and accessories required for complete installation with manufacturer's standard finishes.

1. Fabricate wire mesh items to be readily disassembled.
2. Welding: Weld corner joints of framing and grind smooth, leaving no evidence of joint.

B. Heavy-Duty Wire Mesh Partitions: Fabricate wire mesh partitions with cutouts for pipes, ducts, beams, and other items indicated. Finish edges of cutouts to provide a neat, protective edge.

1. Mesh: Weld mesh to framing.
2. Framing: Fabricate framing with mortise and tenon corner construction.

    a. Provide horizontal stiffeners as indicated or, if not indicated, as required by panel height and as recommended by wire mesh partition manufacturer. Weld horizontal stiffeners to vertical framing.
    b. Fabricate three- and four-way intersections using intersection posts.
    c. Fabricate partition and door framing with slotted holes for connecting adjacent panels.

3. Fabricate wire mesh partitions with 3 to 4 inches (75 to 100 mm) of clear space between finished floor and bottom horizontal framing.
4. Fabricate wire mesh partitions with bottom horizontal framing flush with finished floor.
5. Doors: Align bottom of door with bottom of adjacent panels.

    a. For doors that do not extend full height of partition, provide transom over door, fabricated from same mesh and framing as partition panels.

6. Hardware Preparation: Mortise, reinforce, drill, and tap doors and framing as required to install hardware.

2.6 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.

1. Do not quench or apply post-galvanizing treatments that might interfere with paint adhesion.

B. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean items of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.

C. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

D. Shop Priming: Apply shop primer to uncoated surfaces of wire mesh units unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

E. Powder-Coat Finish: Immediately after cleaning and pretreating, apply manufacturer's standard baked-on powder-coat finish, suitable for use indicated, with a minimum dry film thickness of 2 mils (0.05 mm).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine floors for suitable conditions where wire mesh items will be installed.

C. Examine walls to which wire mesh items will be attached for properly located blocking, grounds, and other solid backing for attachment of support fasteners.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 WIRE MESH PARTITIONS ERECTION

A. Anchor wire mesh partitions to floor with 3/8-inch- (9.5-mm-) diameter postinstalled expansion anchors at 12 inches (300 mm) o.c. through anchor clips located at each post and corner. Shim anchor clips as required to achieve level and plumb installation.

1. Anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if indicated on Shop Drawings.

B. Anchor wire mesh partitions to floor with 3/8-inch- (9.5-mm-) diameter postinstalled expansion anchors at 12 inches (305 mm) o.c. through floor shoes located at each post and corner. Adjust wire mesh partition posts in floor shoes to achieve level and plumb installation.

1. Anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if indicated on Shop Drawings.

C. Anchor wire mesh partitions to walls at 12 inches (305 mm) o.c. through back corner panel framing and as follows:

1. For concrete and solid masonry anchorage, use expansion anchors.
2. For hollow masonry anchorage, use toggle bolts.

D. Secure top capping bars to top framing channels with 1/4-inch- (6-mm-) diameter "U" bolts spaced not more than 28 inches (700 mm) o.c.

E. Provide line posts at locations indicated or, if not indicated, as follows:
1. For partitions that are 7 to 9 feet (2.1 to 2.7 m) high, spaced at 15 to 20 feet (4.6 to 6.1 m) o.c.
2. For partitions that are 10 to 12 feet (3.0 to 3.7 m) high, located between every other panel.
3. For partitions that are more than 12 feet (3.7 m) high, located between each panel.

F. Provide seismic supports and bracing as indicated or, if not indicated, as recommended by manufacturer and as required for stability, extending and fastening members to supporting structure.

G. Where standard-width wire mesh partition panels do not fill entire length of run, provide adjustable filler panels to fill openings.

H. Install doors complete with door hardware.

I. Install service windows complete with window hardware.

J. Weld or bolt sheet metal bases to wire mesh partitions and doors.

K. Bolt accessories to wire mesh partition framing.

3.3 JUSTING AND CLEANING

A. Adjust gates to operate smoothly and easily, without binding or warping. Adjust hardware to function smoothly. Confirm that latches and locks engage accurately and securely without forcing or binding.

B. Remove and replace defective work, including doors and framing that are warped, bowed, or otherwise unacceptable.

C. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

D. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099113 "Exterior Painting"

E. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas, and repair galvanizing to comply with ASTM A 780/A 780M.

END OF SECTION 10 22 13

SECTION 10 26 00 - WALL AND DOOR PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Wall corner guards (HDPE)
2. Corner guards. (Metal)

B. Related Requirements:

1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.
3.

1.3 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable LEED Credits

1. MRc2
2. MRc4
3. MRc5
4. IEQc4.1

B. LEED Requirements

1. MRc2: CONSTRUCTION WASTE MANAGEMENT

   No less than the specified portion of all construction waste from the Project shall be diverted from disposal in a landfill and/or incineration in with the Project Requirements for Construction Waste Management and Disposal. Refer to Specification Sections 017419 Construction Waste Management and Disposal and 013510 Sustainable Design Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

2. MRc4: Recycled Content Material

   No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the Project Requirements for Recycled Content Materials. All materials counted towards the computations of the proportion of the Recycled Content Materials shall comply with the standard minimum percentages of post-consumer waste

materials and for the minimum percentages of pre-consumer waste materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

3. MRc5: REGIONALLY MANUFACTURED HARVESTED MATERIALS

   No less than the specified minimum proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the Project Site in accordance with the Project Requirements for Regionally Manufactured and/or Harvested Materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

4. IEQc4.1: Low Emitting Materials: Sealants and Adhesives

   All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the Project Requirements for Low Emitting Materials – Sealants and Adhesives. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

1.4 SUBMITTALS

A. Product Data: For each type of product.

   1. Include construction details, material descriptions, impact strength, dimensions of individual components and profiles, and finishes.

B. Sustainable Design Submittals:
   1. Chain-of-Custody Qualification Data: For manufacturer and vendor.
   2. Product Data: For adhesives, indicating VOC content.
   3. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: For each type of wall protection showing locations and extent.

   1. Include plans, elevations, sections, and attachment details.

D. Samples for Initial Selection: For each type of impact-resistant wall-protection unit indicated, in each color and texture specified.

   1. Include Samples of accent strips and accessories to verify color selection.

E. Samples for Verification: For each type of exposed finish on the following products, prepared on Samples of size indicated below:
   1. [**Corner**] [**and**] [**End-Wall**] Guards: 12 inches (300 mm) long. Include example top caps.

1.5 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of handrail.

B. Material Certificates: For each type of exposed plastic material.

C. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of wall and door protection product to include in maintenance manuals.

1. Include recommended methods and frequency of maintenance for maintaining best condition of plastic covers under anticipated traffic and use conditions. Include precautions against using cleaning materials and methods that may be detrimental to finishes and performance.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.

B. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store wall and door protection in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

1. Maintain room temperature within storage area at not less than 70 deg F (21 deg C) during the period plastic materials are stored.
2. Keep plastic materials out of direct sunlight.
3. Store plastic wall- and door-protection components for a minimum of 72 hours, or until plastic material attains a minimum room temperature of 70 deg F (21 deg C).

a. Store corner-guard covers in a vertical position.

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of wall- and door-protection units that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including detachment of components from each other or from the substrates, delamination, and permanent deformation beyond normal use.
b. Deterioration of metals, metal finishes, plastics, and other materials beyond normal use.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain wall protection products of each type from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Surface Burning Characteristics: Comply with ASTM E 84 or UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 450 or less.

2.3 WALL AND CORNER GUARDS (HDPE)

A. Heavy-duty assembly consisting extruded 100% post-consumer HDPE. The guards are surface mounted with concealed hardware and designed to withstand impacts.

B. Wall and Guards:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following :
   a. Balco, Inc.
   b. Construction Specialties, Inc.
   c. IPC Door and Wall Protection Systems; Division of InPro Corporation.
   d. Korogard Wall Protection Systems; a division of RJF International Corporation.
   e. Musson Rubber Company.
   f. WallGuard.com

C. Design Criteria:

1. Profile, dimensions, and mounting height:
   a. Refer to details for actual sizes, locations, mounting height and anchorage requirements
2. Density: (ASTM D6111) .024-.027 lbs/cu-in
3. Modulus of Elasticity: (ASTM D6109) 114,000 psi at 1% strain
4. Ultimate Flexural Stress: (ASTM D6109) 2300 psi at 3% strain
5. Allowable Flexural Stress: (ASTM D6109) 1200 psi
6. Endwise Compressive Stress: (ASTM D6108) 1740 psi at 3% strain
7. Screw Withdrawal: (ASTM D6117 7) 90 lbs (#10 x 1 ½”)
8. Water Absorption, 11 weeks: (ASTM D570) less than 0.1%
9. Coefficient of Thermal Expansion: (ASTM D6341) .000055 in/in/^{0}F
10. Stock length: 12’-0”

D. Color and Texture: As selected by Architect from manufacturer's full range.

2.4 CORNER GUARDS (METAL)

A. Surface-Mounted, Metal Corner Guards: Fabricated from one-piece, formed or extruded metal with formed edges; with 90- or 135-degree turn to match wall condition.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Arden Architectural Specialties, Inc.
   b. Balco, Inc.
   c. Construction Specialties, Inc.
   d. IPC Door and Wall Protection Systems; Division of InPro Corporation.
   e. Korogard Wall Protection Systems; a division of RJF International Corporation.
   f. Pawling Corporation.
   g. WallGuard.com.
2. Material: Stainless steel, Type 304 or Type 430.
   a. Thickness: Minimum 0.0781 inch .
   b. Finish: Directional satin, No. 4.
3. Corner Radius: 1/8 inch.
4. Mounting: Tamper-proof Flat-head, countersunk screws through factory-drilled mounting holes.
   a. Profile: Nominal 3-inch- long leg and 1/4-inch corner.
   b. Height: 4’-0”.

2.5 MATERIALS

A. Aluminum Extrusions: Alloy and temper recommended by manufacturer for type of use and finish indicated, but with not less than strength and durability properties specified in ASTM B 221 for Alloy 6063-T5.

B. High-Density Polyethylene (HDPE): High-density polyethylene shapes shall be extruded from high-percentage post consumer recycled plastic and reinforced with fiberglass. Product shall be fully recyclable.

C. Stainless-Steel Sheet: ASTM A 240/A 240M.

1. Type 304 alloy with #4 satin finish, 1/4" thickness

D. Fasteners: Aluminum, nonmagnetic stainless-steel, or other noncorrosive metal screws, bolts, and other fasteners compatible with items being fastened. Use security-type fasteners where exposed to view. Refer to specification section 111993.

E. Adhesive: As recommended by impact-resistant plastic wall protection manufacturer and with a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.6 FABRICATION

A. Fabricate wall protection according to requirements indicated for design, performance, dimensions, and member sizes, including thicknesses of components.

B. Factory Assembly: Assemble components in factory to greatest extent possible to minimize field assembly. Disassemble only as necessary for shipping and handling.

C. Quality: Fabricate components with uniformly tight seams and joints and with exposed edges rolled. Provide surfaces free of wrinkles, chips, dents, uneven coloration, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.

2.7 FINISHES

A. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances, fire rating, and other conditions affecting performance of work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Complete finishing operations, including painting, before installing wall protection.

B. Before installation, clean substrate to remove dust, debris, and loose particles.

3.3 INSTALLATION

A. Installation Quality: Install wall and door protection according to manufacturer's written instructions, level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.

3.4 CLEANING

A. Immediately after completion of installation, clean plastic covers and accessories using a standard ammonia-based household cleaning agent.

B. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

END OF SECTION 10 26 00

SECTION 10 28 00 – TOILET AND BATH ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Washroom accessories.
2. Public-use shower room accessories.
3. Warm-air dryers.
4. Childcare accessories
5. Underlavatory guards.
6. Custodial accessories.

B. Related Requirements:

1. Division 07 section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 11 Section "Detention Furnishings and Equipment” for accessories designed for installation in detention facilities.
3. Division 11 Section ““Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable LEED Credits

1. MRc2
2. MRc4
3. MRc5
4. IEQc4.1

B. LEED Requirements

1. MRc2: CONSTRUCTION WASTE MANAGEMENT

   No less than the specified portion of all construction waste from the Project shall be diverted from disposal in a landfill and/or incineration in with the Project Requirements for Construction Waste Management and Disposal. Refer to Specification Sections 017419 Construction Waste Management and Disposal and 013510 Sustainable Design Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

2. MRc4: Recycled Content Material

No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the Project Requirements for Recycled Content Materials. All materials counted towards the computations of the proportion of the Recycled Content Materials shall comply with the standard minimum percentages of post-consumer waste materials and for the minimum percentages of pre-consumer waste materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

3. MRc5: REGIONALLY MANUFACTURED HARVESTED MATERIALS

   No less than the specified minimum proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the Project Site in accordance with the Project Requirements for Regionally Manufactured and/or Harvested Materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

4. IEQc4.1: Low Emitting Materials: Sealants and Adhesives

   All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the Project Requirements for Low Emitting Materials – Sealants and Adhesives. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

1.4 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
   2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
   3. Include electrical characteristics.

B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

   1. Identify locations using room designations indicated.
   2. Identify products using designations indicated.

3. If a product is submitted as a substitution for a product listed as the basis-of-design, the shop submission shall include a chart comparing the model numbers between the basis-of-design and submitted product.
4. Listed manufacturer or modeled number specified under the basis-of-design is being submitted as a substitution.

1.6 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For manufacturer's special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For accessories to include in maintenance manuals.

1.8 WARRANTY

A. Manufacturer's Special Warranty for Mirrors: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, visible silver spoilage defects.
2. Warranty Period: 2 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 WASHROOM ACCESSORIES

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. A & J Washroom Accessories, Inc.
2. American Specialties, Inc.
3. Bobrick Washroom Equipment, Inc. Basis Of Design
4. Bradley Corporation.
5. GAMCO Specialty Accessories; a division of Bobrick Washroom Equipment, Inc.
6. Imperial Fastener
7. Norix Group, Inc.
8. Tubular Specialties Manufacturing, Inc..

B. Toilet Tissue (Roll) Dispenser:

1. Basis-of-Design Product: Bobrick**;** B- 2888.
2. Description: Roll-in-reserve dispenser with hinged front secured with tumbler lockset.
3. Mounting: Surface mounted.

4. Operation: Noncontrol delivery with theft-resistant spindle.
5. Capacity: Designed for Standard diameter tissue rolls.
6. Material and Finish: Stainless steel, No. 4 finish (satin).

C. Paper Towel (Folded) Dispenser:

1. Basis-of-Design Product: Bobrick; B- 262.
2. Mounting: Surface mounted.
3. Minimum Capacity: 400 C-fold or 525 multifold towels.
4. Material and Finish: Stainless steel, No. 4 finish (satin).
5. Lockset: Tumbler type.
6. Refill Indicators: Pierced slots at sides or front.

D. Combination Towel (Folded) Dispenser/Waste Receptacle:

1. Basis-of-Design Product: Bobrick; B- 3944.
2. Description: Combination unit for dispensing C-fold or multifold towels, with removable waste receptacle.
3. Mounting: Recessed with projecting receptacle.
   a. Refer to drawings for wall depth.
4. Minimum Towel-Dispenser Capacity: 600 C-fold or 800 multifold paper towels.
5. Minimum Waste-Receptacle Capacity: 12 gal.
6. Material and Finish: Stainless steel, No. 4 finish (satin).
7. Liner: Reusable, vinyl waste-receptacle liner.
8. Lockset: Tumbler type for towel-dispenser compartment.

E. Grab Bar:

1. Basis-of-Design Product: Bobrick; B- 6806.99 x 42 and B-6806.99 x 36
2. Mounting: Flanges with concealed fasteners.
3. Material: Stainless steel, 16-gauge.
   a. Finish: Smooth, No. 4 finish (satin) on ends and slip-resistant texture in grip area.
4. Outside Diameter: 1-1/2 inches.
5. Flanges shall be 1/8" thick and shall be completely welded to tube end. Each flange shall have three mounting holes to accommodate 1/4" diameter screws. Closure plate welded on bottom shall be 12 gauge alloy 18-8 stainless steel, type 304 and shall fit closely to flanges and a straight line between rear face mounting surface of flanges.
6. Configuration: As indicated on Drawings.

F. Vendor :

1. Basis-of-Design Product: Bobrick; B- 2706.
2. Type: Sanitary napkin and tampon dispenser.
3. Mounting: Surface mounted.
4. Fabrication: Cabinet - 18-8 S, type-304, 22-gauge stainless steel with satin finish. Door - 18-8 S, type-304, 18-gauge. All-welded construction. .
5. Capacity: 31 sanitary napkins and 22 tampons.
6. Operation: Two coin (50 cents) or visa.
7. Lockset: Tumbler type with separate lock and key for coin box.

G. Sanitary-Napkin Disposal Unit:

1. Basis-of-Design Product: Bobrick; B-254.

2. Mounting: Surface mounted.
3. Door or Cover: Self-closing, disposal-opening cover and hinged face panel with tumbler lockset.
4. Receptacle: Removable.
5. Material and Finish: Stainless steel, No. 4 finish (satin) Insert material and finish.

H. Mirror Unit :

1. Basis-of-Design Product: Bobrick B-290 Series Channel-Frame Mirror.
2. Frame: Stainless-steel channel .
   a. Corners: Mitered and mechanically interlocked .
3. Hangers: Produce rigid, tamper- and theft-resistant installation, using method indicated below.
   a. Wall bracket of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.

I. Liquid-Soap Dispenser <Insert drawing designation>:

1. Basis-of-Design Product: Bobrick B-2111
2. Description: Designed for dispensingsoap in liquid or lotion form.
3. Mounting: Vertically oriented, surface mounted.
4. Capacity: 40 oz.
5. Materials: <**Insert requirements for valve and reservoir materials and finishes**>.
6. Lockset: Tumbler type.
7. Refill Indicator: Window type.

2.3 SHOWER ROOM ACCESSORIES

A. Source Limitations: Obtain public-use shower room accessories from single source from single manufacturer.

B. Folding Shower Seat:

1. Basis-of-Design Product: Bobrick; B-517 or B-518.
2. Configuration: L-shaped seat, Designed for wheelchair access.
3. Seat: White vinyl padded seat.
4. Mounting Mechanism: Stainless steel, No. 4 finish (satin).

C. Robe Hook: Basis-of-Design Product: Bobrick; B-672.
1. Description: Double-prong unit.
2. Material and Finish: Stainless steel, No. 7 finish (polished).

D. Shower Curtain Track:

1. Basis-of-Design Product: Imperial IFC-69.
2. Track: Section Size: 1-7/16 x 9/16 x .062” satin anodized aluminum.
   a. Use IFC-300 nylon slider.
   b. Break-A-Way with mesh top & clear bottom
   c. Nylon Mesh (#50, 20" Wide, ½” Hole)
   d. Curved track: Factory-fabricated, 12 inch radius bends.
   e. Provided with safety tabs
3. Curtain: Break-A-Way with Mesh Top & Clear Bottom

a. Nylon reinforced vinyl,
b. Flame resistant, antimicrobial, self-deodorizing, and tear resistant
c. Width equal to track length from which shower curtain is hung plus 6 inches added fullness.
d. Length equal to floor-to-ceiling height minus distance above the finished floor at bottom as follows:

1) Shower curtain: 2 inches
2) Top Hem: To be 1-1/2” wide and double lock stitched and 1-1/2" wide loop tape double lock stitched to top hem

2.4 WARM-AIR DRYERS

A. Source Limitations: Obtain warm-air dryers from single source from single manufacturer.

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated or comparable product by one of the following:

1. A & J Washroom Accessories, Inc.
2. American Dryer, Inc.
3. American Specialties, Inc.
4. Bobrick Washroom Equipment, Inc.
5. Bradley Corporation.
6. GAMCO Specialty Accessories; a division of Bobrick Washroom Equipment, Inc.
7. Tubular Specialties Manufacturing, Inc.
8. World Dryer Corporation.

C. Warm-Air Dryer:

1. Basis-of-Design Product: Excel Dryer Corporation ‘XL Series’
2. Mounting: Surface mounted.
3. Operation: Electronic-sensor activated with timed power cut-off switch.
   a. Operation Time: 90-seconds min.
4. Cover Material and Finish: Cast iron, with enamel finish in white.
5. Electrical Requirements: 115V AC, 20 Amp, 2300 W. Single phase, UL

2.5 CHILDCARE ACCESSORIES

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated or comparable product by one of the following:

1. American Specialties, Inc.
2. Brocar Products, Inc.
3. Diaper Deck & Company, Inc.
4. GAMCO Specialty Accessories; a division of Bobrick Washroom Equipment, Inc.
5. Koala Kare Products; a division of Bobrick Washroom Equipment, Inc.
6. SSC, Inc.
7. Tubular Specialties Manufacturing, Inc.

B. Diaper-Changing Station:

1. Basis-of-Design Product: Bobrick-KB110-SSWM.
2. Description: Horizontal unit that opens by folding down from stored position and with child-protection strap.

a. Engineered to support a minimum of 250-lb static load when opened.

3. Mounting: Surface mounted, with unit projecting not more than 4 inches from wall when closed .
4. Operation: By pneumatic shock-absorbing mechanism.
5. Material and Finish: Stainless steel, No. 4 finish (satin), exterior shell with rounded plastic corners; HDPE interior in manufacturer's standard color .

C. Liner Dispenser: Built in.

2.6 UNDERLAVATORY GUARDS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Plumberex Specialty Products, Inc.
2. Truebro by IPS Corporation.

B. Underlavatory Guard:

1. Description: Insulating pipe covering for supply and drain piping assemblies that prevent direct contact with and burns from piping; allow service access without removing coverings.
2. Location: Exposed plumbing at all sinks.
3. Material and Finish: Antimicrobial, molded plastic, grey.

2.7 CUSTODIAL ACCESSORIES

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. A & J Washroom Accessories, Inc.
2. American Specialties, Inc.
3. Bobrick Washroom Equipment, Inc.
4. Bradley Corporation.
5. GAMCO Specialty Accessories; a division of Bobrick Washroom Equipment, Inc.
6. Tubular Specialties Manufacturing, Inc.

B. Mop and Broom Holder:

1. Basis-of-Design Product: Bobrick; B-224.
2. Description: Unit with shelf, hooks, holders, and rod suspended beneath shelf .
3. Length: 36 inches .
4. Hooks: Three .
5. Mop/Broom Holders: Four , spring-loaded, rubber hat, cam type.
6. Material and Finish: Stainless steel, No. 4 finish (satin).

a. Shelf: Not less than nominal 0.05-inch- thick stainless steel.
b. Rod: Approximately 1/4-inch- diameter stainless steel.

2.8 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch (0.8-mm) minimum nominal thickness unless otherwise indicated.

B. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.036-inch (0.9-mm) minimum nominal thickness.

C. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 (Z180) hot-dip zinc coating.

D. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.

E. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.

F. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).

G. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

2.9 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of 10 keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

B. Grab Bars: Install to withstand a downward load of at least 300 lbf, when tested according to ASTM F 446.

3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturer's written instructions.

END OF SECTION 10 28 00

SECTION 10 44 13 - FIRE PROTECTION CABINETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Fire-protection cabinets for the following:

a. Portable fire extinguishers.

B. Related Requirements:

1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 10 Section "Signage" for directional signage to out-of-sight fire extinguishers and cabinets.
3. Division 10 Section "Fire Extinguishers." For fire extinguishers and mounting brackets to secure fire extinguisher to wall or structure.
4. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable LEED Credits

1. MRc2
2. MRc4
3. MRc5
4. IEQc4.1

B. LEED Requirements

1. MRc2: CONSTRUCTION WASTE MANAGEMENT

No less than the specified portion of all construction waste from the Project shall be diverted from disposal in a landfill and/or incineration in with the Project Requirements for Construction Waste Management and Disposal. Refer to Specification Sections 017419 Construction Waste Management and Disposal and 013510 Sustainable Design Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

2. MRc4: Recycled Content Material

No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the Project Requirements for Recycled Content Materials. All materials counted towards the computations of the proportion of the Recycled Content Materials shall comply with the standard minimum percentages of post-consumer waste materials and for the minimum percentages of pre-consumer waste materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

3. MRc5: REGIONALLY MANUFACTURED HARVESTED MATERIALS

No less than the specified minimum proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the Project Site in accordance with the Project Requirements for Regionally Manufactured and/or Harvested Materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

4. IEQc4.1: Low Emitting Materials: Sealants and Adhesives

All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the Project Requirements for Low Emitting Materials – Sealants and Adhesives. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Show door hardware, cabinet type, trim style, and panel style. Include roughing-in dimensions and details showing recessed-, semirecessed-, or surface-mounting method and relationships of box and trim to surrounding construction.

B. Shop Drawings: For fire-protection cabinets. Include plans, elevations, sections, details, and attachments to other work.

C. Samples: For each type of exposed finish required.

D. Samples for Initial Selection: For each type of exposed finish required.

E. Product Schedule: For fire-protection cabinets. Indicate whether recessed, semirecessed, or surface mounted. Coordinate final fire-protection cabinet schedule with fire-extinguisher schedule to ensure proper fit and function.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For fire-protection cabinets to include in maintenance manuals.

1.6 COORDINATION

A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

B. Coordinate sizes and locations of fire-protection cabinets with wall depths.

1.7 SEQUENCING

A. Apply vinyl lettering on field-painted fire-protection cabinets after painting is complete.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements in ASTM E 814 for fire-resistance rating of walls where they are installed.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 FIRE-PROTECTION CABINET

A. Cabinet Type: Suitable for fire extinguisher.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Fire End & Croker Corporation.
b. J. L. Industries, Inc., a division of Activar Construction Products Group
c. Kidde Residential and Commercial Division, Subsidiary of Kidde plc.
d. Larsen's Manufacturing Company.
e. Modern Metal Products, Division of Technico Inc
f. Moon-American.

B. Cabinet Construction: Rated and nonrated.

1. Fire-Rated Cabinets: Construct fire-rated cabinets with double walls fabricated from 0.0428-inch- thick, cold-rolled steel sheet lined with minimum 5/8-inch-thick, fire-barrier material. Provide factory-drilled mounting holes.

C. Cabinet Material: Steel sheet.

1. Shelf: Same metal and finish as cabinet.

D. Recessed Cabinet: Cabinet box recessed in walls of sufficient depth to suit style of trim indicated.

1. Exposed Flat Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).

E. Semirecessed Cabinet: Cabinet box partially recessed in walls of sufficient depth to suit style of trim indicated; with one-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend). Provide where walls are of insufficient depth for recessed cabinets but are of sufficient depth to accommodate semirecessed cabinet installation.

1. Rolled-Edge Trim: 2-1/2-inch backbend depth.

F. Cabinet Trim Material: Same material and finish as door.

G. Door Material: Steel sheet.

H. Door Style: Flat, no glazing and lockable.

I. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

1. Provide continuous hinge, of same material and finish as trim, permitting door to open 180 degrees.

J. Accessories:

1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
2. Door Lock: Cylinder lock, keyed alike to other cabinets.
3. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated

a. Identify fire extinguisher in fire protection cabinet with the words "FIRE EXTINGUISHER."

1) Location: Applied to cabinet door.
2) Application Process: Silk-screened.
3) Lettering Color: Red.
4) Orientation: Vertical.

K. Finishes:

1. Manufacturer's standard baked-enamel paint for the following:
2. Aluminum: Baked enamel or powder coat.
3. Steel: Baked enamel or powder coat.

2.3 FABRICATION

A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.

1. Weld joints and grind smooth.
2. Provide factory-drilled mounting holes.
3. Prepare doors and frames to receive locks.
4. Install door locks at factory.

B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles.

1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch (13 mm) thick.
2. Fabricate door frames of one-piece construction with edges flanged.

3. Miter and weld perimeter door frames.

C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.4 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's AMP 500, "Metal Finishes Manual for Architectural and Metal Products," for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces of fire-protection cabinets from damage by applying a strippable, temporary protective covering before shipping.

C. Finish fire-protection cabinets after assembly.

D. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls and partitions for suitable framing depth and blocking where recessed and semirecessed cabinets will be installed.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare recesses for recessed and semirecessed fire-protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

A. General: Install fire-protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights indicated below: or, if not indicated, at heights acceptable to authorities having jurisdiction.

1. Fire-Protection Cabinets: 48-inches above finished floor to top of cabinet.

B. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.

1. Unless otherwise indicated, provide recessed fire-protection cabinets. If wall thickness is inadequate for recessed cabinets, provide semirecessed fire-protection cabinets.
2. Provide inside latch and lock for break-glass panels.
3. Fasten mounting brackets to inside surface of fire-protection cabinets, square and plumb.

C. Identification: Apply vinyl lettering at locations indicated.

3.4 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as fire-protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.

B. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

C. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

D. Touch up marred finishes, or replace fire-protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire-protection cabinet and mounting bracket manufacturers.

E. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 10 44 13

SECTION 10 44 16 - FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes portable, hand-carried fire extinguishers.

B. Related Requirements:

1. Section 104413 "Fire Protection Cabinets."

1.3 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable LEED Credits

1. MRc2
2. MRc4
3. MRc5
4. IEQc4.1

B. LEED Requirements

1. MRc2: CONSTRUCTION WASTE MANAGEMENT

   No less than the specified portion of all construction waste from the Project shall be diverted from disposal in a landfill and/or incineration in with the Project Requirements for Construction Waste Management and Disposal. Refer to Specification Sections 017419 Construction Waste Management and Disposal and 013510 Sustainable Design Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

2. MRc4: Recycled Content Material

   No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the Project Requirements for Recycled Content Materials. All materials counted towards the computations of the proportion of the Recycled Content Materials shall comply with the standard minimum percentages of post-consumer waste materials and for the minimum percentages of pre-consumer waste materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

3. MRc5: REGIONALLY MANUFACTURED HARVESTED MATERIALS

No less than the specified minimum proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the Project Site in accordance with the Project Requirements for Regionally Manufactured and/or Harvested Materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

4. IEQc4.1: Low Emitting Materials: Sealants and Adhesives

   All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the Project Requirements for Low Emitting Materials – Sealants and Adhesives. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher and mounting brackets.

1.5 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

1.7 COORDINATION

A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.

   1. Failures include, but are not limited to, the following:

      a. Failure of hydrostatic test according to NFPA 10.
      b. Faulty operation of valves or release levers.

   2. Warranty Period: **2** Insert number years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

1. Provide fire extinguishers approved, listed, and labeled by FM Global.

2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

A. Fire Extinguishers: Type, size, and capacity for each fire protection cabinet and mounting bracket where indicated.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Amerex Corporation.
   b. Ansul Incorporated; Tyco International Ltd.
   c. Badger Fire Protection; a Kidde company.
   d. J. L. Industries, Inc.; a division of Activar Construction Products Group.
   e. Kidde Residential and Commercial Division; Subsidiary of Kidde plc.
   f. Larsen's Manufacturing Company.
   g. Pem All Fire Extinguisher Corp.; a division of PEM Systems, Inc.
   h. Pyro-Chem; Tyco Safety Products.
2. Valves: Manufacturer's standard.
3. Handles and Levers: Manufacturer's standard.
4. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B.

B. Multipurpose Dry-Chemical Type in Steel Container: UL-rated 4-A:60-B:C, 10-lb nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

2.3 MOUNTING BRACKETS

A. Mounting Brackets: Manufacturer's standard galvanized steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or red baked-enamel finish.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Amerex Corporation.
   b. Ansul Incorporated; Tyco International Ltd.
   c. Badger Fire Protection; a Kidde company.
   d. Buckeye Fire Equipment Company.
   e. J. L. Industries, Inc.; a division of Activar Construction Products Group.
   f. Larsen's Manufacturing Company.

B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.

1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.

a. Orientation: Vertical.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fire extinguishers for proper charging and tagging.

1. Remove and replace damaged, defective, or undercharged fire extinguishers.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.

1. Mounting Brackets: 48 above finished floor to top of fire extinguisher.

B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

END OF SECTION 10 44 16

SECTION 10 51 13 - METAL LOCKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Heavy-duty metal lockers.
    a. Single and Multi-tier lockers,
2. Locker benches.

B. Related Sections:

1. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.
2. Division 03 Section “Cast-In-Place Concrete” for concrete bases for metal lockers.

1.3 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable LEED Credits

1. MRc2
2. MRc4
3. MRc5
4. IEQc4.1

B. LEED Requirements

1. MRc2: CONSTRUCTION WASTE MANAGEMENT

    No less than the specified portion of all construction waste from the Project shall be diverted from disposal in a landfill and/or incineration in with the Project Requirements for Construction Waste Management and Disposal. Refer to Specification Sections 017419 Construction Waste Management and Disposal and 013510 Sustainable Design Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

2. MRc4: Recycled Content Material

    No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the Project Requirements for Recycled Content Materials. All materials counted towards the computations of the proportion of the Recycled Content Materials

shall comply with the standard minimum percentages of post-consumer waste materials and for the minimum percentages of pre-consumer waste materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

3. MRc5: REGIONALLY MANUFACTURED HARVESTED MATERIALS

   No less than the specified minimum proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the Project Site in accordance with the Project Requirements for Regionally Manufactured and/or Harvested Materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

4. IEQc4.1: Low Emitting Materials: Sealants and Adhesives

   All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the Project Requirements for Low Emitting Materials – Sealants and Adhesives. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of metal locker.

   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal locker and bench.

B. Shop Drawings: For metal lockers.

   1. Include plans, elevations, sections, details, and attachments to other work.
   2. Show locker trim and accessories.
   3. Include locker identification system and numbering sequence.

C. Samples: For each color specified, in manufacturer's standard size.

D. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available.

E. Product Schedule: For lockers.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms to include in maintenance manuals.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver metal lockers until spaces to receive them are clean, dry, and ready for their installation.

1.8 FIELD CONDITIONS

A. Field Measurements: Verify actual dimensions of recessed openings by field measurements before fabrication.

1.9 COORDINATION

A. Coordinate sizes and locations of concrete bases for metal lockers.

B. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of work specified in other Sections to ensure that metal lockers can be supported and installed as indicated.

1.10 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of metal lockers that fail in materials or workmanship, excluding finish, within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures.
b. Faulty operation of latches and other door hardware.

2. Damage from deliberate destruction and vandalism is excluded.
3. Warranty Period for Metal Lockers: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain metal lockers, locker benches, and accessories from single source from single locker manufacturer.

1. Obtain locks from single lock manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Accessibility Requirements: For lockers indicated to be accessible, comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC A117.1.

2.3 HEAVY-DUTY METAL LOCKERS

A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1. DeBourgh Mfg. Co.; Sentry Corridor/Personnel Lockers.
2. List Industries Inc.; Marquis Protector.
3. Lyon Workspace Products, LLC; All-Welded Lockers.
4. Penco Products, Inc.; All-Welded Lockers.
5. American Locker Security System.

B. Locker Arrangement: As indicated on Drawings .

C. Material: Cold-rolled steel sheet.

D. Body: Assembled by welding body components together. Fabricate from unperforated steel sheet with thicknesses as follows:

1. Tops, Bottoms, and Sides: 0.060-inch nominal thickness.
2. Backs: 0.048-inch nominal thickness.
3. Shelves: 0.060-inch nominal thickness, with double bend at front and single bend at sides and back.

E. Frames: Channel formed; fabricated from 0.060-inch nominal-thickness steel sheet; lapped and factory welded at corners; with top and bottom main frames factory welded into vertical main frames. Form continuous, integral door strike full height on vertical main frames.

1. Cross Frames between Tiers: Channel formed and fabricated from same material as main frames; welded to vertical main frames.

F. Doors: One piece; fabricated from 0.075-inch nominal-thickness steel sheet; formed into channel shape with double bend at vertical edges and with right-angle single bend at horizontal edges.

1. Reinforcement: Manufacturer's standard reinforcing angles, channels, or stiffeners for doors more than 15 inches wide; welded to inner face of doors.
2. Door Style:

a. As indicated on drawings

G. Hinges: Welded to door and attached to door frame with no fewer than two factory-installed rivets per hinge that are completely concealed and tamper resistant when door is closed; fabricated to swing 180 degrees.

1. Continuous Hinges: Manufacturer's standard, steel, full height.

H. Recessed Door Handle and Latch: Stainless-steel cup with integral door pull, recessed so locking device does not protrude beyond face of door; pry and vandal resistant.

1. Multipoint Latching: Finger-lift latch control designed for use with or padlocks; positive automatic latching and prelocking.

    a. Latch Hooks: Equip doors 48 inches and higher with three latch hooks and doors less than 48 inches high with two latch hooks; fabricated from 0.120-inch nominal-thickness steel sheet; welded to full-height door strikes; with resilient silencer on each latch hook.
    b. Latching Mechanism: Manufacturer's standard, rattle-free latching mechanism and moving components isolated to prevent metal-to-metal contact, and incorporating a prelocking device that allows locker door to be locked while door is open and then closed without unlocking or damaging lock or latching mechanism.

I. Equipment: Equip each metal locker with identification plate and the following unless otherwise indicated:

1. Single-Tier Units: Shelf, coat rod, and three single-prong wall hooks.
2. Double Tier Units: One double prong ceiling hook and three single prong wall hooks.
3. Triple-Tier Units: One double-prong wall hook.

J. Accessories:

1. Continuous Sloping Tops: Fabricated from 0.048-inch nominal-thickness steel sheet, with a pitch of approximately 20 degrees.

    a. Closures: Vertical-end type.

2. Filler Panels: Fabricated from 0.048-inch nominal-thickness steel sheet.
3. Boxed End Panels: Fabricated from 0.048-inch nominal-thickness steel sheet.

K. Finish: Baked enamel or powder coat.

1. Color(s): As selected by Architect from manufacturer's full range.

2.4 KEYLESS LOCKS

A. Digital Keypad Locks: Battery-powered electronic keypad with reprogrammable manager and owner codes that override access. Three consecutive incorrect code entries shall disable lock for three minutes.

1. Locations: Keypad lock shall be installed on four and five-tiered metal lockers in main lobby.
2. Designed for permanently assigned access via entry of user's four-digit code
3. Designed for shared or temporary access by multiple users, with user-defined code to lock and unlock. Provide LED indicator to show when lock is in use.

2.5 LOCKER BENCHES

A. Provide bench units with overall assembly height of 17-1/2 inches (445 mm).

B. Bench Tops: Manufacturer's standard one-piece units, with rounded corners and edges.

1. Size: Minimum 9-1/2 inches wide by 1-1/4 inches thick (241 mm wide by 32 mm thick).
2. Laminated clear hardwood with one coat of clear sealer on all surfaces and one coat of clear lacquer on top and sides.

C. Fixed Pedestals: Manufacturer's standard supports, with predrilled fastener holes for attaching bench top and anchoring to floor, complete with fasteners and anchors, and as follows:

1. Tubular Steel: 1-1/2-inch- (38-mm-) diameter steel tubing threaded on both ends, with standard pipe flange at top and bell-shaped cast-iron base; with baked-enamel or powder-coat finish; anchored with exposed fasteners.

a. Color: Match metal lockers.

2.6 FABRICATION

A. Fabricate metal lockers square, rigid, without warp, and with metal faces flat and free of dents or distortion. Make exposed metal edges safe to touch and free of sharp edges and burrs.

1. Form body panels, doors, shelves, and accessories from one-piece steel sheet unless otherwise indicated.
2. Provide fasteners, filler plates, supports, clips, and closures as required for complete installation.

B. Fabricate each metal locker with an individual door and frame; individual top, bottom, and back; and common intermediate uprights separating compartments. Factory weld frame members of each metal locker together to form a rigid, one-piece assembly.

C. Welded Construction: Factory preassemble metal lockers by welding all joints, seams, and connections; with no bolts, nuts, screws, or rivets used in assembly of main locker groups. Factory weld main locker groups into one-piece structures. Grind exposed welds flush.

D. Accessible Lockers: Fabricate as follows:

1. Locate bottom shelf no lower than 15 inches (381 mm) above the floor.
2. Where hooks, coat rods, or additional shelves are provided, locate no higher than 48 inches (1219 mm) above the floor.

E. Continuous Base: Formed into channel or zee profile for stiffness, and fabricated in lengths as long as practical to enclose base and base ends of metal lockers; finished to match lockers.

F. Continuous Sloping Tops: Fabricated in lengths as long as practical, without visible fasteners at splice locations; finished to match lockers.

1. Sloping-top corner fillers, mitered.

G. Individual Sloping Tops: Fabricated in width to fit one locker frame in lieu of flat locker tops; with integral back; finished to match lockers. Provide wedge-shaped divider panels between lockers.

H. Recess Trim: Fabricated with minimum 2-1/2-inch (64-mm) face width and in lengths as long as practical; finished to match lockers.

I. Filler Panels: Fabricated in an unequal leg angle shape; finished to match lockers. Provide slip-joint filler angle formed to receive filler panel.

J. Boxed End Panels: Fabricated with 1-inch- (25-mm-) wide edge dimension, and designed for concealing fasteners and holes at exposed ends of nonrecessed metal lockers; finished to match lockers.

1. Provide one-piece panels for double-row (back-to-back) locker ends.

K. Finished End Panels: Designed for concealing unused penetrations and fasteners, except for perimeter fasteners, at exposed ends of nonrecessed metal lockers; finished to match lockers.

1. Provide one-piece panels for double-row (back-to-back) locker ends.

L. Center Dividers: Full-depth, vertical partitions between bottom and shelf; finished to match lockers.

2.7 ACCESSORIES

A. Fasteners: Zinc- or nickel-plated steel, slotless-type, exposed bolt heads; with self-locking nuts or lock washers for nuts on moving parts.

B. Anchors: Material, type, and size required for secure anchorage to each substrate.

1. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls, and elsewhere as indicated, for corrosion resistance.
2. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

2.8 STEEL SHEET FINISHES

A. Factory finish steel surfaces and accessories except stainless-steel and chrome-plated surfaces.

B. Baked-Enamel Finish: Immediately after cleaning, pretreating, and phosphatizing, apply manufacturer's standard thermosetting baked-enamel finish. Comply with paint manufacturer's written instructions for application, baking, and minimum dry film thickness.

C. Powder-Coat Finish: Immediately after cleaning and pretreating, electrostatically apply manufacturer's standard, baked-polymer, thermosetting powder finish. Comply with resin manufacturer's written instructions for application, baking, and minimum dry film thickness.

2.9 STAINLESS-STEEL FINISHES

A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.

1. Run grain of directional finishes with long dimension of each piece.
2. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls, floors, and support bases, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install lockers level, plumb, and true; shim as required, using concealed shims.

1. Anchor locker runs at ends and at intervals recommended by manufacturer, but not more than 36 inches (910 mm) o.c. Using concealed fasteners, install anchors through backup reinforcing plates, channels, or blocking as required to prevent metal distortion.
2. Anchor back-to-back metal lockers to floor.

B. Welded Lockers: Connect groups together with standard fasteners, with no exposed fasteners on face frames.

C. Equipment:

1. Attach hooks with at least two fasteners.
2. Attach door locks on doors using security-type fasteners.
3. Identification Plates: Identify metal lockers with identification indicated on Drawings.

a. Attach plates to each locker door, near top, centered, with at least two aluminum rivets.
b. Attach plates to upper shelf of each open-front metal locker, centered, with a least two aluminum rivets.

D. Trim: Fit exposed connections of trim, fillers, and closures accurately together to form tight, hairline joints, with concealed fasteners and splice plates.

1. Attach recess trim to recessed metal lockers with concealed clips.
2. Attach filler panels with concealed fasteners. Locate filler panels where indicated on Drawings.
3. Attach sloping-top units to metal lockers, with closures at exposed ends.
4. Attach boxed end panels using concealed fasteners to conceal exposed ends of nonrecessed metal lockers.
5. Attach finished end panels using fasteners only at perimeter to conceal exposed ends of nonrecessed metal lockers.

E. Fixed Locker Benches: Provide no fewer than two pedestals for each bench, uniformly spaced not more than 72 inches (1830 mm) apart. Securely fasten tops of pedestals to undersides of bench tops, and anchor bases to floor.

F. Freestanding Locker Benches: Place benches in locations indicated on Drawings.

3.3 ADJUSTING

A. Clean, lubricate, and adjust hardware. Adjust doors and latches to operate easily without binding. Verify that integral locking devices operate properly.

3.4 PROTECTION

A. Protect metal lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit use during construction.

B. Touch up marred finishes, or replace metal lockers that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

END OF SECTION 10 51 13

SECTION 10 75 16 - GROUND-SET FLAGPOLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes ground-set flagpoles.

B. Owner-Furnished Material: Flags.

1.3 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable LEED Credits

1. MRc2
2. MRc4
3. MRc5
4. IEQc4.1

B. LEED Requirements

1. MRc2: CONSTRUCTION WASTE MANAGEMENT

   No less than the specified portion of all construction waste from the Project shall be diverted from disposal in a landfill and/or incineration in with the Project Requirements for Construction Waste Management and Disposal. Refer to Specification Sections 017419 Construction Waste Management and Disposal and 013510 Sustainable Design Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

2. MRc4: Recycled Content Material

   No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the Project Requirements for Recycled Content Materials. All materials counted towards the computations of the proportion of the Recycled Content Materials shall comply with the standard minimum percentages of post-consumer waste materials and for the minimum percentages of pre-consumer waste materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

3. MRc5: REGIONALLY MANUFACTURED HARVESTED MATERIALS

No less than the specified minimum proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the Project Site in accordance with the Project Requirements for Regionally Manufactured and/or Harvested Materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

4. IEQc4.1: Low Emitting Materials: Sealants and Adhesives

   All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the Project Requirements for Low Emitting Materials – Sealants and Adhesives. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

   1. Include construction details, material descriptions, dimensions of individual components and profiles, operating characteristics, fittings, accessories, and finishes for flagpoles.

B. Shop Drawings: For flagpoles.

   1. Include plans, elevations, and attachment details. Show general arrangement, jointing, fittings, accessories, grounding, anchoring, and support.
   2. Include section, and details of foundation system.

C. Samples for Verification: For each type of exposed finish, in manufacturer's standard sizes.

D. Delegated-Design Submittal: For flagpoles.

1.5 PERFORMANCE REQUIREMENTS

A. Structural Performance: Flagpole assemblies, including anchorages and supports, shall withstand the effects of gravity loads, and the following loads and stresses within limits and under conditions indicated according to the following design criteria:

   1. Seismic Loads: according to SEI/ASCE 7 Insert requirement.
   2. Wind Loads: 80-90 mph according to NAAMM FP 1001, "Guide Specifications for Design of Metal Flagpoles." SEI/ASCE 7 .
   3. Base flagpole design on nylon or cotton flags of maximum standard size suitable for use with flagpole or flag size indicated, whichever is more stringent.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For flagpoles to include in operation and maintenance manuals.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Spiral wrap flagpoles with heavy paper and enclose in a hard fiber tube or other protective container.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

2.2 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. American Flagpole; a Kearney-National Inc. company.
2. Atlantic Fiberglass Products, Inc.
3. Baartol Company.
4. Concord Industries, Inc.
5. Eder Flag Manufacturing Company, Inc.
6. Ewing Flagpoles.
7. Lingo Inc.; Acme Flagpole Company Division.
8. Millerbernd Manufacturing Company.
9. Morgan-Francis; Division of Original Tractor Cab Co., Inc.
10. PLP Composite Technologies, Inc.
11. Pole-Tech Company Inc.
12. U.S. Flag & Flagpole Supply, LP.

2.3 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design flagpole assemblies.

B. Structural Performance: Flagpole assemblies, including anchorages and supports, shall withstand the effects of gravity loads, and the following loads and stresses within limits and under conditions indicated according to the following design criteria:

1. Seismic Loads: according to SEI/ASCE 7 .
2. Wind Loads: 80-90 mph according to NAAMM FP 1001, "Guide Specifications for Design of Metal Flagpoles." SEI/ASCE 7 .
3. Base flagpole design on nylon or cotton flags of maximum standard size suitable for use with flagpole or flag size indicated, whichever is more stringent.

2.4 STAINLESS-STEEL FLAGPOLES

A. Stainless-Steel Flagpoles: Tapered flagpoles fabricated from pipe, tube, or plate complying with ASTM A 312/A 312M, ASTM A 269, or ASTM A 666, Type 304.

B. Exposed Height: 25 feet .

C. Construct flagpoles in one piece if possible. If more than one piece is necessary, comply with the following:

1. Fabricate shop and field joints without using fasteners, screw collars, or lead calking.
2. Provide flush hairline joints using self-aligning, snug-fitting, internal sleeves.

D. Metal Foundation Tube: Manufacturer's standard corrugated-steel foundation tube, 0.060-inch (1.52-mm) wall thickness with 3/16-inch (4.8-mm) steel bottom plate and support plate; 3/4-inch- (19-mm-) diameter, steel ground spike; and steel centering wedges welded together. Galvanize foundation tube after assembly. Furnish loose hardwood wedges at top of foundation tube for plumbing pole.

1. Flashing Collar: Same material and finish as flagpole.

2.5 FITTINGS

A. Finial Ball: Flush-seam ball, sized as indicated or, if not indicated, to match flagpole-butt diameter.

1. 0.063-inch (1.6-mm) spun aluminum with gold anodic finish.
2. 20-oz. (0.70-mm) copper with 23-karat, gold-leaf finish.
3. Spun stainless steel, finished to match flagpole.
4. Spun copper alloy, finished to match flagpole.

B. Internal Halyard, Winch System: Manually operated winch with control stop device and removable handle, stainless-steel cable halyard, and concealed revolving truck assembly with plastic-coated counterweight and sling. Furnish flush access door secured with cylinder lock. Finish truck assembly to match flagpole.

1. Halyard Flag Snaps: Stainless-steel swivel snap hooks with neoprene or vinyl covers. Furnish two per halyard.
2. Plastic Halyard Flag Clips: Made from injection-molded, UV-stabilized, acetal resin (Delrin). Clips attach to flag and have two eyes for inserting both runs of halyards. Furnish two per halyard.

2.6 MISCELLANEOUS MATERIALS

A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M.

B. Drainage Material: Crushed stone, or crushed or uncrushed gravel; coarse aggregate.

C. Sand: ASTM C 33/C 33M, fine aggregate.

D. Elastomeric Joint Sealant: Multicomponent nonsag urethane joint sealant complying with requirements in Section 079200 "Joint Sealants."

E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

2.7 STAINLESS-STEEL FINISHES

A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.

1. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
2. Directional Satin Finish: No. 4.

PART 3 - EXECUTION

3.1 PREPARATION

A. Prepare uncoated metal flagpoles that are set in foundation tubes by painting below-grade portions with a heavy coat of bituminous paint.

B. Foundation Excavation: Excavate to neat clean lines in undisturbed soil. Remove loose soil and foreign matter from excavation and moisten earth before placing concrete. Place and compact drainage material at excavation bottom.

C. Provide forms where required due to unstable soil conditions and for perimeter of flagpole base at grade. Secure and brace forms to prevent displacement during concreting.

D. Foundation Tube: Place foundation tube, center, and brace to prevent displacement during concreting. Place concrete. Plumb and level foundation tube and allow concrete to cure.

E. Sleeves: Locate and secure sleeves in forms by bracing to reinforcement and forms.

F. Anchor Bolts: Locate and secure anchor bolts in forms with templates and by tying to reinforcement.

G. Place concrete, as specified in Section 033000 "Cast-in-Place Concrete." Compact concrete in place by using vibrators. Moist-cure exposed concrete for no fewer than seven days or use nonstaining curing compound.

H. Trowel exposed concrete surfaces to a smooth, dense finish, free of trowel marks, and uniform in texture and appearance. Provide positive slope for water runoff to perimeter of concrete base.

3.2 FLAGPOLE INSTALLATION

A. General: Install flagpoles where indicated and according to Shop Drawings and manufacturer's written instructions.

B. Foundation Tube: Place flagpole in tube, seated on bottom plate between steel centering wedges, and install hardwood wedges to secure flagpole in place. Place and compact sand in foundation tube and remove hardwood wedges. Seal top of foundation

tube with a 2-inch (50-mm) layer of elastomeric joint sealant and cover with flashing collar.

C. Baseplate: Cast anchor bolts in concrete foundation. Install baseplate on washers placed over leveling nuts on anchor bolts and adjust until flagpole is plumb. After flagpole is plumb, tighten retaining nuts and fill space under baseplate solidly with nonshrink, nonmetallic grout. Finish exposed grout surfaces smooth and slope 45 degrees away from edges of baseplate.

END OF SECTION 10 75 16

SECTION 11 19 00 - GENERAL PROVISIONS FOR DETENTION WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the responsibilities for a single-source Detention Equipment Contractor for Detention Work.

B. Detention Work required by, but not specified in, this Section work includes the following:
   1. Division 11 Section “Detention Hollow Metal Doors and Frames”
   2. Division 11 Section ”Detention Stainless Steel Windows”
   3. Division 11 Section ”Detention Enclosures”
   4. Division 11 Section ”Detention Hardware”
   5. Division 11 Section ”Detention Furnishings and Equipment”

1.3 DESCRIPTION OF WORK

A. General Contractor:
   1. The General Contractor shall employ a single pre-approved Detention Equipment Contractor having met all the requirements listed in this Section. The General Contractor shall list his Detention Equipment Contractor on the bid form. Contracting by the General Contractor for separate portions of work under Sections 111900 through 111999 is prohibited.

B. Detention Equipment Contractor (DEC):
   1. The Detention Equipment Contractor shall be responsible for submitting an aggregate bid to the General Contractor for all Division 11 Detention and Security work described herein and elsewhere in the Contract Documents.
   2. The Detention Equipment Contractor shall be responsible for the interfacing and integration of products and systems with the General Contractor and the Security Electronics Contractor (SEC) to ensure that the entire work of this project will be carried out in an orderly, complete and coordinated fashion.
   3. The Detention Equipment Contractor shall provide a full time Superintendent to supervise the work in this section. The Superintendent shall be at the site when the Detention Equipment Contractor's work is being performed at the site.

1.4 QUALITY ASSURANCE

A. The Detention Equipment Contractor (DEC) shall furnish detention equipment as described in these sections, and shall coordinate this equipment with his manufacturers, fabricators, installers, and with work by others. Questions on the detention equipment must be directed to the Detention Equipment Contractor before being directed to the General Contractor, Architect/Engineer or Owner.

B. Acceptable Pre-qualified Detention Equipment Contractors:
   1. CCC Group Inc.; San Antonio, TX 78220; 210/661-4251
   2. ISI Detention Contracting Group, Inc.; San Antonio, TX 78247; 210/495-5245
   3. Pauly Jail Building Co., Inc.; Noblesville, IN 46062; 317/580-0833
   4. Maximum Security Corp.; Waterford, NY 12188; 518/233-1800

C. Materials required for installation by the Detention Equipment Contractor may be provided by any of the detention equipment manufacturers included in the Project Manual. The Detention Equipment Contractor shall receive the materials and assume complete responsibility for the detailing, coordination, erecting, installation and performance and warranty of such work.

D. The Detention Equipment Contractor shall be required to provide a labor and materials payment bond in the amount of 100% of the contract sum.

1.5 COORDINATION

A. Coordinate detention work to ensure efficient and orderly installation of each part of detention work. Coordinate detention work that depends on each other for proper installation, connection, and operation.
   1. Develop special procedures required for coordination of detention work.
   2. Coordinate installation of different detention components to ensure maximum accessibility for required maintenance, service, and repair.
   3. Coordinate provisions to accommodate detention work scheduled for later installation.

B. Coordinate selection of detention products for compatibility.

C. Assemble and coordinate Shop Drawings for detention work provided by separate entities responsible for detention work. Submit detention work submittals simultaneously as a group along with applicable Coordination Drawings.

D. Coordinate installation of anchorages and embedments for detention work. Obtain and distribute, to parties involved, setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
   1. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing detention work to comply with indicated requirements.

E. Coordinate protection of detention work.

F. Coordinate preparation of Project Record Documents for detention work and integrate information from entities responsible for detention work to form one combined record.

G. Coordinate preparation of operation and maintenance manuals for detention work and integrate information from entities responsible for detention work to form one combined record.

H. Equipment listed in Division 11 are not normally counted by LEED for material credits. Division 11 base building materials shall be accounted toward LEED credits MRc2, MRc4, MRc5, and any sealant or adhesive materials as applied for IEQc4.1.

1.6 SHAKEDOWN PERIOD

A. The Detention Equipment Contractor shall coordinate with the General Contractor to establish a shakedown period for the detention work. The shakedown period shall be a minimum of thirty days and shall be completed after Substantial Completion.

B. Prior to initiation of the shakedown period, all work related to and supporting the detention material shall be completed.

C. The Detention Equipment Contractor shall maintain a log of all anomalies, malfunctions, and repairs encountered during the shakedown period. The log shall be submitted to the Architect for assessment at the conclusion of the shakedown period.

D. Training of the Owner's staff shall occur after substantial completion.

1.7 WARRANTY

A. The Detention Equipment Contractor shall warrant materials furnished under this Section to be free from defects in material and workmanship. The Detention Equipment Contractor shall provide all labor and materials to repair or replace defective detention equipment work or components.

B. The Detention Equipment Contractor shall maintain the quantities of spare parts provided to the Owner in the original inventory during the warranty period. Components used for repair shall be replaced immediately and Owner shall not be charged for shipping or other costs unless failure is due to abuse or negligence.

C. The Owner and/or Owner's Representative shall notify the Detention Equipment Contractor on a twenty-four (24) hour phone number (supplied by the Detention Equipment Contractor), outlining defects in the detention equipment. The Detention Equipment Contractor shall respond to this call within two hours with a return call by a service technician.

D. The warranty shall exclude vandalism, misuse, acts of nature or abuse.

E. The warranty shall provide for a maximum response time (service technician on the site) of twenty-four (24) hours on the first occurrence and twelve (12) hours on the second occurrence. The Detention Equipment Contractor shall also guarantee shipment of any part request within twenty-four (24) hours during the warranty period.

F. Record maintenance and service calls by signing the Owner's project logbook maintained on the premises.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of

detention work.

1. Examine roughing-in for embedded and built-in anchors to verify actual locations of detention work connections before detention work installation.
2. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of detention work.

B. Inspect built-in and cast-in anchor installations before installing detention work to verify that anchor installations comply with requirements. Prepare inspection reports.
   1. Where inspections indicate that anchors do not comply with specified requirements, reinspect after repairs or replacements are made.
   2. Perform additional inspections to determine compliance of replaced or additional work. Prepare inspection reports.

C. Verify locations of detention work with those indicated on Coordination Drawings.

3.2 FIELD QUALITY CONTROL

A. Observe field welding of detention work and anchorages.

B. Verify that detention work is installed and connected according to the Contract Documents.

C. Verify that electrical wiring installation complies with manufacturer's submittal and written installation requirements in Division 26 Sections.

D. Observe startup service of detention work.

E. Observe installation and startup checks of detention work according to manufacturer's written instructions.

F. Inspect installed detention work to verify compliance with requirements. Prepare inspection reports and indicate compliance with and deviations from the Contract Documents.
   1. Perform additional inspections to determine compliance of replaced or additional work. Prepare inspection reports.
   2. Prepare field quality-control certification that states installed detention work and its installation complies with requirements in the Contract Documents.

G. Testing: After installing detention work and after electrical circuitry has been energized, test detention work for compliance with requirements.
   1. When testing reveals detention work not in compliance with requirements, perform additional random testing to determine extent of noncompliance.
   2. Where test results indicate that detention work does not comply with specified requirements, retest after repairs or replacements are made.
   3. Perform additional testing and inspecting, at Contractor's expense, to determine compliance of replaced or additional work.

END OF SECTION 111900

SECTION 11 19 13 - DETENTION HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following designated as “DHM” on door and window schedules:
   1. Detention swinging hollow metal doors.
   2. Detention sliding hollow metal doors.
   3. Detention hollow metal frames.
   4. Detention hollow metal sidelight frames.
   5. Detention hollow metal borrowed-light frames.

B. Related Sections include the following:
   1. Division 3 Section “Plant-Precast Structural Concrete”
   2. Division 3 Section “Plant-Precast Architectural Concrete”
   3. Division 4 Section “Unit Masonry Assemblies”
   4. Division 5 Section “Metal Fabrications”
   5. Division 7 Section “Security Joint Sealants”
   6. Division 8 Section “Security Glass and Glazing”
   7. Division 9 Section “Painting”
   8. Division 11 Section “General Provisions for Detention Work”
   9. Division 11 Section “Detention Enclosures”
   10. Division 11 Section “Detention Hardware”
   11. Division 11 Section “Detention Sliding Door Locks Devices”
   12. Division 11 Section “Tamper Proof Metal Fasteners”
   13. Division 26 for Electrical
   14. Division 27 for Communications
   15. Division 28 for Electronic Safety and Security

1.3 PERFORMANCE REQUIREMENTS

A. Detention doors and frames for this Contract shall be constructed as specified and to meet the following tests. An independent testing laboratory shall perform the tests described below, with data attesting to construction of the door and frame. Test data shall have been performed within the past five (5) years and shall be submitted with the shop drawing submittal.
   1. Doors tested in accordance with Standard UL-752, “Bullet Penetration”.
   2. Doors tested in accordance with ASTM F 1450-12A, “Door Assembly Impact Test”.
   3. Doors tested in accordance with ASTM F 1450-12A, “Door Static Load Test”.
   4. Doors tested in accordance with ASTM F 1450-12A, “Door Rack Test”.
   5. Doors tested in accordance with Methods E152, Standard UL-10 (B), or Methods NFPA 252, “Door Assembly Fire Test”.
   6. Doors tested in accordance with ASTM F 1450-12A, “Door Edge Crush Test”.

7. Doors tested in accordance with NAAMM HMMA 863-98, “Removable Glazing Stop Test”.
8. Frames tested in accordance with ASTM F1592, “Standard Test Methods for Detention Hollow Metal Vision Systems”

1.4 SUBMITTALS

A. Product Data: Include construction details, material descriptions, core descriptions, label compliance, fire-resistance rating, and finishes for each type of detention door and frame specified.

B. Shop Drawings: For detention doors and frames. Include conditions at openings, details of construction, dimensions of profiles, and details of joints and connections. Show anchorage and accessories. Identify each detention door and frame using same reference numbers for openings as those on Drawings.

C. Coordination Drawings: Drawings of each opening, including detention door and frame, drawn to scale and coordinating detention door hardware. Show the following:
1. Locations, dimensions, and profiles of detention door hardware reinforcements.
2. Locations and installation details of detention door hardware.
3. Elevations of each detention door design type showing dimensions, locations of detention door hardware, and preparations for power, signal, and electrified control systems.
4. Details of each detention frame type.

D. Samples:
1. Door: 1'-0" x 1'-0" corner section with hinge mortise and reinforcement showing internal construction.
2. Frame: 1'-0" x 1'-0" corner section showing welding of head to jamb. Include hinge mortise, reinforcement and plaster guard in one rabbet, and glazing stop applied as specified in the opposite rabbet. Glazing stop shall be applied in both head and jamb section to show corner joint.
3. Samples submitted shall be of the production type and shall represent in all respects the minimum quality of work to be furnished by the manufacturer. No work represented by the samples shall be fabricated until the samples are approved, and any downgrading of quality demonstrated by the sample can be cause for rejection of the work.

E. Certification by Manufacturer: That products supplied complies with performance requirements specified.

F. Product Test Reports: Showing compliance with specified requirements.

G. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

A. Detention Equipment Contractor (DEC) Qualifications
1. General: Refer to Section 111900.

B. Provide detention hollow metal work manufactured by a single firm specializing in the production of this type of work.

C. Installation shall be under supervision of manufacturer-approved personnel.

D. When a fire resistance classification is shown or scheduled for steel doors and frames, provide fire rated doors investigated and tested as a fire door assembly, complete with type of hardware to be used. Identify each fire door with recognized testing laboratory labels, indicating applicable fire rating of steel doors.

E. Uniform Building Code:
1. Comply with UBC 1997 and UBC Standard 7-2.

F. Temperature rise rated assemblies: Provide assemblies rated for 450 degree F maximum temperature rise at 30 minutes at doors to stairwells, exit passageways, horizontal exits and other locations indicated on Drawings.

G. Door identification label to include: Fire protection rating under positive pressure, minimum latchbolt throw and maximum temperature rise.

H. Include supplemental “S” label on 20 minute doors and other openings where doorway occurs in a 1-hour rated exit access corridor.

I. Hardware: Coordinate products used during fire tests meeting UBC 7-2 including component gasket systems for “S” label.

J. When a fire resistance classification is shown or scheduled for steel doors and/or frames containing components that have not been tested as an assembly, the manufacturer shall construct the door and frame components of the assembly in accord with the requirements of the testing laboratory for the desired fire resistance rating, and certify in writing to the Owner, Enforcing Authority, Contractor and the Architect that the door and frame components have been constructed in accord with the testing laboratory requirements in lieu of label.

K. Job Site Door Check:
1. When and as directed by the Architect, the Contractor shall destroy a randomly selected detention hollow metal door by sawing it in half or otherwise taken it apart as deemed necessary, for verification that construction is in accordance with these specifications.
2. When examination discloses door construction at variance with the details specified, the door manufacturer shall replace all doors shipped to the project, as of the date of inspection, with doors constructed in conformance with project specifications.
3. Under conditions of non-conformity, the door manufacturer shall pay for the destroyed door and related labor.
4. When examination proves that the door was constructed in conformance with specifications, the Owner will pay to replace the destroyed door and related labor for replacement.
5. Upon approval of the Architect dispose the destroyed door.

1.6 JOB CONDITIONS

A. Hardware Coordination Conference: See Detention Hardware Section 11 19 53.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle hollow metal work per manufacturer's requirements.

1.8 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Special Warranty: Submit a written warranty executed by the manufacturer and installer agreeing to repair or replace materials furnished under this Section that fail in materials or workmanship within the specified warranty period. Submit the warranty to the Architect for approval.

C. Warranty Period: One (1) year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURER OF DETENTION HOLLOW METAL DOORS AND FRAMES

A. Acceptable Manufacturers:
1. Chief Industries; Grand Island, NE
2. Habersham Metal Product Co.; Cornelia, Georgia
3. Willo Products; Decatur, Alabama

2.2 DETENTION HOLLOW METAL DOORS

A. Materials:
1. Galvanealed steel sheets: Zinc-coated carbon steel sheets of commercial quality, complying with ASTM A 653/A 653M, A60 zinc coating.
2. Steel shall be free of scale, pitting, coil breaks or other surface blemishes. It shall be free of buckles, waves or any other defects caused by the use of improperly leveled sheets.
3. Interior and exterior doors: Face sheets shall be 12 gauge galvanealed steel.

B. Construction:
1. Provide detention hollow metal doors of the types and sizes indicated on the drawings and schedules. Doors shall be constructed in accordance with the specifications and shall meet the performance requirements.
2. Doors shall be neat in appearance and free from warpage or buckle. Edge bends shall be true and straight and of minimum radius for the thickness of material used.
3. Internal Core Construction: One of the following two (2) types may be used:
   a. Steel stiffened by continuous vertically formed steel hat sections which, upon assembly, shall span the full thickness, full height and full width of the interior space between door faces. These stiffeners shall be of 16 gauge minimum to meet the performance standards established in the quality control section of this specification, spaced such that the vertical interior webs shall be no more than 4" o.c. and securely fastened to both face sheets by spot welds spaced a maximum of 3" o.c. vertically. Hat sections shall be welded together, both sides, by welds spaced a

maximum of 6" vertically. Spaces between stiffeners shall be filled with 6.0 lbs./cu. ft. fiberglass or mineral rockwool batt-type material.

b. Continuous, inner-reinforcement full height and width shall be true truss design with triangular form, 28 gauge minimum, the shape of which cannot be altered without changing the length of the sides. Flat apexes shall be resistance spot welded on 2 3/4" centers horizontally and 3" centers vertically. Each flute of reinforcement to be fire and sound insulated with six (6) pound density Rock Wool.

4. The vertical edges shall be reinforced by a continuous steel channel, not less than 10 gauge thickness extending the full length of the door. The top and bottom edges shall be closed with a continuous steel channel, not less than 10 gauge thickness, spot welded to both face sheets a maximum of 4" o.c. The 10 gauge closing end channel shall be continuously welded to the vertical reinforcing channel at all four corners producing a fully welded perimeter reinforcing channel.
5. Metal doors shall have a flush top and bottom edge channel of not less than 16 gauge and shall be welded to the closing channel at the corners and 1/2" long welds 12" on center.
6. Door face sheets shall be joined at their vertical edges by a continuous weld extending the full height of the door and finished smooth such that there are no visible seams.
7. Doors shall be smooth, flush surfaces without visible joints or seams on exposed faces or stile edges, except around glazed or louvered panel inserts.
8. Edge profiles shall be provided on both vertical edges of doors as follows:
   a. Single acting doors - beveled 1/8 in. in 2 in profile.
   b. Sliding doors or equivalent - square profile.
9. Hardware reinforcements and preparation:
   a. Doors shall be mortised, reinforced, drilled and tapped at the factory for hardware, in accordance with the final approved hardware schedule and templates provided by the hardware supplier.
   b. Minimum hardware reinforcement shall be as follows:
      1) Mortise hinges: Steel plate 3/l6" thick x full height, secured by spot-welds 4" o.c.
      2) Surface hinges: Steel plate 1/4" thick
      3) Mortise Locksets and Dead Bolts: 3/l6" thick steel sheet, welded to inside of door on detention side (cell side) and 3/l6" thick steel lock mounting plate, beveled at edges, applied to the surface of the door with security screws.
      4) Reinforcement for slide device hanger attachment: per device manufacturer's recommendations.
      5) Closers: 12 gauge steel sheet, secured with not less than 6 spot welds.
      6) Push Plates and Loop Pulls: l6 gauge steel sheet, secured with not less than 2 spot-welds.
      7) Automatic Door Bottoms: Reinforce for mortise-type units with l2 gauge steel, and l6 gauge for surface-applied units.
10. Glass moldings and stops:
    a. Doors shall be provided with steel moldings to secure glazing by others in accordance with glass sizes and thicknesses shown on the drawings and approved submittal drawings.
    b. Fixed glass molding shall not be less than l2 gauge steel sheet around perimeter, and shall be spot welded to both face sheets at 3" o.c. maximum.
    c. Removable glass stops shall consist of 10 gauge galvanealed angle. Angle stops shall be mitered or notched and tight fitting at the corner joints, and securely fastened to the frame using torx-head (star with center

pin) security screws of the size, strength and spacing necessary to satisfy impact performance criteria.

d. Removable glass stops shall be on the side opposite the area of inmate confinement or where they are likely to be supervised.

11. Removable lock cover plate to be on the hinge side, unless door swings into a room and there is no other access to the room, then removable lock cover plate is to be on the stop side.
12. Coordinate electric hardware requirements to be integrally built into the door with the hardware requirements.
13. Provide dust box (welded to interior of door edge) at bolt receiver hole.
14. Provide weep hole openings in the bottom of exterior doors to permit the escape of entrapped moisture.
15. Food pass / cuff port openings:
    a. The food pass opening shall be a flush opening fabricated using interior channels, 12 gauge minimum, securely welded to the inside of both face sheets and dressed smooth. The four corner seams shall be continuously arc welded and dressed smooth. The finished opening shall be constructed such that it cannot be dismantled or otherwise affected by tampering.
    b. Provide food pass shutters as detailed on the drawings. The food pass shutter shall be constructed from a hollow metal door panel. Welds shall be ground smooth. The food pass shutter and hinge shall be factory installed by plug welds.
    c. The food pass shall be furnished with a full width Braun hinge, shutter bumpers, prepped for a detention lock mount, and escutcheon.

2.3 DETENTION HOLLOW METAL FRAMES

A. Materials:
1. Galvanealed steel sheets: Zinc-coated carbon steel sheets of commercial quality, complying with ASTM A 653/A 653M, A60 zinc coating.
2. Steel shall be free of scale, pitting, coil breaks or other surface blemishes. It shall be free of buckles, waves or any other defects caused by the use of improperly leveled sheets.
3. Interior and exterior openings: Steel shall be 12 gauge galvanealed steel.

B. Construction:
1. Provide detention hollow metal frames of the types and sizes indicated on the drawings and schedules. Frames shall be constructed in accordance with the specifications and shall meet the performance requirements.
2. Frames shall be neat in appearance, square, and free of defects, warpage and buckles. Press steel members shall be straight and of uniform profile throughout their lengths.
3. Jamb, header, and sill profiles shall be as indicated on the drawings.
4. Fabricate frames with mitered corners continuously welded through head inside corner and miter ground smooth.
5. When shipping limitations so dictate, frames for large openings shall be fabricated in sections designated for splicing in the field by others. Where splicing is necessary, angle splices shall be installed at the corners of the profile, and shall extend at least 4 in. on either side of the joint. Splicing angles shall be the same gage thickness as the frame. Field splices shall be made in accordance with approved submittal drawings.
6. Frames for multiple openings shall have mullion members which, after fabrication, are closed tubular shapes conforming to profiles shown on the drawings, and having no visible seams or joints. All joints between faces of

abutted members shall be continuously welded and finished smooth. All joints between stops of abutted members shall be welded along the soffit and shall be left neat and uniform in appearance. The General Contractor shall provide for welding and finishing all field joints between faces of abutted members.

7. Hardware reinforcements and preparation:
   a. Frames shall be mortised, reinforced, drilled and tapped at the factory for hardware, in accordance with the final approved hardware schedule and templates provided by the hardware supplier.
   b. Minimum hardware reinforcement shall be as follows:
      1) Hinges and Pivots: Steel plate 3/l6" thick x full width of jamb x full height of jamb.
      2) Provide an additional 3/l6" thick angle back up drilled and tapped to accommodate security screws, welded to reinforcing and inside trim of frame.
      3) Strike Plate Clips: Steel plate 3/l6" thick x l l/2" wide x 3" long.
      4) Closers: 12 gauge steel sheet, secured with not less than 6 spot welds.
8. Floor anchors:
   a. Floor anchors with two holes for fasteners shall be fastened inside jambs with at least four (4) spot welds per anchor.
   b. Where so scheduled, adjustable floor anchors, providing not less than 2 in. height adjustment, shall be fastened inside jambs with at least four (4) spot welds per anchor.
   c. Thickness of floor anchors shall be the same as frame.
9. Jamb anchors:
   a. Anchor spacing:
      1) The number of jamb anchors provided on each jamb shall be as follows:
         a) For borrowed lite frames provide two (2) anchors plus one (1) for each 18" or fraction thereof over 3'-0", spaced at 18" maximum between anchors.
         b) For door frames provide two (2) anchors plus one (1) for each 18" or fraction thereof over 4'-6", spaced at 18" maximum between anchors (U.L. fire ratings may require additional anchors).
   b. Masonry types:
      1) Frames for installation in masonry walls shall be provided with loose ”T” anchors made from minimum of 16 gauge or adjustable jamb anchors of the strap and stirrup type made from the same thickness steel as the frame. Straps shall be no less than 2 in. x 10 in. in size, corrugated and/or perforated.
   c. Expansion bolt type:
      1) Frames for installation in existing masonry or concrete walls shall be prepared for expansion bolt type anchors. The preparation shall consist of a countersunk hole for a 0.5 in. diameter bolt and a conduit spacer from the unexposed surface of the frame to the wall. The spacer shall be welded to the frame and spaced as described.
      2) After sufficient tightening of the bolt, the bolt head shall be welded by the installation contractor so as to provide a non-removable condition. The welded bolt head shall be ground, dressed and finished smooth.
10. Grout guards shall be provided at hardware preparations, glazing stop screws and silencer preparations on frames to be set in masonry or concrete openings. Grout guards shall be sufficient to protect preparations from grout of a 4 in. maximum slump consistency which is hand troweled in place.
    a. Glass stop screws shall be protected from grout by a steel threaded

receptacle welded to the frame.

b. Door silencers (3 Glynn Johnson GJ64 silencers per door minimum) preparations shall be protected by steel grout guards.

11. Frames shall be provided with two (2) temporary steel spreaders welded to the bottom of the jambs to serve as bracing during shipping and handling. The installation contractor shall be responsible for finishing and touch-up of marks caused by spreader removal.
12. Removable lock cover plate to be on the hinge side, unless door swings into a room and there is no other access to the room, then removable lock cover plate is to be on the stop side.
13. Provide grout openings for vertical hollow metal frames sections that are not accessible for grouting due to steel lintels or other obstructions. The General Contractor shall provide for filling grout openings and finishing.
14. Provide separate conduit systems for door control, intercom, etc., within hollow metal frames.
15. Removable glazing stops:
    a. Removable glass stops shall consist of 10 gauge galvanealed angle. Angle stops shall be mitered or notched and tight fitting at the corner joints, and securely fastened to the frame using torx-head (star with center pin) security screws of the size, strength and spacing necessary to satisfy impact performance criteria.
    b. Removable glass stops shall be on the side opposite the area of inmate confinement or where they are likely to be supervised.
    c. During shipment, non-security fasteners may be substituted to hold glass stops in place. The security fasteners shall then be included in the same shipment but packaged separately for protection until used to stop in the required glazing.
16. Provide two sets of fasteners. One set of standard drive screws for installation, and glazing. After glazing and final paint is complete, torx pin head screws shall be installed. Painting of torx pin head screws is prohibited.

2.4 CLEARANCES AND TOLERANCES

A. Edge clearances for swinging doors shall not exceed the following:
1. Between doors and frames at head and jambs: 1/8 in.
2. Between edges of pairs of doors: 1/8 in.
3. At door sills where a threshold is used: 3/8 in.
4. At door sills where no threshold is used: 3/4 in.
5. Install fire-rated doors in accordance with NFPA Standard No. 80.

B. Manufacturing tolerance shall be maintained within the following limits:
1. Frames for single door or pair of doors: Width, measured between rabbets at the head: Nominal opening width +1/16 in., -1/32 in.. Height (total length of jamb rabbet): Nominal opening height ± 3/64 in.. Cross sectional profile dimensions:

a.	Face	± 1/32 in.
b.	Stop	± 1/32 in.
c.	Rabbet	± 1/32 in.
d.	Depth	± 1/32 in.
e.	Throat	± 1/16 in.
f.	Flatness of large frames	1/8 in. in 10 ft. of length or width

2. Swinging and sliding door:

a.	Width	± 3/64 in.
b.	Height	± 3/64 in.
c.	Thickness	± 1/16 in.

d.	Hardware cutout dimensions	Template dimensions +0.015 in. - 0 in.
e.	Hardware location	± 1/32 in.
f.	Bow/ flatness	± 1/8 in.

2.5 FINISH

A. Prime Painted.
1. Clean off mill scale and foreign materials
2. Grind, fill and sand smooth.
3. Bonderize treat surfaces
4. Coat with corrosion resistant primer.

2.6 ELECTRICAL REQUIREMENTS

A. Detention hollow metal fabricator shall furnish and install junction boxes and conduit between junction boxes in door frames for electrical locks, door position switches, and intercom call stations; coordinate special hardware requirements with the Electrical Contractor and Detention Equipment Contractor.

B. See the Detention Hardware Schedule, the Detention Hollow Metal Door Schedules, and Details.

2.7 DETENTION EQUIPMENT ACCESSORIES

A. Provide accessories, anchorage inserts and security fasteners for a complete, tamperproof installation.

B. Exposed Security Fasteners:
1. Provide torx-head (star design with center pin) security fasteners for anchoring work in exposed detention areas. Comply with specification section 11 199.
2. Finish shall match that specified of the item anchored.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations before installation.

C. Notify the General Contractor in writing of conditions detrimental to the proper and timely completion of the work.

D. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Expenses carried by the Architect/Engineer, Project Manager or Owner in troubleshooting equipment problems caused by inadequate workmanship or other form of poor performance on the part of the Contractor, shall be borne by the Contractor.

B. Install Detention Hollow Metal Doors and Frames in accordance with shop drawings, manufacturer's written installation instructions, and as herein specified.

C. Place detention hollow metal frames prior to construction of enclosing walls. Set frames accurately in position, plumbed and aligned (using metal shims), and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders leaving surfaces smooth and undamaged.

D. Prior to installation, frames shall be checked for size, and swing, and with temporary spreaders removed, corrected for squareness, alignment, twist and plumb. Permissible installation tolerances shall not exceed the following:
1. Squareness $\pm$ 1/16 in.: Measured on a line, from jamb perpendicular to frame head.
2. Alignment $\pm$ 1/16 in.: Measured at jambs on a horizontal line parallel to the plane of the face.
3. Twist $\pm$ 1/16 in.: Measured at opposite face corners of jambs on parallel lines, perpendicular to the plane of the door rabbet.
4. Plumb $\pm$ 1/16 in.: Measured at jambs on a perpendicular line from the head to the floor.

E. Install fire-rated frames in accordance with NFPA Standard No. 80.

F. Grout fill solid detention hollow metal frame jambs, sill and head sections. Sill shall be packed solid with mortar before setting of frame. Provide grout openings in detention hollow metal frames where access to fill frames may be restricted due to steel lintels or other obstructions.

G. Touch-up painting of factory finished or factory primed items is the Installer's responsibility.

H. Fill voids between materials of the detention equipment and embeds or other physical construction with low-mod gel, equal to Sikadur 23, by Sika and paint equipment to match surrounding materials.

3.3 ADJUSTMENT AND CLEANING

A. Check and readjust Detention Hollow Metal Doors and Frames just prior to final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including doors or frames which are warped, bowed or otherwise damaged.

B. Clean equipment thoroughly prior to Substantial Completion.

3.4 PROTECTION

A. Protect equipment and finishes until Substantial Completion.

B. Replace damaged equipment as directed by the Architect.

END OF SECTION 11 19 13

SECTION 11 19 23 – DETENTION STAINLESS STEEL WINDOWS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes stainless steel detention windows.

B. Related Sections include the following:
1. Division 3 Section “Plant-Precast Structural Concrete”
2. Division 3 Section “Plant-Precast Architectural Concrete”
3. Division 4 Section “Unit Masonry Assemblies”
4. Division 5 Section “Metal Fabrications”
5. Division 7 Section “Security Joint Sealants”
6. Division 8 Section “Security Glass and Glazing”
7. Division 11 Section “General Provisions for Detention Work”
8. Division 11 Section “Tamper Proof Metal Fasteners”

1.3 PERFORMANCE REQUIREMENTS

A. Windows shall meet or exceed the following requirements:
1. Air Infiltration Test: ASTM E 283-99; maximum air infiltration of 0.01 cfm/ft² of frame area at a static air pressure difference across the window unit of 1.57 psf (25 mph) and 0.02 cfm/ft² at a static air pressure difference of 6.27 psf (50 mph).
2. Water Resistance Test: ASTM E 331-00; no water penetration for 15 minutes when window is subjected to a water flow rate of 5 U.S.gal/h-ft² at a static air pressure difference of 12.50 psf (70 mph).
3. Water Resistance Test: ASTM E 547-00; no water penetration while the window is subjected to a continuous water flow rate of 5 U.S.gal/h-ft² and 4 cycles of 5 minutes at a static air pressure difference of 12.50 psf (70 mph).
4. Uniform Load Structural Test: ASTM E 330-02; no permanent deformation or breakage of any component that will render the window assembly inoperable when subjected to positive and negative static air pressure difference of 100 psf (200 mph). Tested on a maximum window size of 15 1/2" x 47 3/4" glazed with 1/2" polycarbonate.
5. Thermal Requirements: NFRC 100: 2001; the thermal transmittance of the window frame (U-factor) should not be more than 0.80 btu/h-ft^2-F and the thermal transmittance of the window assembly should not be more than 0.58 btu/h-ft^2-F when calculated as per the simulation procedure outlined in NFRC 100: 2001 for a window of 16" x 48" glazed with 1" insulating glass unit with 1/2’’ airspace.
6. Security Steel Performance Requirements Selection: ASTM A 627-03; the tool-resisting steel bars for security applications shall meet ONE of the following:
   a. Grade No. 1, Composite T.R. Steel
   b. Grade No. 2, Composite T.R. Steel
   c. Grade No. 3, Homogenous T.R. Steel

d. As defined in tables X 1.1 and X 1.2 of ASTM A 627-03. Composite tool-resisting steel bar is defined as a composite assembly made of steel and tungsten carbide.

7. Deflection & Drop Weight Test: ASTM A 627-03; test 1" dia. round, tool-resisting steel security bar by performing "Deflection Test" and "Drop Weight Test".
8. Cutting Test: ASTM A 627-03; test 1" dia. round bars and 5/16" x 2 1/4" or 3/8" x 2 1/4" flat bars by performing a "Cutting Test". The minimum number of rod saws to be used to sever the bars shall be ONE of the following:
   a. Grade No. 1; 1" dia. Round composite T.R. Steel: 144 Rod Saws Combined with 3/8" x 2 1/4" composite T.R. Steel flat bar: 72 Rod Saws
   b. Grade No. 2; 1" dia. Round composite T.R. Steel: 72 Rod Saws Combined with 3/8" x 2 1/4" composite T.R. Steel flat bar: 36 Rod Saws
   c. Grade No. 3; 1" dia. Round homogenous T.R. Steel: 6 Rod Saws Combined with 5/16" x 2 1/4" homogenous T.R. Steel flat bar: 3 Rod Saws
9. Vision System Impact Test; ASTM F 1592-01; submit the window assembly to the impact test sequence for Grade No. 1, in Table 1 of ASTM F 1592-01. 600 blows of 200 ft-lbf impact energy each must be delivered at least in the following four locations: Frame corner, glazing corner, center of glazing and center of one muntin; total of 2,400 blows minimum.

1.4 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for detention windows.

B. Shop Drawings: Include plans, elevations, sections, details, attachments to other Work, and the following:
   1. Full-size section details of framing members, including detention bars reinforcement and stiffeners.
   2. Location of weep holes.
   3. Glazing details.

C. Coordination Drawings: Drawings of each detention window opening, drawn to scale and coordinated with anchorages for detention windows. Show the following:
   1. Locations and installation details of embedded items for anchoring detention windows.
   2. Locations, dimensions, and profiles of detention bars and perimeter frames for detention windows.
   3. Elevations of each detention window type showing dimensions, locations, and preparations for anchorages.
   4. Details of each detention window type.

D. Samples for Initial Selection: For units with factory-applied color finishes.
   1. Submit 4 samples of specified finish, on 24" lengths of window members.

E. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:
   1. Main Framing Member: 12-inch- (305-mm-) long, full-size sections with factory-applied color finish.
   2. Window Corner Fabrication: 12-by-12-inch- (305-by-305-mm-) long, full-size window corner including full-size sections with factory-applied color finish, weather stripping, and glazing.

F. Certificates:

1. Manufacturer shall submit 6 certificates certifying that materials meet specification requirements.

G. Submit Warranty as specified herein.

1.5 QUALITY ASSURANCE

A. Detention Equipment Contractor (DEC) Qualifications
1. General: Refer to Section 111900.

B. Provide detention stainless steel windows manufactured by a single firm specializing in the production of this type of work.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle stainless steel detention windows per manufacturer's requirements.

1.7 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace detention windows that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
a. Structural failures including deflections exceeding 1/4 inch (6 mm).
b. Failure of welds.
c. Lateral deflection of glass lite edges in excess of 1/175.
d. Excessive air leakage.
e. Excessive water penetration.
f. Deterioration of metals, metal finishes, and other materials beyond normal weathering and detention use.

C. Warranty Period: Three years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURER OF STAINLESS STEEL DETENTION WINDOWS

A. Acceptable Manufacturers:
1. C.M. Security Group, Inc., Montreal Quebec
2. Hope’s Security Windows; Jamestown, New York
3. Willo Products; Decatur, Alabama

2.2 MATERIALS

A. Stainless Steel: Type 304 14 GA standard 2B (bright cold rolled) finish, shall be specially formed to the profiles and sizes shown on the drawings for head, sill, jambs, glass stops, muntins(optional), corner keys and trims.

B. Extruded Aluminum: Horizontal/vertical muntins shall be specially designed aluminum extrusion 6063-T5, no less than 22,000 psi ultimate tensile strength, clear anodized finish with a nominal thickness of 0.125".

C. Tool-Resisting Steel Bars: Shall be painted with approved-rust-inhibitive primer paint and shall conform to ONE of the following grades by ASTM A 627-03 standard:
1. Grade No. 1, Composite T.R. Steel, 1" dia. round & 3/8" x 2 1/4" flat.
2. Grade No. 2, Composite T.R. Steel, 1" dia. round & 3/8" x 2 1/4" flat.
3. Grade No. 3, Homogenous T.R. Steel, 1" dia. Round & 5/16" x 2 1/4" flat.

D. Fasteners: Non-magnetic stainless steel, or other materials warranted by manufacturer to be non-corrosive and compatible with window members, trims, hardware and anchors.
1. Provide stainless steel, torx tamper resistant 1/4"-20 screws spaced at 6" c/c or stainless steel "pop" rivets for exposed fasteners.

E. Window Clips and Anchors: Depending on design strength requirements, fabricate from rust inhibitive primer painted mild steel.

F. Sealant: Provide type recommended by window manufacturer for joint size and movement, to remain permanently elastic, non-shrinking and non-migrating. Comply with Division 7 Section “Security Joint Sealants” for installation of sealant.

G. Thermal Break: 1/4" thick thermoplastic thermal bar between frame and glass stops, (shall be factory attached to glass stops).

H. Polycarbonate: The specially designed muntin gap filler shall be extruded in U.V. resistant colored polycarbonate

2.3 FABRICATION

A. General: Provide manufacturer's standard fabrication and accessories which comply with indicated standards, except to extent more stringent requirements are indicated. Include all items for assembly and anchorage of window units, and prepare for glazing. Provide perimeter frames, sill, jamb and head as shown and specified.

B. Assembly: Main frame corners shall be reinforced and sealed with specially formed stainless steel corner keys welded to the concealed faces of the window. Total of 8 per window. Corner keys shall be designed to allow factory applied sealant.

C. Welding: All welding shall be done by qualified welders, using latest welding techniques and designs compatible with requirements for the window performance as specified.

D. Window Design Sizes and Profiles: Window design, required sizes for window units and profile requirements are indicated on drawings. Details on drawings are based upon standard details. Similar details by other pre-qualified manufacturers will be acceptable, provided they comply with window design, size, profile and performance requirements as specified.

E. Coordination of Fabrication: Where possible, check actual window openings by accurate field measurement before fabrication. Where necessary, proceed with fabrication without field measurements, based on approved shop drawings and coordinate installation tolerances to ensure proper fit of windows.

F. Drainage: Provide means of drainage for water and condensation which may accumulate in members of window units.

G. Mullions: Provide mullions as shown, matching window units, and complete with anchors for support and installation. Allow for erection tolerances and provide for movements of window units due to thermal expansion and building deflections.

2.4 FINISH

A. Color shall be selected by the Architect from manufacturer's standard colors.

B. Provide standard No. 2B stainless steel finish (bright cold rolled) for window frame and interior trims and polyester powder coating for all glass stops and exterior trims.

C. Provide clear anodized finish Class 1 (0.7 mil. minimum thickness) for the aluminum muntins.

D. Provide finish to match approved sample.

E. Finished material shall be properly marked, packaged and protected for shipment. Care shall be exerted by the window erector to avoid damage to the finish. After erection of the windows any abraded surface shall be cleaned and touched-up with specified compound in a color to match factory applied finish

2.5 DETENTION EQUIPMENT ACCESSORIES

A. Provide accessories, anchorage inserts and security fasteners for a complete, tamperproof installation.

B. Exposed Security Fasteners:
1. Provide torx-head (star design with center pin) security fasteners for anchoring work in exposed detention areas. Comply with specification section 11199.
2. Finish shall match that specified of the item anchored.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of detention windows.
   1. Examine roughing-in for embedded and built-in anchors to verify actual locations of detention window connections before detention window installation.
   2. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of detention windows.

B. Inspect built-in and cast-in anchor installations, before installing detention windows, to verify that anchor installations comply with requirements. Prepare inspection reports.
   1. Remove and replace anchors where inspections indicate that they do not comply with specified requirements. Reinspect after repairs or replacements are made.
   2. Perform additional inspections to determine compliance of replaced or additional work. Prepare inspection reports.

C. Verify locations of detention windows with those indicated on Coordination Drawings.

D. For material whose orientation is critical for its performance as a ballistic barrier, verify installation orientation.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Coordination: Furnish layouts for cast-in-place anchors, clips, and other detention window anchors whose installation is specified in other Sections.
   1. Furnish cast-in-place anchors and similar devices to other trades for installation well in advance of time needed for coordinating other work.

B. In-Place-Construction Anchors: Install embedded plate anchors in window openings at locations corresponding to detention window frame anchors.

3.3 INSTALLATION

A. Expenses carried by the Architect/Engineer, Project Manager or Owner in troubleshooting equipment problems caused by inadequate workmanship or other form of poor performance on the part of the Contractor, shall be borne by the Contractor.

B. Comply with manufacturer's specifications and recommendations for installation of window units, hardware, operators, and other components of the work.

C. Set units plumb, level and true to line, without warp or rack of frames or sash. Anchor securely in place by methods shown on shop drawings. Separate zinc-coated steel and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials, by bituminous or paint coating or plastic materials.

D. Set sill members (when required) and other members with joint fillers or gaskets, to provide weather-tight construction. Refer to "Joint Sealer" section of Division 7 for sealants, fillers, and gaskets to be installed concurrently with window units. Coordinate installation with wall flashings and other components of the work.

E. Clean surfaces promptly after installation of windows, exercising care to avoid finish damage. Remove excess sealant, dirt and other substances.

F. After erection of the windows, clean and touch-up any abraded surfaces, as approved by the window manufacturer, to match factory-applied finish.

G. Fill voids between materials of the detention equipment and embeds or other physical construction with low-mod gel, equal to Sikadur 23, by Sika and paint equipment to match surrounding materials.

H. Provide protection and other precautions required through the remainder of the construction period to ensure that window units will be without damage or deterioration at the time of substantial completion.

END OF SECTION 11 19 23

SECTION 11 19 43 - DETENTION ENCLOSURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following for detention/security applications:
   1. Detention bar grille assemblies.
   2. Detention woven-rod-mesh assemblies.

B. Related Sections include the following:
   1. Division 3 Section “Plant-Precast Structural Concrete”
   2. Division 3 Section “Plant-Precast Architectural Concrete”
   3. Division 4 Section “Unit Masonry Assemblies”
   4. Division 5 Section “Metal Fabrications”
   5. Division 7 Section “Security Joint Sealants”
   6. Division 9 Section “Painting”
   7. Division 11 Section “General Provisions for Detention Work”
   8. Division 11 Section “Detention Hollow Metal Doors and Frames”
   9. Division 11 Section “Detention Hardware”
   10. Division 11 Section “Tamper Proof Metal Fasteners”
   11. Division 26 for Electrical
   12. Division 27 for Communications
   13. Division 28 for Electronic Safety and Security

1.3 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of detention enclosure indicated.

B. Shop Drawings: For each type of detention enclosure. Include plans, elevations, sections, details, and attachments to other Work. Indicate type of steel for each detention enclosure component.
   1. Indicate requirements for cast-in anchors to be installed as work of other Sections.

C. Coordination Drawings: Drawings of each opening in detention enclosures, drawn to scale and coordinating detention door hardware. Show the following:
   1. Locations, dimensions, and profiles of detention door hardware reinforcements.
   2. Locations and installation details of detention door hardware.
   3. Elevations of each detention enclosure door design type showing dimensions, locations of detention door hardware, and preparations for power, signal, and electrified control systems.
   4. Details of each detention enclosure frame.

D. Samples: 12-by-12-inch (300-by-300-mm) cut-away corner section of woven-rod-mesh assembly, constructed of specified framing and woven-rod panel, showing fabrication techniques and workmanship.

E. Material Certificates: For homogeneous tool-resisting steel, signed by manufacturers, indicating compliance with performance requirements for complete test sequence according to applicable ASTM standard.

F. Mill Certificates: For homogeneous tool-resisting steel rods, certifying that rods were fabricated from material with same chemical and physical properties as material used to fabricate homogeneous tool-resisting steel round bars.

1.4 QUALITY ASSURANCE

A. Detention Equipment Contractor (DEC) Qualifications
   1. General: Refer to Section 111900.

B. Provide detention enclosures manufactured by a single firm specializing in the production of this type of work.

C. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing homogeneous tool-resisting steel, as documented according to ASTM E 548.

D. Approved Manufacturers:
   1. Kane Manufacturing Corporation: Kane, PA\
   2. PDI, Inc.: Orange, CA
   3. Or approved equal

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle detention material per manufacturer's requirements.

B. Protect units and finishes from damage during shipping, storage, handling, installation and construction of other work in the same area.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify detention enclosure openings by field measurements before fabrication and indicate measurements on Shop Drawings.
   1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating detention enclosures without field measurements. Coordinate wall and floor construction to ensure that actual opening dimensions correspond to established dimensions.

1.7 COORDINATION

A. Coordinate installation of anchorages for detention enclosures. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 DETENTION BAR GRILLE ASSEMBLIES

A. General: At points where detention bar grille partitions, cell fronts and doors are indicated on the drawings, they shall be constructed of the quality, sizes and shapes of the members specified. Vertical ribbed bars shall pass through and positively interlock at each intersection with horizontal flat bars, without reducing the diameter of the vertical bars. Pipe sleeves, swedging, caulking or other interlocks that are not positive, or dependent on friction for security, are unacceptable for this work. Provide vertical flat bar framing members of the same size and material quality specified for horizontal bars. Connections of detention bar grille partitions to adjacent walls, floors and ceilings shall be in compliance with details shown on the drawings.

B. Detention Bar Grille Partitions:
1. Detention bar grille partitions and cell fronts are to be constructed in sections, or panels, of proper width, comprised of 7/8-inch diameter homogeneous tool resisting double ribbed vertical bars, complying with ASTM A627, spaced not to exceed 4-inch on centers. Intermediate horizontal flat bars and framing members shall be 2 1/4-inch x 3/8-inch mild steel, with horizontals spaced not to exceed 12-inch on centers.
2. Top horizontal flat bar shall be connected to vertical framing members with a 2-inch x 2-inch x 1/4-inch angle knee securely shop plug welded in place.
3. Intermediate horizontal flat bar intersections with vertical framing members shall be secured permanently in place by 3/16-inch shop fillet welds.
4. Vertical double ribbed bars shall be securely welded in place at both the top and bottom flat bar framing members and intermediate horizontal flat bars.

C. Detention Bar Grille Doors:
1. When detention bar grille doors are required in detention bar grille partitions, they shall be constructed of the same materials as the partitions of which they are a part.
2. Detention bar grille doors shall be shop prepared to receive hardware as specified. Sliding detention bar grille doors shall have provisions for hanger, guide and strike shop applied.
3. Food pass openings shall be provided in detention bar grille doors where indicated on the door schedule. Openings in detention bar grille shall be approximately 15-inches wide by 4 2-inches high, framed at the top with a flat bar same as intermediate horizontal bars. Provide a 1/4-inch thick steel plate shelf, approximately 5-inch wide by 14-inch long, at the bottom of the food pass openings.

D. Detention bar grille assemblies shall be painted one shop coat of manufacturer's standard rust inhibitive metal primer.

2.2 DETENTION WOVEN-ROD-MESH ASSEMBLIES

A. General: Provide enclosure system consisting of main framing, woven-rod panels, concealment plates, and other fittings necessary for a complete assembly.

B. Main Framing: Formed from 1-1/2-by-2-1/2-inch (38-by-63.5-mm) built-up tubular steel, consisting of an open channel with fixed concealment plates.
1. Open Channel: Formed from 0.1265-inch- (3.2-mm-) thick steel sheet, tubing, or

channel; with individual slots along inner edges to support woven-rod panels.

2. Concealment Plates: Steel sheet to match open channel.

C. Supplementary Framing: Formed from 2-inch-square by 3/16-inch- (51-mm-square by 4.8-mm-) thick steel tubing.

D. Braces: Formed from same material as main framing.

E. Woven-Rod Panels: Formed from double crimped, 3/8-inch (9.5-mm) steel rod, woven horizontally and vertically into a rigid grille with rods at 2 inches (51 mm) o.c.
1. Steel Rod for Galvanized Assemblies: Mild steel.
2. Steel Rod for Nongalvanized Assemblies: Mild steel.
3. Provide integral security screen for assemblies that occur at outdoor recreation yards installed on the outside face. Stainless steel wire cloth, 12 mesh.

F. Wall and Ceiling Anchorage and Trim: Continuous 2-by-2-by-3/16-inch (51-by-51-by-4.8-mm) mild steel angle with 2-by-3/16-inch (51-by-4.8-mm) mild steel flat bar.

G. Finishes:
1. Exterior Locations: Stainless Steel.
2. Interior Locations: Powder coar in color selected by Architect from manufacturer's standard colors.

2.3 FINISH

A. Detention Bar Grille:
1. After fabrication surfaces shall be vapor degreased and bonderized. Exposed surfaces have a heavy coating of rust inhibitive primer, prepared for field finishing. Primer shall be compatible with finish coats as specified in Section 09900 Painting.

B. Detention Wire Mesh:
1. For interior installations:
a. Interior and exterior surfaces of the main frame, rods and concealment plates shall be thoroughly cleaned and bonderized in a five-step process. The surfaces shall then receive one coat of primer and one coat of electrostatically applied baked-on enamel. Color of finish shall be as approved by the Architect from manufacturer's full line of standard colors.
b. Finished material shall be properly marked, packaged and protected for shipment. Care shall be exerted by the erector to avoid damage to the finish. After erection, abraded surface shall be cleaned and touched-up with specified compound in a color to match factory applied finish.

2.4 DETENTION EQUIPMENT ACCESSORIES

A. Provide accessories, anchorage inserts and security fasteners for a complete, tamperproof installation.

B. Exposed Security Fasteners:
1. Provide torx-head (star design with center pin) security fasteners for anchoring work in exposed detention areas. Comply with specification section 11 19 93.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of detention enclosures.
   1. Examine roughing-in for embedded and built-in anchors to verify actual locations of detention enclosure connections before detention enclosure installation.
   2. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of detention enclosures.

B. Inspect built-in and cast-in anchor installations before installing detention enclosures to verify that anchor installations comply with requirements. Prepare inspection reports.
   1. Remove and replace anchors where inspections indicate that they do not comply with specified requirements. Reinspect after repairs or replacements are made.
   2. Perform additional inspections to determine compliance of replaced or additional work. Prepare inspection reports.

C. Verify locations of detention enclosures with those indicated on Coordination Drawings.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Expenses carried by the Architect/Engineer, Project Manager or Owner in troubleshooting equipment problems caused by inadequate workmanship or other form of poor performance on the part of the Contractor, shall be borne by the Contractor.

B. General: Install detention enclosures plumb, rigid, properly aligned, and securely fastened in place, complying with Drawings, Coordination Drawings, and manufacturer's written recommendations.

C. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing detention enclosures to in-place construction. Include threaded fasteners for concrete and masonry inserts, security fasteners, and other connectors.
   1. Proprietary Built-in Masonry Anchors: Install anchors integral with unit masonry. Comply with requirements in Division 4 Section "Unit Masonry Assemblies."

D. Cutting, Fitting, and Placement: Obtain manufacturer's written approval for cutting, drilling, and fitting required for installing detention enclosures. Set detention enclosures accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete or masonry or similar construction.

F. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping-size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

G. Field Welding: Comply with the following requirements:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

H. Fill voids between materials of the detention equipment and embeds or other physical construction with low-mod gel, equal to Sikadur 23, by Sika and paint equipment to match surrounding materials.

3.3 INSTALLATION OF BAR-GRILLE ASSEMBLIES

A. Wall and Ceiling Anchorage: Weld framing to continuous angles with continuous welds. Anchor angles to embedded anchors by welding.

B. Partitions: Weld adjacent framing members to each other with continuous 1/4-inch (6-mm) deep welds on both sides; grind smooth.

3.4 INSTALLATION OF WOVEN-ROD-MESH ASSEMBLIES

A. Wall and Ceiling Anchorage: Fasten continuous anchor angle to walls and ceilings with 3/8-inch- (9.5-mm-) diameter, security-type, double-expansion anchor bolts with "break-off" heads.
   1. Weld main framing to wall and ceiling angles with 1-inch (25-mm) welds at 12 inches (305 mm) o.c.

B. Weld adjacent main framing members to each other with 1/4-inch deep by 3/4-inch (6-mm by 19-mm) long welds at 12 inches (305 mm) o.c. on both sides of framing.

C. Provide supplementary framing at three-way connections and multiple-panel-height partitions. Weld main framing to supplementary framing with 1/8-inch (3-mm) fillet welds 1 inch (25 mm) long at 12 inches (305 mm) o.c. on both sides of framing.

D. Provide additional field bracing as shown or necessary for rigid, secure installation.

E. Adjust doors to operate easily without binding.

3.5 FIELD QUALITY CONTROL

A. Inspect installed products to verify compliance with requirements. Prepare inspection reports and indicate compliance with and deviations from the Contract Documents.

B. Remove and replace detention work where inspections indicate that work does not comply with specified requirements.

C. Perform additional inspections to determine compliance of replaced or additional work. Prepare inspection reports.

D. Prepare field quality-control certification that states installed products and their

installation comply with requirements in the Contract Documents.

3.6 CLEANING AND PROTECTION

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 11 19 43

SECTION 11 19 53 - DETENTION HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Related Sections include the following:
1. Division 11 Section “General Provisions for Detention Work”
2. Division 11 Section “Detention Hollow Metal Doors and Frames”
3. Division 11 Section “Detention Enclosures”
4. Division 11 Section “Tamper Proof Metal Fasteners”
5. Division 26 for Electrical
6. Division 27 for Communications
7. Division 28 for Electronic Safety and Security

1.3 PERFORMANCE REQUIREMENTS

A. Swinging Detention Door Assemblies: Provide detention door hardware as part of a detention door assembly that complies with security grade indicated, when tested according to ASTM F 1450-12A, based on testing manufacturer's standard units in assemblies similar to those indicated for this Project.

1.4 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of detention door hardware.

B. Shop Drawings: For each type of detention door hardware. Include openings by door number and location, manufacturer's names, catalog numbers, keying information, materials, and finish. The Architect/Engineer's approval of schedule will not relieve Contractor or Supplier of responsibility for errors or omissions which it might contain.

C. Keying schedule. Contractor shall deliver keying schedule to owner.

D. Certification by Manufacturer: That products supplied complies with performance requirements specified.

E. Qualification Data: For Installer.

F. Product Test Reports: Showing compliance with specified requirements.

G. Maintenance Data: For each type of detention door hardware to include in maintenance manuals.

H. Warranties: Special warranties specified in this Section.

I. Detention Keying Schedule: Coordinate a Detention Keying Meeting with the Architect, User, and hardware supplier so as not to delay the manufacturer and delivery of the required detention locks. Submit keying system schedule after signed approval by User.

1.5 QUALITY ASSURANCE

A. Detention Equipment Contractor (DEC) Qualifications
   1. General: Refer to Section 11 19 00 GENERAL PROVISIONS FOR DETENTION WORK.

B. Provide detention hardware manufactured by a single firm specializing in the production of this type of work.

C. Installation and maintenance of the detention hardware shall be performed by manufacturer approved personnel. Submit certification of manufacturer training with shop drawings.

D. Provide hardware for Fire- Rated Openings conforming to UBC Standard 7-2.

1.6 JOB CONDITIONS

A. Detention Hardware and Keying Coordination Conference:
   1. A coordination conference will be held and coordinated by the General Contractor after submittals of schedules and shop drawings.
   2. Participants: A qualified representative of each of the following parties will attend the conference:
      a. Owner
      b. Project Manager
      c. Architect/Engineer
      d. General Contractor
      e. Detention Equipment Contractor
      f. Electrical Contractor
      g. Detention Hollow Metal Work Supplier
      h. Detention Hollow Metal Work Installer
      i. Detention Hardware Supplier
      j. Detention Hardware Installer
   3. Bid Package Contractor shall take minutes of the hardware coordination conference.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle detention hardware per manufacturer's requirements.

B. Delivery: Deliver items in manufacturer's original package. Each item individually packaged and carefully marked for intended opening and use. Each item complete with all necessary screws, bolts, keys, instructions, and where necessary, installation templates.

C. Storage: Store off floor in dry area of building out of way of other work in progress.

Provide maximum protection against loss and damage.

D. Handling: Handle items in a manner to prevent damage. Marred, defaced, damaged and defective items will be rejected.

1.8 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Special Warranty: Submit a written warranty executed by the manufacturer and installer agreeing to repair or replace materials furnished under this Section that fail in materials or workmanship within the specified warranty period. Submit the warranty to the Architect for approval. The spare part provided to the Owner in the original inventory shall be maintained during the warranty period. Components used for repair shall be replaced immediately and the Owner shall not be charged for shipping or other costs unless failure is due to abuse or negligence.

C. Warranty Period: Two (2) years from date of Substantial Completion.

1.9 MAINTENANCE SERVICE

A. Maintenance Manual: Furnish a bound complete set of maintenance instructions as needed for Owner's continued adjustment, maintenance, repair, and removal and replacement of detention door hardware.

B. Training: Provide on site review of Operational and Maintenance manuals and spare parts with the Owner's designated personnel. Provide sixteen hours of training on repair and maintenance of the detention door hardware.
   1. Provide a professionally produced video tape on the repair and maintenance of the detention door hardware.

C. Initial Maintenance Service: Beginning at Substantial Completion, provide at six (6) month intervals (coordinate exact time with the User) per year for the basic warranty period full maintenance by skilled employees of detention door hardware Installer. Include preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper detention door hardware operation. Provide parts and supplies as used in the manufacture and installation of original products.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Catalog numbers of the manufacturers listed have been used to establish the quality required. The only other manufacturers approved are listed. Other manufacturers seeking approval shall do so in writing per General Requirements and shall list exact catalog numbers and description of the items he proposes to furnish.

B. Acceptable hardware manufacturers.

1.	Airteq	Airteq Systems; Lake Oswego, OR
2.	Brink	R.R. Brink Locking Systems, Inc.; Shorewood, IL
3.	Folger Adam	Folger Adam Security Inc.; Lemont, IL
4.	Glynn-Johnson	Glynn-Johnson Corp.; Indianapolis, IN
5.	Hiawatha	Hiawatha Metalcraft, Inc.; Minneapolis, MN
6.	Ives	H.B. Ives Div.; New Haven, CT
7.	LCN	LCN Closers; Princeton, IL
8.	Norton	Norton Closer Div.; Charlotte, NC
9.	Pemko	Pemko Mfg. Co.; Emeryville, CA
10.	Reese	Reese Enterprises; Rosemount, MN
11.	Southern Steel	Southern Steel Co.; San Antonio, TX
12.	Zero	Zero Weatherstripping; Bronx, NY

2.2 DETENTION HINGES

A. Utility-Door Detention Hinges:
1. Series/Manufacturer:
   a. 203FS/Southern Steel
2. Heavy weight, plain bearing; fabricated from cast iron or steel; 3/8-inch- (9.5-mm-)diameter, case-hardened, fully welded, steel hinge pin; full surface.

B. Food-Pass Hinges:
   a. Integral piano hinges are provided by the door manufacturer.

C. Institutional Mortise Hinges:
1. Series/Manufacturer:
   a. 204FMSS/Southern Steel
2. 4 1/2 x 4 1/2, 3/16" thick leaves.
3. Cast stainless steel leaves with integral security studs, non-removable stainless steel pins, stainless steel ball bearings, three knuckle with "HT" hospital tips.
4. Provide quantities as follows:
   a. Doors less than 5 feet high provide 1 Pair.
   b. Doors over 5 feet to 7 feet 6 inches provide 1-1/2 Pair.
   c. Doors over 7 feet 6 inches to 10 feet provide 2 Pair.
   d. Doors over 3 feet wide provide 2 Pair.

2.3 DETENTION ELECTRIC LOCKS

A. Maximum Security – Full Cycle:
1. Series/Manufacturer:
   a. 10120AM/Southern Steel
2. Frame mounted 115 VAC, motor operated.
3. Bolt is retracted electrically by icon at the control panel and remains retracted until door is opened.
4. Bolt is retracted manually by mogul key on outside and/or inside.
5. See Detention Hardware Schedule for keying.
6. Internal switches monitor status of bolt to show deadlocked and unlocked conditions.
7. Provide a key cylinder extension for locks keyed both sides or keyed stop side.

B. Maximum Security – Half Cycle:
1. Series/Manufacturer:

a. 10120AMD/Southern Steel
2. Frame mounted 115VAC, motor operated.
3. Normal function: Control signal retracts bolt where it remains retracted for 10 seconds regardless of door position. After 10 seconds, control system will then automatically send relock signal.
4. Emergency function: Control signal retracts bolt where it remains retracted until relocked by relock command from the control station.
5. Bolt is retracted electrically when contact push button is depressed from inside only. See floor plans for locations.
6. Bolt is retracted manually by mogul key on outside and/or inside.
7. See Detention Hardware Schedule for keying.
8. Internal switches monitor status of bolt to show deadlocked and unlocked conditions.
9. Provide a key cylinder extension for locks keyed both sides or keyed stop side.

C. Minimum Security - Electrical Operation:
1. Series/Manufacturer:
a. 10600/Southern Steel
2. Install mortise in door.
3. Mogul cylinders.
4. See Detention Hardware Schedule for lock function.
5. Provide with strike.

2.4 DETENTION MECHANICAL LOCKS

A. Maximum Security - Mechanical Operation: (Detention Access Panels)
1. Series/Manufacturer:
a. 1010A/Southern Steel
2. Door mounted deadbolt.
3. Bolt is retracted manually by paracentric key on outside only. .
4. Provide strike as scheduled.
5. Provide with hollow metal lock mounting, escutcheon and security screws.

B. Minimum Security - Mechanical Operation:
1. Series/Acceptable Manufacturer:
a. 10500/Southern Steel
2. Install mortise in door.
3. Mogul cylinders.
4. See Detention Hardware Schedule for lock function.
5. Provide strike as scheduled.

2.5 CLOSERS

A. Concealed Door Closer:
1. Overhead concealed door closers shall be one manufacturer and carry a two year warranty.
2. A factory representative shall inspect closers after installation to insure proper adjustment and operation.
3. Closers shall have full hydraulic, rack and pinion action with high strength cast iron cylinder.
4. Spring power shall be adjustable. Spring power shall provide an opening force range of 8 to 15 pounds from 0 degrees to 90 degrees.
5. Closers shall have separate adjustments for latch speed, general speed and back check.

6. Where scheduled provide with integral Door Position Switch.
7. Adjustments screws shall be accessible through a heavy duty mounting plate when finish plates are removed.
8. Closers shall be field adjustable to allow precise setting for each door and fitted with a protective shield.
9. Install of the finish plate shall fully conceal all adjustment mechanisms.
10. Closers shall have an extra heavy duty, forged steel concealed arm.
11. The low friction track roller shall be attached to the arm by a threaded mounting.
12. Closers shall have a metal track designed to prevent jamming and to eject foreign objects place in the track mortised into the top of the door.
13. Provide brackets, spacer blocks and any accessory required to insure proper installation.
14. Attach with stainless steel security screws.
15. LCN 2210 series.

2.6 POSITION SWITCHES

A. Concealed Door Position Switch:
   1. Manufacturer:
      a. DPS6200/Airteq
      b. 201020/Brink
      c. ASSW-105A/Folger Adam
      d. 200MRS/Southern Steel
   2. Mortise installation overhead mounting with switch contacts housed in the door frame and actuating magnet mortised into the top of the door.
   3. Adjust switch for minimum movement to activate.
   4. Locate position switches in frame head, six inches (center of switch) from lock edge of door.
   5. Fasteners shall be torx-head (star design with center pin) security fasteners.

B. Keeper Switches:
   1. SPDT limit monitoring switch, rating 10 amps at 120 VAC.
   2. All manual locks shall utilize keeper switches.
   3. Fasteners shall be torx-head (star design with center pin) security fasteners.

2.7 DOOR ACCESSORIES

A. Push Plates:
   1. Series/Manufacturer:
      a. 1456/Hiawatha
   2. 3/16" thick stainless steel.
   3. 3 2" W. x 16" H. with 7/8" lip projection at bottom.
   4. Attach with stainless steel security rivets.

B. Pull - Loop:
   1. Series/Manufacturer:
      a. 212/Southern Steel
   2. Cast bronze, satin chrome plated.
   3. Dimensions 8 3/4" long x 1 2" clearance.
   4. Fasteners shall be torx-head (star design with center pin) security fasteners.

C. Pull - Flush:
   1. Series/Manufacturer:

a. 614/Airteq
b. 300011/Brink
c. 214/Southern Steel

2. Cast bronze, satin chrome plated.
3. Dimensions 4" wide x 5" high x 1" depth.
4. Fasteners shall be torx-head (star design with center pin) security fasteners.
5. Contractors option: Use detention hollow metal manufacturers flush pull integral with the detention door.

D. Kickplates:
1. Manufacturer:
a. Rockwood
2. Kickplates shall be .050 stainless steel with eased edges.
3. 10 inches high (except reduce height 2 inch less than bottom rail when required) x 2 inches less than door width on singles and 1 inch less on pairs.
4. Attach with stainless steel security rivets.

E. Door Stops:
1. Black silicone rubber bumper 2" diameter, mounted on a 5/8" x 2 1/2" steel shank for permanent attachment in grout filled masonry or concrete.

F. Thresholds:
1. Thresholds with door bottom are used on exterior doors. Interior doors use auto door bottom for sealing.
2. Manufacturer
a. Pemko/1715 threshold. Pemko/209 V bottom.
b. Reese
c. National
3. Fasteners shall be stainless steel torx-head (star design with center pin) security fasteners with expansion anchors.

G. Automatic Door Bottom:
1. Interior doors use auto door bottom for sealing. Thresholds with door bottom are used on exterior doors. .
2. Model/Manufacturer:
a. 4131/Pemko
3. Surface mounted type, clear anodized aluminum, cam-actuated drop down vinyl seal, with spring mechanism return.
4. Secured with stainless steel, torx-head (star design with center pin) security screws.

H. Weatherstripping/Smoke Seals:
1. Model/Manufacturer:
a. 315CR/Pemko
2. Extruded clear anodized aluminum with neoprene seal.
3. Secured with stainless steel, torx-head (star design with center pin) security screws.

I. Head Drip:
1. Model/Manufacturer:
a. R201/Reese
2. Extruded clear anodized aluminum.
3. Secured with stainless steel, torx-head (star design with center pin) security screws.
4. All exterior doors shall have head drips, whether or not scheduled.

2.8 FINISHES

	US Symbol	ANSI Symbol	Description
Hinges, Exterior	US32D	630	Satin Stainless Steel
Hinges, Interior	US26D	626	Satin Chrome
Locks & Pulls	US26D	626	Satin Chrome
Closers	AL	689	Aluminum Painted
Push & Kick plates	US32D	630	Satin Stainless Steel
Strike Plates	US32D	630	Satin Stainless Steel

2.9 CYLINDERS, KEYS AND KEYING

A. The detention locks will incorporate two (2) separate keying systems; one for lever tumbler (Paracentric) and one for pin tumbler (mogul cylinder) locks. Each keying system's keys shall be dye stamped for identification; corresponding to the Detention Equipment Contractor's final schematic keying chart.

B. Lever tumbler locks shall be keyed alike or different as directed. Provide cut keys as required.

C. Mogul cylinder locks shall be master keyed as directed. Provide cut change keys, and master keys as required.

D. For each individual key cabinet, provide the following:
1. For all individual key designations, there shall be three (3) keys each.
2. For each Master Key designations (A,B,...etc.), there shall be five (5) keys each.

E. A complete, detailed schematic chart of the keying system will be required. The Detention Equipment Contractor will also be required to enter the key symbols for all doors on additional floor plans which will be supplied by the Architect. Two (2) copies of the schematic keying chart and architectural floor plans shall be turned over to the user at the completion of the project. The cost for this service shall be included with the cost of materials at the time of bidding.

F. The key schedule is confidential information known only to the Institution, Architect, and lock manufacturer. The Architect shall arrange to meet with the Institution to determine the keying schedule. The lock manufacturer shall deliver keys directly to the Institution (signature required), and provide confirmation of delivery to the Contractor.

G. Keys shall not leave the manufacturer's custody without prior arrangements for delivery and authorization from the Owner.

H. All paracentric keys will be furnished with a key shield.

2.10 KEY CONTROL

A. Key control system shall be furnished only and have a capacity of 1.75 times the number of individual key designations and shall be a complete dual tag system. Similar to TelKee Big Head system, consists of a cabinet, tabs, hook labels, receipt forms, visible index software.

B. Cabinet shall have concealed-type hinge and rounded sides, lock with keys.

C. Panels must have individual hook and label pockets formed as an integral part of the panel, for both paracentric and mogul key types, as required.

D. Tags of two types shall be provided, one set for permanent attachment of file key without the use of tools and the other set with snaphook holding at least four keys.

E. Indexing software shall be provided only for owners' installation and use.

F. Permanent Loan Registry shall be furnished to protect identity of key borrowers while Receipt Tabs shall be supplied for temporary loan.

2.11 DETENTION EQUIPMENT ACCESSORIES

A. Provide accessories, anchorage inserts and security fasteners for a complete, tamperproof installation.

B. Exposed Security Fasteners:
1. Provide torx-head (star design with center pin) security fasteners for anchoring work in exposed detention areas. Comply with specification section 11 19 93.
2. Finish shall match that specified of the item anchored.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before installation.

C. Notify the General Contractor in writing of conditions detrimental to the proper and timely completion of the work.

D. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Expenses carried by the Architect/Engineer, Project Manager or Owner in troubleshooting equipment problems caused by inadequate workmanship or other form of poor performance on the part of the Contractor, shall be borne by the Contractor.

B. Install Detention Hardware in accordance with shop drawings, manufacturer's written installation instructions, and as herein specified.

C. Installation shall be under supervision of manufacturer approved personnel.

D. Mounting Heights: Heights given are center line heights up from finish floor unless stated; heights given "Number to Number" indicate that all shall be at one height within limits given. Where heights of items are not listed, mount in accord with recommendations of DHI.

1.	Bottom hinge	10 to l3 inches
2.	Top hinge	6 to 8 inches down from head
3.	Intermediate hinges	Equally spaced
4.	Detention lock	40 inches to centerline of lockbolt
5.	Door pull	50 inches to centerline of grip
6.	Flush pull	50 inches to centerline of grip
7.	Push plate	56 inches to centerline of plate

E. Fitting: Fit hardware accurately and properly. Remove exposed parts until after painter's finishing is completed, then reinstall. Securely fasten all fixed parts. Fit faces of mortised parts snug and flush. Make sure operating parts move freely and smoothly without binding, sticking or excessive clearance.

F. Adjusting and Finishing: After work has been otherwise completed, examine hardware for complete and proper installation. Lubricate bearing surfaces of moving parts. Adjust latching and holding devices to proper function. Adjust door control devices to proper speed and power. Test keys for conformance to approved keying system. Clean exposed surfaces, check for surface damage and polish.

G. Thresholds: Install in one continuous piece, full width of opening. Set in full bed of mastic and fasten with countersunk anchors at 6 inches on center.

3.3 DEFECTIVE WORK

A. Where hardware is found defective in materials or installation; rework, restore, replace or otherwise correct as directed.

B. Following will be considered as defective materials:
1. Unauthorized substitutes.
2. Items delivered with missing, broken, damaged or defaced parts.
3. Items of incorrect hand or function.

C. Following will be considered as defective installation:
1. Items broken, damaged, or defaced after delivery.
2. Items incomplete, misaligned or incorrectly located.

3.4 SPARE PARTS

A. Shall be provided for the Owners' stock as follows:
1. 6 Locks 10120AP
2. 6 Mogul Cylinders
3. 12 Solenoid valves
4. 6 Swing door Position Switches
5. 6 Keeper Switches
6. Six complete repair parts kit for the 10120 Series locks, containing: Springs, micro switches, screws, nuts, solenoid valves, washers and miscellaneous parts.

3.5 HARDWARE SCHEDULE

A. DHW-111
10505 – F05 CLASSROOM FUNCTION
INSTITUTIONAL HINGES
CONCEALED CLOSER
STOP
SILENCERS

B. DHW-112
10507 – F07 STOREROOM FUNCTION
STOP
AUTO DOOR BOTTOM
WEATHERSTRIPPING

C. DHW-112M
10507 – F07 STOREROOM FUNCTION
INSTITUTIONAL HINGES
HINGES
STOP
THRESHOLD
CLOSER W/ DPS

D. DHW-114M
10601
INSTITUTIONAL HINGES
STOP
CLOSER W/ DPS

E. DHW-115
1010AM DEADLOCK
INSTITUTIONAL HINGES
SILENCERS
STOP

F. DHW-120
10501 – F01 PASSAGE FUNCTION
INSTITUTIONAL HINGES
STOP
SILENCERS

G. DHW-120M
10501 – F01 PASSAGE FUNCTION
INSTITUTIONAL HINGES
CONCEALED CLOSER W/ DPS
STOP
SILENCERS

H. DHW-210M
10605
INSTITUTIONAL HINGES
CLOSER
STOP
SILENCERS

I. **DHW-310**
INSTITUTIONAL HINGES
10120 AMD-1 LOCK
CONCEALED DOOR CLOSER WITH DPS
LOOP PULL, HINGE SIDE
FLUSH PUL, STRIKE SIDE
DOOR STOP
SILENCERS

J. **DHW-310R**
INSTITUTIONAL HINGES
10120AMD-1 LOCK
CONCEALED DOOR CLOSER WITH INTEGRAL DPS
WEATHERSTRIPPING
AUTO DOOR BOTTOM
LOOP PULL, HINGE SIDE
FLUSH PULL, STRIKE SIDE
DOOR STOP

K. **DHW-310MX**
INSTITUTIONAL HINGES
10120AMD-1 LOCK
CONCEALED DOOR CLOSER WITH INTEGRAL DPS
LOOP PULL, BOTH SIDES
THRESHOLD
WEATHERSTRIPPING

L. **DHW-320**
INSTITUTIONAL HINGES
10120AMD-2 LOCK
CONCEALED DOOR CLOSER WITH DPS
LOOP PULL, HINGE SIDE
FLUSH PULL, STRIKE SIDE
DOOR STOP

M. **DHW-320MX**
INSTITUTIONAL HINGES
10120AMD-2 LOCK
CONCEALED DOOR CLOSER WITH INTEGRAL DPS
LOOP PULL, BOTH SIDES
THRESHOLD
WEATHERSTRIPPING
DOOR STOP

N. **DHW-320MR**
INSTITUTIONAL HINGES
10120AMD-2 LOCK
10501 PASSAGE FUNCTION LEVER SET X 2 FOR FIRE RATING
CONCEALED DOOR CLOSER WITH INTEGRAL DPS
WEATHERSTRIPPING
AUTO DOOR BOTTOM
LOOP PULL, HINGE SIDE
FLUSH PULL, STRIKE SIDE
DOOR STOP

O. DHW-810
MOTORIZED FULLY DRIVEN SLIDING CELL DEVICE
SOUTHERN STEEL 3150LX.bPK-1
MANUAL RELEASE AT DOOR VIA HIP HIGH KEY RELEASE
KEY OUTSIDE
LOOP PULL, HINGE SIDE
FLUSH PULL, STOP SIDE
DOOR SKIRT

P. DHW-820
MOTORIZED FULLY DRIVEN SLIDING CELL DEVICE
SOUTHERN STEEL 3165LX.bPK-2
MANUAL RELEASE AT DOOR VIA HIP HIGH KEY RELEASE
LOOP PULL, HINGE SIDE
FLUSH PULL, STOP SIDE
DOOR SKIRT

Q. DHW-820R
MOTORIZED FULLY DRIVEN SLIDING CELL DEVICE
SOUTHERN STEEL 3165LX.bPK-2
MANUAL RELEASE AT DOOR VIA HIP HIGH KEY RELEASE
LOOP PULL, HINGE SIDE
FLUSH PULL, STOP SIDE
DOOR SKIRT
GASKETING AS REQUIRED TO COMPLY WITH UL REQUIREMENTS

R. DHW-321R
INSTITUTIONAL HINGES X 2
10120AMD-2 LOCK X 2
10501 PASSAGE LEVER SET X 2 FOR FIRE RATING
CONCEALED CLOSER WITH INTEGRAL DPS X 2
LOOP PULL, BOTH SIDES X 2
AUTO DOOR BOTTOM X 2
WEATHERSTRIPPING X 2

END OF SECTION 11 19 53

SECTION 11 19 63 - DETENTION FURNISHINGS AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Related Sections include the following:
1. Division 3 Section “Plant-Precast Structural Concrete”
2. Division 3 Section “Plant-Precast Architectural Concrete”
3. Division 4 Section “Unit Masonry Assemblies”
4. Division 5 Section “Metal Fabrications”
5. Division 7 Section “Security Joint Sealants”
6. Division 9 Section “Painting”
7. Division 11 Section “General Provisions for Detention Work”
8. Division 11 Section “Detention Hardware”
9. Division 11 Section “Tamper Proof Metal Fasteners”

1.3 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of detention furnishing indicated.

B. Shop Drawings: For each type of detention furnishing. Include plans, elevations, sections, details, and attachments to other work.

C. Coordination Drawings: Drawings of each built-in anchor supporting detention furnishings, including those to be installed as work of other Sections, drawn to scale and coordinating anchorage with detention furnishings. Show the following:
1. Locations, dimensions, and profiles of wall and floor reinforcements.
2. Locations and installation details of built-in anchors.
3. Elevations of each detention furnishing showing dimensions of furnishing, preparations for receiving anchors, and locations of anchorage.
4. Details of attachment of each detention furnishing to built-in anchors.

D. Samples: For each type of detention furnishing with factory-applied color finishes.

1.4 QUALITY ASSURANCE

A. Detention Equipment Contractor (DEC) Qualifications
1. General: Refer to Section 11 19 00 GENERAL PROVISIONS FOR DETENTION WORK.

B. Provide detention furnishings and equipment manufactured by a single firm specializing in the production of this type of work.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle detention furnishings and equipment per manufacturer's requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURER OF DETENTION FURNISHINGS AND EQUIPMENT

A. Acceptable Manufacturers:
1. Chief Industries, Inc.; Grand Island, NE
2. Norix Group, Inc.; West Chicago, IL
3. PDI, San Antonio, TX

2.2 (DN1.1) DETENTION MIRROR WITH EMBEDDED MOUNTING

A. Mirror:
1. Mirror frame dimensions shall be 12 1/2" x 16 1/2", fabricated from 16 gauge mild steel. 5/16" x 1" mirror frame to be chromium plated.
2. Mirror opening shall be 10 1/2" x 14 1/2. Mirror shall be made of 20 gauge stainless steel polished for high reflectivity.
3. Include chromium plated security fasteners.

B. Embedded Mounting Plate:
1. Embedded mounting plate to be constructed of 1/4" plate steel with (2) 11 gauge x 3" wide bent steel anchors with minimum 1" bend.
2. Embed plate shall be drilled and tapped for security fasteners.
3. Embedded mounting plate shall be provided with one (1) shop coat primer.

C. Mount top of mirror at 6'-2" above finish floor typically, in handicap areas mount bottom of mirror at 3'-4" above finish floor.

D. Provide low-mod gel, equal to Sikadur 23 by Sika, around perimeter of frame and embed.

2.3 (DN1.2) DETENTION SHOWER SEATS

A. Shower Seats: Double-pan retractable, recessed shower seat with recessed handle. Approximately 16-inch by 16-inch overall size formed from 0.078-inch thick, stainless-steel sheet. Seat pivots on solid 0.375-inch diameter stainless-steel rod and self-latches when closed. Minimum 750 lb. loading capacity. Provide No. 4 finish.
1. Products: Subject to compliance with requirements, provide one of the following
a. A & J Washroom Accessories Inc.; U931.
b. American Specialties, Inc.; 170.
c. Bradley Corporation; SA65.

2.4 (DN1.3) DETENTION GRAB BAR

A. Provide 18 GA x 1-1/2 IN Stainless Steel Tubing Grab Bar

B. Attach to walls with 3/8 IN diameter round head expansion anchors. Tack weld after installation

C. Provide 10 GA stainless steel bent plate closure welded to the bottom of the tubing. Provide 3/16 IN diameter weep holes in bottom at 12 IN on center.

D. Provide 4 IN diameter x 11 GA mounting flange on each end, welded to tubing and closure plate. Provide three 7/16 IN mounting holes in each flange.

2.5 (DN1.4)TRANSACTION DRAWER

A. Construction:
1. Wall Opening: 27.5"W x 11.625"H.
2. Drawer Material: Aluminum frame, stainless steel hood and bullet resistant plastic.
3. Transaction Drawers are weather resistant as well as bullet resistant. The front stainless steel panel pivots upward as drawer moves outward. Drawer movement is provided by smooth extension slides. It locks with drop bolt. Lexan lid stays closed as drawer is extended.

B. Product/Manufacturer:
1. No. 2725A/Creative Industries Inc., Indianapolis, Ind.
2. Or approved equal

2.6 (DN2.1) LEG STYLE TABLE (30 IN x 72 IN)

A. Owner Furnish, Owner Install

B. Refer to Section 11 19 93 and manufacturer recommendations for installation requirements.

2.7 (DN2.3) OUTDOOR TABLE (44 IN x 44 IN)

A. Owner Furnish, Owner Install

B. Refer to Section 11 19 93 and manufacturer recommendations for installation requirements.

2.8 (DN2.4) TABLE, FIXED SEATING ROUND TABLE, 42”

A. Owner Furnish, Owner Install

B. Refer to Section 11 19 93 and manufacturer recommendations for installation requirements.

2.9 (DN2.5) TABLE, FIXED SEATING ROUND TABLE, 48”

A. Owner Furnish, Owner Install

B. Refer to Section 11 19 93 and manufacturer recommendations for installation

requirements.

2.10 (DN2.7) TABLE, FIXED SEATING ROUND TABLE, 72”

A. Owner Furnish, Owner Install

B. Refer to Section 11 19 93 and manufacturer recommendations for installation requirements.

2.11 (DN2.8) TABLE, 36” SQUARE LEG STYLE

A. Owner Furnish, Owner Install

B. Refer to Section 11 19 93 and manufacturer recommendations for installation requirements.

2.12 (DN2.9) TABLE, 72” 5 SEAT PLUS ADA

A. Owner Furnish, Owner Install

B. Refer to Section 11 19 93 and manufacturer recommendations for installation requirements.

2.13 (DN3.1) ARMLESS CHAIR

A. Owner Furnish, Owner Install

B. Refer to Section 11 19 93 and manufacturer recommendations for installation requirements.

2.14 (DN3.2) 4 BEAM SEATING W/ END ARMS

A. Owner Furnish, Owner Install

B. Refer to Section 11 19 93 and manufacturer recommendations for installation requirements.

2.15 (DN3.3) LOUNGE CHAIR, LEFT ARM

A. Owner Furnish, Owner Install

B. Refer to Section 11 19 93 and manufacturer recommendations for installation requirements.

2.16 (DN3.4) LOUNGE CHAIR, ARMLESS

A. Owner Furnish, Owner Install

B. Refer to Section 11 19 93 and manufacturer recommendations for installation requirements.

2.17 (DN3.1) LOUNGE CHAIR, RIGHT ARM

A. Owner Furnish, Owner Install

B. Refer to Section 11 19 93 and manufacturer recommendations for installation requirements.

2.18 (DN4.1) DETENTION SHELF

A. Owner Furnish, Owner Install

B. Refer to Section 11 19 93 and manufacturer recommendations for installation requirements.

2.19 (DN4.2) DETENTION DESK

A. Owner Furnish, Owner Install

B. Refer to Section 11 19 93 and manufacturer recommendations for installation requirements.

2.20 (DN4.3) DETENTION BUNK

A. Owner Furnish, Owner Install

B. Refer to Section 11 19 93 and manufacturer recommendations for installation requirements.

2.21 (DN4.4) FLOOR MOUNTED STOOL

A. Owner Furnish, Owner Install

B. Refer to Section 11 19 93 and manufacturer recommendations for installation requirements.

2.22 (DN4.5) BEDROOM BUNK

A. Owner Furnish, Owner Install

B. Refer to Section 11 19 93 and manufacturer recommendations for installation requirements.

2.23 (DN4.6) THREE COMPARTMENT SHELF

A. Owner Furnish, Owner Install

B. Refer to Section 11 19 93 and manufacturer recommendations for installation requirements.

2.24 (DN4.7) WALL MOUNTED SWING STOOL, ADA ACCESSIBLE

A. Owner Furnish, Owner Install

B. Refer to Section 11 19 93 and manufacturer recommendations for installation requirements.

2.25 (DN4.8) FLOOR MOUNTED BED

A. Owner Furnish, Owner Install

B. Refer to Section 11 19 93 and manufacturer recommendations for installation requirements.

2.26 DETENTION ACCESS PANEL (DAP)

A. See floor plans and reflected ceiling plans for wall and ceiling mounted detention access panels. Coordinate size and location with the General Contractor.

B. Provide masonry anchors to attach metal framing in masonry construction.

C. Provide safety chain on swing-down ceiling type detention access panels.

D. Provide security sealant in accordance with 07 92 22 around perimeter of angle frame.

E. Assembly shall be provided with one (1) shop coat of primer. Field finish paint per Division 09 specification, color as selected by Architect. Verify primer compatibility with finish paint as specified in Division 09.

F. Prep door and frame for detention deadlock. See hardware set DHW-115 in the Detention Hardware specifications.

G. Furnish and install 20 additional 24”x24” Detention Access Panels in addition to what is required on the drawings. Final size and location of installation to be directed by General Contractor after coordinating with the MEP sub-contractors and shop drawings.

2.27 STAINLESS STEEL DETENTION ACCESS PANEL

A. MATERIALS
1. Stainless Steel: Type 304 14 GA standard 2B (bright cold rolled) finish.

B. Provide masonry anchors to attach metal framing in masonry construction.

C. Provide security sealant in accordance with 07 92 22 around perimeter of angle frame.

D. Prep door and frame for detention deadlock. See hardware set DHW-115 in the Detention Hardware specifications.

2.28 PISTOL LOCKERS:

A. Construction:
1. (2) Three compartment pistol lockers stacked.
2. 3/16" shell and doors.
3. Compartments lined with 1/8" felt.
4. Swing out compartment doors hung on continuous hinges.
5. Recessed models to have 3/16" x 2" x 4" masonry tabs.
6. Provide each compartment with snap locks, each compartment individually keyed and masterkeyed.
7. Provide compartment/key labels and numbers (as per the Owner's direction and requirements).

B. Size/Mounting:
1. 20" wide x 28" high x 6" deep.
2. Top of pistol lockers to be mounted at 5'-4" above finish floor.
3. See floor plans for location of lockers.

C. Assembly shall be provided with powder coat finish paint, color as selected by Architect.

2.29 DETENTION SPECIMEN PASS

A. Construction:
1. Stainless steel door on inmate side
2. Stainless steel door with vision panel on staff side.
a. 1 ¼” Acrylic vision panel

B. Size/Mounting
1. Clear inside dimension 8” x 8” x Wall Width

C. Acceptable Manufacturers:
1. Chief Industries, Inc.; Grand Island, NE
2. Norix Group, Inc.; West Chicago, IL
3. PDI; San Antonio, TX
4. Creative Industries; Indianapolis, IN

2.30 DETENTION EQUIPMENT ACCESSORIES

A. Provide accessories, anchorage inserts and security fasteners for a complete, tamperproof installation.

B. Exposed Security Fasteners:
1. Provide torx-pin head security fasteners for anchoring work in exposed detention areas. Comply with specification section 11 19 93.
2. Finish to be zinc coated or stainless steel for wet locations.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the work.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations before installation.

C. Notify the General Contractor in writing of conditions detrimental to the proper and timely completion of the work.

D. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the work.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Expenses carried by the Architect/Engineer, Project Manager or Owner in troubleshooting equipment problems caused by inadequate workmanship or other form of poor performance on the part of the Contractor, shall be borne by the Contractor.

B. Comply with manufacturer's printed installation instructions.

C. Touch-up painting of factory finished or factory primed items is the Installer's responsibility.

D. Fill voids between materials of the detention equipment and embeds or other physical construction with low-mod gel, equal to Sikadur 23, by Sika.

3.3 CLEANING

A. Clean equipment thoroughly prior to Substantial Completion.

3.4 PROTECTION

A. Protect equipment and finishes until Substantial Completion.

B. Replace damaged equipment as directed by the Architect.

END OF SECTION 11 19 63

SECTION 11 19 93 - TAMPER-PROOF METAL FASTENERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
1. Tamper-proof metal fasteners
2. Tamper-proof anchors.
3. Accessories.

B. Related Sections include the following:
1. Division 5 for Metals
2. Division 8 for Openings
3. Division 10 for Specialties
4. Division 11 for Equipment
5. Division 14 for Conveying Equipment
6. Division 21 for Fire Suppression
7. Division 22 for Plumbing
8. Division 23 for Heating, Ventilating, and Air-Conditioning (HVAC)
9. Division 25 for Integrated Automation
10. Division 26 for Electrical
11. Division 27 for Communications
12. Division 28 for Electronic Safety and Security

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. (no more than 12 different types allowed on the project.)

B. Submit Data on tools/wrenches to be used for this project.

1.4 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle per manufacturer's requirements.

PART 2 - PRODUCTS

2.1 TAMPER-PROOF METAL FASTENERS

A. Exposed Security Fasteners:
1. Torx-pin head security fasteners.

2. Finish shall match that specified of the item anchored
3. Diameter: #4 through ¾”

B. Expansion Anchors:
1. Structural concrete of masonry stud anchors similar to Hilti Qwik-Bolt or equal.
2. Provide with non-removable nuts of twist-off nuts.

C. Fabrication
1. Fabricate removable tamper-proof fasteners to allow removal only by tools specifically for individual tamper-proof fastener design.
2. Plating: Cadmium, zinc, nickel, phosphate and chrome.
3. Limit size and shape variations such that no more than six (6) different tools are required for each type of tamper-proof fastener used on the project.

2.2 ACCESSORIES

A. Screw-thread Adhesive Sealant: Loctite No. 271 or acceptable substitute.

2.3 Sources

A. Security Screws may be obtained through the following dealers:
1. Bryce Fastener Company, Inc.; Gilbert, AZ
2. Camcar Division of Textron, Inc.; Rockford, IL
3. Safety Socket Screw Corporation; Chicago, IL
4. Sentry Security Fasteners, Inc.; Peoria, IL
5. Tamper-Pruf Screws, Inc.; Paramount, CA
6. Tanner Bolt & Nut Corporation; Brooklyn, NY

PART 3 - EXECUTION

3.1 LOCATIONS

A. Provide tamper-proof metal fasteners to work under the General, Mechanical, and Electrical Contracts. This shall include fasteners for equipment, furnishings, fixtures, doors, windows, exposed structural connections, attachments and hardware.

B. Tamper-proof metal fasteners shall be used for fastenings, except in the following areas:
1. Mechanical and electrical rooms, communication equipment rooms, including roof mounted equipment.
2. Areas above suspended ceilings, behind access panels and within pipe and duct chases.
3. Areas not within secure perimeter.

3.2 INSTALLATION

A. Install work using proper sized tamper-proof fastener, matched to configuration, structural loading, and size.

B. Install fasteners with the proper amount of torque as recommended by the manufacturer.

C. Set tamper-proof fasteners with screw thread adhesive sealant in accordance with manufacturer's instructions.

D. Store and maintain inventory control for each installing tool used for installation of security fasteners. After use, installers shall return tools for inventory control. At completion of the project, installing tools shall be turned over to the facility.

E. Install tamper-proof fasteners after final painting to allow for future removal during maintenance.

3.3 SPARE PARTS

A. Provide five (5) security fastener kits to the Owner. Kits shall contain all fasteners found on project and a tool with bits. Package each set in an individual kit and deliver to an authorized representative of the owner.

END OF SECTION 11 19 93

SECTION 112300 - COMMERCIAL LAUNDRY EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Washer.
B. Dryers.

1.2 RELATED SECTIONS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division - 1 Specification sections, apply to work of this section.

B. Division 03 Section - Cast-In-Place Concrete: Foundation bases for the quipment.

C. Division 05 Section - Metal Fabrications: Steel equipment supports.

D. Division 22 and 23 Sections for supply and exhaust fans; exhaust ductwork; service roughing-ins; drain traps; valves, pipes, and fittings; and other materials required to complete commercial laundry equipment installation.

E. Division 26 Sections for wiring disconnect switches, and other electrical materials required to complete commercial laundry equipment installation.

F. Wall and floor systems and finishes are specified in the Division 9.

G. Provide tamper-proof metal fasteners in all areas accessible to inmates in accordance with Specification Section 111993, Tamper-Proof Metal Fasteners.

H. For security joint sealant requirements please refer to Specification Section 079222 Security Joint Sealants.

1.3 REFERENCES

A. UL Certification: Provide electric equipment and components that are evaluated by UL for fire, and electric shock according to applicable safety standards and that are UL certified for compliance and labeled for intended use.

B. NFPA 70 - National Electrical Code.

1.4 SUSTAINABLE PROJECT REQUIREMENTS

A. MRc2: Construction Waste Management
No less than the specified minimum proportion of all construction waste from the project shall be diverted from disposal in a landfill and/or incineration in accordance with the project requirements for Construction Waste Management.

See Section 01352 and 01505 Sustainable Design Requirements.

B. MRc4: Recycled Content Material
No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the project requirements for Recycled Content Materials.
All materials counted toward the computation of the proportion of the Recycled Content Materials shall comply with the standard for the minimum percentages of post-consumer waste materials and for the minimum percentage of pre-consumer waste materials. See Section 01352 Sustainable Design Requirements.

Contractor shall provide LEED credit verification as per Section 01340 Submittal Procedures

C. MRc5: Regionally manufactured harvested materials
No less than the specified proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the project site in accordance with the project requirements for Regionally Manufactured and/or Harvested Materials. See Section 01352 Sustainable Design Requirements.
Contractor shall provide LEED credit verification as per section Section 01340 Submittal Procedures.

D. EQc4.1: Low-Emitting Materials – Sealants and Adhesives
All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the project requirements for Low-Emitting Materials – Sealants and Adhesives. See Section 01352 Sustainable Design Requirements.

Contractor shall provide LEED credit verification as per Section 01340 Submittal Procedures.

E. EQc4.2: Low-Emitting Materials – Paints and Coatings
All paints and coatings used in the building interior comply with the project requirements for Low-Emitting Materials – Paints and Coatings. See Section 01352 Sustainable Design Requirements.
Contractor shall provide LEED credit verification as per Section 01340 Submittal Procedures.

1.5 SUBMITTALS

A. Submit under provisions of Section 01352.

B. Manufacturer's data sheets on each product to be used, including:

1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.

C. Shop Drawings: Include plans, elevations, sections, roughing-in dimensions, fabrication details, utility service requirements, and attachments to other work.

D. Coordination Drawings: Indicate locations of laundry equipment and connections to utilities, and clearance requirements for equipment access and maintenance.

E. Operation and Maintenance Data: For laundry equipment to include in emergency, operation, and maintenance manuals. Include a schedule with the following:

1. Designation indicated on Drawings.
2. Manufacturer's name and model number.
3. List of factory-authorized service agencies including their addresses and telephone numbers.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store equipment on site protected from weather, direct sunlight and temperature extremes. Do not remove packaging prior to storage and installation.
B. Consult manufacturer if machines are to be stored for an extended period of time.

1.7 PROJECT CONDITIONS

Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.8 WARRANTY

Minimum of 24 months parts and labor warranty on all Washers and Dryers.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer:

Unimac

B. Requests for substitutions will be considered in accordance with provisions of Section 012500.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrates have not been properly prepared then notify the Architect before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. System Startup and Commissioning: Arrange for a local manufacturer's representative to inspect machines prior to startup and operation.

3.4 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

ITEM	MANUFACTURER	MODEL NUMBER	QTY.
L1.	**Intermetro***	**BT48A**	**3**

DESCRIPTION: **Soiled Laundry Carts (NSF).**
Total of 3 units. Two carts for upper level housing units and one cart for first floor housing. These trucks shall have 6" diameter casters, two casters shall be swivel and two rigid.

FINISH:
a. Zinc Plated Heavy gauge steel.
b. Charcoal Blue Color

L2.	**Intermetro***	**CLT48A**	**3**

DESCRIPTION: **Clean Linen Carts**
These Linen Trucks shall be convertible equipped with all necessary accessories. They shall have capability to transport both bulk soiled bags and folded clean linens. These trucks shall have a 48 cubic feet capacity. These trucks shall have drain in the bottom, which allows them to be easily cleaned. These trucks shall have 6" diameter casters, two casters shall be swivel and two rigid.

FINISH:
a. Polymer construction
b. Charcoal Blue Color

L3. **Open Number**

L4.	**Unimac**	**UWNMN2SP112CW01**	**5**

DESCRIPTION: **Washers for Housing Units**
The overall dimensions of the "push to start" top load washer shall be 25 5/8" x 28" x 42 1/4" high. Each top load washer shall have low usage of hot water, low motor energy consumption and high moisture removal capabilities. Hence, each washer shall qualify to bear energy star label. The washer shall have a correctional package.

FINISH:
a. S/S tub
b. Color: White

ITEM	MANUFACTURER	MODEL NUMBER	QTY.

REQUIREMENTS:

Electrical:
- **a.** 120/60/1
- **b.** 15 Amperes (Amps)
- **c.** ½ Horse Power (Hp)

Plumbing: Incoming Cold Water (CW) shall be 60 degree – 80 degrees Fahrenheit (F) & Hot Water (HW) 125 degrees F
- **a.** ¾" HW @ 20 –120 Pounds per square inch (PSI)
- **b.** ¾" CW @ 20 –120 PSI
- **c.** ¾" Indirect Waste(IW) to Funnel Floor Drain (FFD)

NOTES: The GC and Laundry Equipment Contractor shall refer to the plumbing engineering drawings for the drain connections.

L5. **Unimac** **UDE807** **5**

DESCRIPTION: **Dryers for floor Housing Units**
The overall dimensions of the dryer shall be 26 7/8" x 28" x 43" high. The dryer shall have manual push to start controls. Each dryer shall have 7.0 cubic feet capacity. Each dryer shall have large door opening for ease in loading and unloading. The dryer shall have a correctional package.

FINISH: Color: White

REQUIREMENTS:

Electrical:
- **a.** 120/208/60/1
- **b.** 30 Amps
- **c.** 1/3 Hp
- d. 4.75 Kilowatts(KW)

Mechanical:
4" Exhaust duct

NOTES: The Laundry Equipment Contractor shall field verify the door swing for each dryer prior to purchasing them because of room configuration.

L6. **Intermetro*** **LXHR-Plus** **5**

DESCRIPTION: **Linen Carts (NSF).**
The overall dimensions of this cart shall be 24" x 24" x 39" high. The cart has a capacity to hold 7 laundry bags.

ITEM	**MANUFACTURER**	**MODEL NUMBER**	**QTY.**
	FINISH:	6” diameter casters	
L7.	**Aero**	**2F1-2424**	**5**
	DESCRIPTION:	**Laundry Sink with Faucet (NSF).** The overall dimension shall be 27 ½" x 27" x 41 ¼" high including 10" high backsplash. The sink shall have 24” x 24” x 14” deep bowl. The unit shall have a faucet, cross bracings and welded gussets.	
	FINISH:	**a.** 14 ga 304 S/S sink **b.** 16 ga 304 S/S legs **c.** S/S adjustable feet	
	REQUIREMENTS:	**Plumbing:** **a.** ½" HW **b.** ½" CW **c.** 1 ½" Direct Waste (DW)	

ASTERISKS in the above SPECIFICATIONS DENOTE:

* **Equipment will be purchased and installed by the DPDS/DPSCS and not by the Laundry Equipment Contractor/General Contractor, BUT the General Contractor shall be responsible for providing all utility rough-ins for these equipment as needed.**

END OF SECTION

SECTION 114000 – FOOD SERVICE EQUIPMENT

PART 1: GENERAL

1.1 COMMISSIONING

The materials, components and systems described in this section are subject to the Commissioning process. Contractor must comply with all Commissioning Requirements. Commissioning Requirements are described in Section 019113 General Commissioning Requirements and in Division 36 Commissioning. Division 36 provides an individual Commissioning specification section for each Division 2 through Division 33 specification section requiring Commissioning.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division - 1 Specification sections, apply to work of this section.

B. Requirements for providing plumbing fixtures, trim for sinks, other equipment, service piping (cold water, hot water, waste), including connections to fixtures and equipment, exhaust duct connections are specified in the Division 22 and 23.

C. Provide electrical fixtures and equipment, including the conduit and wiring between fixtures/equipment and stub-outs, and their connections, including circuits to the panels as specified in the Division 26.

D. Wall and floor systems and finishes are specified in the Division 9.

E. Provide tamper-proof metal fasteners in all areas accessible to inmates in accordance with Specification Section 111993, Tamper-Proof Metal Fasteners.

F. For security joint sealant requirements please refer to Specification Section 079222 Security Joint Sealants.

1.3 DESCRIPTION OF WORK

A. The Kitchen Equipment Contractor (KEC) shall provide appropriate services to make Food Service Facility operational. The extent of scope of work includes, but is not limited to:

1. Procuring, receiving, storing, handling, delivery, setting-in-place and where applicable installing of each specified equipment (buyout and fabricated) for the Food Service Facility shall be the responsibility of the KEC.
2. All Food Service Facility equipment shall be **new** and have a

Correctional/Security package appropriate for use in the Correctional Facility.

3. Field inspections throughout the new/renovated food service facility. Do field verifications of the dimensions for all custom & buyout equipment, entrances, elevators, stairs, etc., throughout the facility
4. Testing and adjustment of equipment as applicable.
5. Demonstrating of the necessary and major equipment
6. Providing of Maintenance manuals as appropriate.
7. Furnishing warranties as specified here and as stated within the Contract documents.

B. Work includes all labor, material, equipment and services required for furnishing and setting in place of kitchen equipment as indicated in the contract document. Equipment shall be ready for the final connections for Plumbing, HVAC, and Electrical trades.

C. Deviations:

All equipment shall be provided according to the following specifications and associated drawings including equipment schedules. No deviations from the specifications shall be permitted without obtaining written approval from the following:

1. State (DPSCS/DPDS)
2. Food Service Consultant

Verbal or written approval from only one of the above entity shall not be accepted.

The request for deviations shall be submitted by the KEC to the DPSCS and the Consultant in such a way that the approval or rejection can be made unanimously by both the DPSCS and the Food Service Consultant 14 business days prior to the bid opening. Once the General Contractor (GC) has submitted the bid to the DPSCS, no requests for deviations shall be allowed. If necessary, DPSCS will request the KEC to obtain additional approvals from the DHMH.

To obtain approvals from the DPSCS, the Food Service Consultant and if necessary from DHMH, the KEC shall provide Manufacturer's written specifications, product literature, layouts, mechanical and electrical studies to prove to the approving body that what the KEC has proposed shall exceed or be equal to the specifications of the Contract Document. At the same time the proposed equipment of the KEC shall fit within the given space and be appropriate for the project. Once, the KEC obtains the approval the KEC shall include the same product literature, layouts, mechanical and electrical documents in the Food Service Shop Drawing Submittal package.

Even though the KEC has obtained an unanimous written approval for substituting equipment from the above designated entities, yet, if there is a possibility of any increase in costs for

utility connections, etc., then those costs shall be entirely borne by the GC/KEC and not by the owner.

D. No options or substitutions shall be permitted for the equipment specified in Section 114000 3.6.

1. **Low temp industries, Inc.** (LTI, Inc.)
   9192 Tara Boulevard
   Jonesboro, Georgia 30236
   (888) 584-2722

2. **Meiko**
   1349 Heil Quaker Boulevard
   La Vergne, Tennessee 37086
   (800) 868-3469

E. THE UTILITY CONNECTIONS to all the Food Service Equipment, from the ROUGH - INS, to the FINAL CONNECTIONS shall not be the responsibility of the KEC. The KEC, shall also not be responsible for OPERATIONAL TESTING, CONTROL WIRING, ETC., THE GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR GETTING ALL OF THE ABOVE WORK DONE FROM THE APPROPRIATE QUALIFIED TRADES Such as PLUMBING, MECHANICAL AND ELECTRICAL TRADES.

1.4 QUALITY CONTROL

The GC shall select a KEC based **solely on the required qualifications** and not on the KEC's bid price for this project. The GC will review the KEC firm's qualifications. The bidder (GC) shall ensure that the KEC meets the below criteria and the GC shall provide a statement in the bid documents indicating that the candidate KEC meets the qualifications outlined here.

A. Qualifications of KEC:
All work of this section shall be provided by a qualified KEC. The candidate KEC shall meet the following qualification requirements:

1. Relevant Experience
   Candidate KEC firms shall have relevant experience in the correctional food service facilities.
   Criteria:
   The KEC should show the capability of having purchased and successfully installed Food Service equipment in 2 or more correctional food service projects. Each project should have been **completed and operational** for a **minimum of two years**, but not greater than 5 years. **Each project** should have a kitchen equipment value of $ 700,000.00 or greater.
2. Number of years in business
   The candidate KEC firm should be an established KEC firm and currently in business for a minimum of 7 continuous years.
3. Bankruptcy Protection
   Candidate KEC firm or any of it owners have not filed for bankruptcy protection within the past 5 years.

4. Project Superintendent
   The candidate KEC firm shall submit the name and qualifications of the proposed site based project superintendent who had experience in managing correctional food service projects. The project superintendent shall have a minimum of 5 years of experience and shall remain permanently assigned to the project until the owner's acceptance of the project. The site based project superintendent is not required full time at the site but as needed to fulfill his contractual responsibilities. As needed, the project superintendent shall be available at the site for site verification, site coordination, assurance of proper connection of equipment, and coordination with other trades during construction but not limited to this work. The owner may, at their option and upon written request of the KEC approve the replacement of a site based project superintendent only due to the circumstances beyond the control of the KEC.

B. The KEC shall be responsible for coordination and installation of all kitchen equipment supplied by various vendors and manufacturers. The KEC shall provide the necessary information, data, templates, etc. which are required for the coordination of other trades to the GC. Once, the Notice-to-proceed is given to the GC by the DPSCS, the KEC shall produce coordination and installation drawings, i.e., shop drawings (30" x 42") and submit the same to the GC and the Consultant within 60 days.

C. Kitchen equipment work shall conform to all Federal, State, and Local codes, regulations, rules, and laws that govern all necessary permits, tests and inspections for the equipment

D. **Equipment specified in this section shall be manufactured to** meet requirements of:

1. The National Sanitation Foundation and bear **NSF** labels.
2. Underwriters Laboratories and bear **UL** labels.
3. American Gas Association, Inc and bear **AGA** labels.
4. Comply with applicable **ANSI** standards for electrical powered and gas burning equipment, for piping to compress gas cylinders, and for plumbing fittings including vacuum breakers and air gaps to prevent siphon in water piping.
5. Air Conditioning and Refrigeration Institute **(ARI)**.
6. American Society of Mechanical Engineers and bear **ASME** labels.
7. National Fire Protection Association **(NFPA)**.
8. National Electric Code **(NEC).**
9. United States Department of Agriculture **(USDA)**
10. COMAR 10.15.03 **(State of Maryland Health Code)**
11. Hazard Analysis Critical Control Points **(HACCP)** regulations

E. Kitchen equipment shall meet requirements and bear label of the **NSF**. Specifications set forth are considered minimum and may be superseded by any superior requirements in effect as of this date by the NSF or the State and City Health Departments.

F. Where requirements of drawings and specifications are in excess of regulations, drawings, and specifications shall govern. Whenever the requirements of the drawings and specifications conflict regulations, regulations shall govern. No extra charge shall be made for providing items required by regulations but not specified or indicated.

G. Where units cannot be fully shop fabricated, the fabricator shall complete fabrication work at the project site.

H. Wherever possible equipment shall be energy efficient and bear energy star label.

1.5 SUSTAINABLE PROJECT REQUIREMENTS

A. MRc2: Construction Waste Management
No less than the specified minimum proportion of all construction waste from the project shall be diverted from disposal in a landfill and/or incineration in accordance with the project requirements for Construction Waste Management. See Section 01352 and01505 Sustainable Design Requirements.

B. EQc4.1: Low-Emitting Materials – Sealants and Adhesives
All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the project requirements for Low-Emitting Materials – Sealants and Adhesives. See Section 01352 Sustainable Design Requirements.

Contractor shall provide LEED credit verification as per Section 01340 Submittal Procedures

C. EQc4.2: Low-Emitting Materials – Paints and Coatings
All paints and coatings used in the building interior comply with the project requirements for Low-Emitting Materials – Paints and Coatings. See Section 01352 Sustainable Design Requirements.

Contractor shall provide LEED credit verification as per Section 01352 Submittal Procedures.

D. MR5: Regional Materials
Comply with the section 01352

1.6 SUBMITTALS

A. All submittals shall be submitted no later than **60 calendar days** from the date of Notice to Proceed given to the GC. The Food Service submittals

shall be submitted in total **at one time and no partial submittals shall be acceptable.** These submittals shall be sent simultaneously to the DPSCS and Food Service Consultant. Any re submission of the Food Service submittals including incomplete submissions, which are generated by the GC/KEC to be reviewed by the A/E team then the GC will be charged from the second review onwards for the review time of the A/E team. The review time for the Food Service Consultant will begin after receiving a complete submission package. The GC shall allow 4 weeks for the review of the KEC submittal package. If the consultant is required to review from the second time onwards, then each review of the KEC submittal package will require a minimum of 3 weeks review time. For additional information refer to Division 1, General Requirements.

B. DPSCS and the Food Service Consultant shall each receive **only one set of the submittal package.** After the DPSCS, the Food Service Consultant and the remaining A/E team have reviewed the submittal package then the GC/KEC shall make copies of the submittal package with review comments for distribution as called out by the Architect in the earlier sections. The KEC shall provide equipment according to the drawings and specifications approved by the DPSCS and the DHMH.

C. The submittal requirements described below, apply to all equipment.
Submittal package shall include the following but not limited to the following list:

1. **Floor Plans:**
   Food Service Equipment Plans should be provided in a minimum scale of ¼" = 1'- 0".
2. **Equipment Schedules:**
   Submit equipment schedules indicating item numbers, quantity, description, and manufacturers names. **Utility information shall not be a part of the equipment schedule** but shall be submitted **separately** as indicated below in PART 1, 1.4.C.5 and 1.4.C.6.
3. **Cut sheet Books:**
   Cut sheet books for the Food Service Equipment shall be provided. On manufacturer's data sheets, any information **not pertaining to the equipment specified for this project should be crossed out**. A typed **8 ½" x 11" lead sheet shall precede each cut sheet indicating Manufacturer's names, model numbers, quantities, characteristics and utility requirements of the equipment.** Clearly show all components, which are provided as "optional" by manufacturer but are required for this work. Cut sheet book submittal shall be bounded in numerical sequence corresponding to item numbers of the equipment. Omission of data from this submission does not reduce obligation to provide items as specified.
4. **Rough-in-drawings:**
   Submit plumbing, electrical and mechanical, Rough in

drawings in a minimum scale of 1/4" =1'-0". Drawings shall indicate size and location of each hot and cold water, waste, indirect waste and electrical connection to be stubbed out of floor and wall for connection to individual items. Each point of connection shall be dimensioned to the total of individual dimensions on a line shall equal to a known distance between walls or columns or two other reference points. Rough-in drawings shall also indicate dimension of floor depressions, raised bases and wall openings for the equipment. Verify the locations of new floor drains, open site drains & rough-ins at the site, before completing the Rough-in drawings. Wherever possible, rough-in shall extend out from walls instead of floors and the GC shall make a special note of this on all Rough-in drawings. The GC and KEC shall make the necessary field inspections before concrete floors are installed to check the location of sleeves and conduits affecting equipment relative to space on which each piece of equipment is to be located and its utility connected to avoid expensive relocations of the utilities. Utility services shall be roughed-in at the site to match Rough-in drawings and GC/KEC shall be responsible for conforming to these conditions with the equipment and connections provided by them. These Rough-in drawings shall be submitted to the A/E for approval.

5. **Plumbing Schedules:**
   Submit plumbing schedules in a tabular format indicating pertinent plumbing and mechanical information required to make hook-ups and the final connections to all the equipment. The schedule shall include quantity, exact size, maximum utility demands (CFMS, BTUS, etc.) and connection characteristics, etc.,
6. **Electrical Schedules:**
   Submit electrical schedules in a tabular format indicating pertinent electrical information required to make hook-ups and the final connections to all the equipment. The electrical schedule shall include actual load requirement along with maximum utility demands, quantity, exact size and connection characteristics.
7. **Detailed shop drawings:**
   Submit detailed shop drawings of each fabricated equipment in a minimum scale of 3/4" = 1'-0". The drawings shall indicate dimensions, details of construction, material, finish, gauge, installation methods and relation to the adjoining equipment and related work. Depict reinforcement and anchoring details. Indicate an item number below each detail on the drawing. At a minimum shop drawings shall be provided of Hoods, walk-ins, refrigeration systems, etc., etc.,
8. **Templates:**
   Submit full scale templates to prove that the floor troughs for kettle meet the pour path.
9. If necessary, furnish certified analysis of performance tests, rated capacities, mechanical connections required and other information required for review of standard manufactured articles and equipment.

1.7 GUARANTEE, SERVICE AND WARRANTIES

A. Refrigeration equipment for Walk-ins shall be provided with 5 years full service contract from the date of owner's acceptance of work. The contract shall include providing parts, replacements of parts, replacement of equipment and 24-hour per day local service. Other refrigerated equipment shall be supplied with the manufacturer's extended 5-year replacement warranty for compressors and condensers at no cost to the owner from the date of the owner's acceptance of work.

B. **All equipment specified in the food service contract documents** of this project shall be provided **with 2 years manufacturer's warranties.** Work specified herein shall be accepted when all defects have been corrected and the A/E certifies all of the contractor's obligations hereunder have been fulfilled. The GC/KEC shall guarantee the entire installation completely free of all defects of material, equipment, workmanship (manufacturers, KEC and his installer), and provide proper adjustment of all systems, equipment and devices for 2 years beginning from the date of owner's acceptance of work.

PART 2: PRODUCTS

2.1 GENERAL REQUIREMENTS

A. KEC shall be responsible for providing each item of equipment complying with the requirements of and being approved by, the Local and State Health Departments. All equipment shall be complete with all usual wiring, switches, controls, valves, vacuum breakers, regulating valves, etc.

B. Manufactured items are specified by manufacturer's name and model number and it is the intention that when these items shall be furnished they shall be complete with all accessories as stated in published catalogue data, shop drawings and literature existing at the time of the bidding.

C. Provide all internal piping connections including faucets, stops, valves, cocks, strainers, water pressure regulating valves, flow control valves and/appurtenant devices as part of the equipment installation. Also, provide all internal wiring of equipment, thermostats, lighting fixtures and bulbs within equipment, electrical starters, motors, switches and/appurtenant devices as part of the equipment installation.

D. The manufacturer called out in the itemized specifications shall fabricate all specially built equipment. Where stationary items of equipment are installed less than 4" from walls provide approved vermin-proof seal between equipment and the structure. Generally this shall consist of an angle, of the same material as the equipment, fastened to the equipment and to the wall with bolts and having silicone sealer between equipment and structure or other pieces of equipment, including partitions, floors, bases, etc. These shall be fully detailed in shop drawings submittals and coordinated with the various trades and subcontractors involved.

Where electrical receptacles occur, cut recesses in walls as required to permit the equipment to fit snugly against such walls leaving no gaps or other openings.

E. Any dimensions shown, and all dimensions required for the work shall be verified by the KEC. Any discrepancies shall be referred to the A/E before any work affected thereby has been performed. This shall also apply to recesses, depressions in floors, curbs etc., that have been provided by other trades, which in any way may affect the work under this section.

F. Before purchasing or fabricating any item of equipment, the KEC's attention is especially directed to the necessity of checking the sizes of all doors and other openings through, which the equipment must pass. He shall also check the particular location where the equipment shall be placed. Should the KEC fail to do such checking and it is necessary to enlarge any opening, or change the dimensions or any piece of equipment, the owner shall not be responsible for and all costs in connections therewith.

2.2 MATERIALS

A. Stainless steel (S/S) shall be type 304, extra low carbon non - magnetic, austenitic18% chrome - 8% nickel corrosion resisting alloy steel. Sheets shall be flat, free of all buckles and surface imperfections.

B. Galvanized iron (GI) shall be Armco iron or an approved grade copper bearing steel. Finish of GI to be 2 coats of epoxy based gray hammer tone paint on prime undercoat over thoroughly cleaned surfaces.

C. Except as otherwise indicated in the contract documents, exposed metal less than 18 Gauge S/S. e.g. removable covers, skirts, enclosure panels, closures and trim strips, etc.

D. S/S pipe and tubing shall be seamless or welded of gauge specified and of true roundness. Seamless tubing shall be thoroughly and correctly annealed, pickled, and ground smooth. Welded tubing shall be thoroughly heat treated and properly quenched to eliminate precipitation, drawn true to size and roundness and polished to match S/S sheets.

E. Structural sheet members used for framing consisting of angles, bands, bars, channels etc., shall be ductile in quality, free of hard spots, runs and defects. They shall be smooth, galvanized by the hot dip process with all surplus removed, free of runs, blisters, excess spills and uncoated spots or patches.

F. White metal shall consist of corrosion - resistant metal containing not less than 30% nickel. All castings shall be rough ground, polished, buffed to bright luster, free from pit marks, runs, checks, burrs, and other imperfections. In lieu of white metal casting, 18 - 8 S/S dies-stamped or cast will be acceptable.

G. **Sound deadening**, non-flaking material of 1/8" thick heavy bodied resinous coating shall be applied to all S/S fabricated equipment.

2.3 FABRICATION

A. Welding:

1. All welding shall be done by the Heliarc method. All welding shall be done in a thorough manner with welding rod of the same composition as sheets or parts welded. Welds shall be complete welds, strong and ductile with excess metals ground off and joints finished smooth to match adjoining surfaces. Welds are to be free of mechanical imperfections, such as gas moles, pits, runs, cracks etc. All joints in tops, sides and ends of fixtures, tables, drain boards, over shelves, sinks etc., shall be continuously welded so that the fixtures shall appear as one piece construction. Butt welds made by spot welding straps under seams and filling in the voids with solder and finished by grinding shall not be acceptable.
2. Spot welds shall have a maximum spacing between welds of 3". Tack welds shall have at least 1/4" length of welding material at a maximum spacing of 4". Welds at the ends of channel batten shall not exceed 2" center.
3. **In no case shall soldering at any time be considered as a replacement for welding.** The soldering should not be done when the stability and the strength of the equipment or the joint is in question.

B. Screws, bolts, and rivets:

1. All exposed surfaces shall be free from bolt, screw and rivet heads. When bolts are required they shall be concealed type and be of similar composition as the metal to which they are applied. Where bolt or screw threads on the interior of fixtures are visible or may come in contact with hands or wiping cloth, they must be capped with a S/S acorn and not with S/S lock washer.
2. Where screw threads are not visible or readily accessible, they must be capped with a standard lock washer and treated to prevent rusting or corroding. Wherever bolts or screws are welded to the underside of the trim or the tops, the reverse side of the weld shall be neatly finished and uniform with the adjoining surface of the trim or the top. Depressions at these points shall not be acceptable. Rivets shall not be used as a method of fastening in any location.
3. All welds, bolts, screws, nuts, washers, and rivets shall be S/S except where 1brass is fastened they shall be brass. Where dissimilar metals are fastened, the fastenings shall be of higher grade metal. Spacing and extent of welds, bolts, screws and rivet shall ensure suitable fastenings, and prevent bulging of metal fastened. **All fasteners shall be tamper-proof and non-removable.** Provide tamper-proof metal fasteners in all areas accessible to inmates in accordance with Specification Section 111993, Tamper-Proof Metal Fasteners. This includes exposed fasteners, supports, attachments, or connections for all material, equipment, furnishings, fixtures, doors & hardware, and systems.

C. Joints:

1. Tops of fixtures shall be fabricated in the factory with welded joints to reduce field joints to a minimum. Where fixtures join, the tops of such fixtures shall be continuous with welded joints. All joints shall be ground and polished to match the factory finish.
2. In general, the fixtures shall be shop fabricated of one-piece construction, and shall be shipped to the job completely assembled. When equipment is too large to transport or enter the building as one piece, the required field joints shall be kept at a minimum. Joints welded at the job site shall be equal to the construction as specified above.
3. Trim is not an acceptable substitution for accuracy and neatness. When trim is required and accepted by the owner in lieu of the rejection of items of equipment, it is the KEC's responsibility to provide the same at no cost to the owner.
4. Workmanship throughout shall be of the highest grade, in accordance with the best practice and most modern methods. All parts shall fit together securely and accurately. Minimum of field joints shall be provided, but the ground for providing field joints shall be for the convenience of installation and shipping.
5. Joints shall be provided with butt straps on the underside of the top so that tops can be pulled together tightly forming a hairline/watertight connection. All field joints shall be welded, ground, and polished to a number 4 finish. There shall be no exposed bolts or rivets on the top except where construction necessitates, A/E shall decide if any are required.

D. Grinding, polishing, and finishing:

1. All exposed welded joints shall be flush with adjoining material and neatly finished to obtain smooth and even surface. Wherever material has been sunken or depressed by welding operation, such depression shall be hammered and made flush with the adjoining surface and if necessary, again ground to eliminate low spots. In all cases, the grain of rough grinding shall be removed by successive fine polishing operations.
2. All unexposed welded joints on under shelves of tables or counters in S/S construction shall be suitably coated at the factory by metallic base paint to prevent possible corrosion at such locations.
3. After GI part of the equipment has been welded, all welds and areas where the galvanizing has been damaged it shall be recoated to prevent oxidation. KEC shall submit a sample of recoated area complete with a detailed explanation of the method to be used for Architect's approval before proceeding, if required.
4. Butt joints and contact joints, wherever they occur, shall be close fitting and shall not require solder as a filler. Wherever break bends occur, they shall be free of undue extrusion and shall not be flaky, scaly or cracked in appearance, where such breaks do mar the uniform surface appearance of the material, all such marks shall be removed by suitable grinding, polishing and finishing. Wherever sheared edges occur, they shall be free of burrs, fins or irregular projections and shall be finished to all danger of cutting or laceration when the hand is drawn over such sheared edges. In no case are overlapping materials to be acceptable where miters or bull-nosed corner occurs.
5. The grain of polishing shall run in the same direction on all horizontal and

all vertical surfaces of each individual item of fabricated equipment, except in the case where table or sink tops join at right angles and sinks and adjacent drain boards join with the length of the back splash and sink compartment shall be acceptable.

6. Whenever, S/S surfaces are disturbed by the fabricating process, those surfaces shall be finished in a fine satin finish.
7. At the completion of installation all equipment shall be polished and buffed. S/S, where exposed shall be polished to a # 4 commercial finish. Where unexposed, the finish shall be # 28. All painted surfaces shall be carefully retouched as required.
8. Metal surfaces, which require painting, on those surfaces first rust and dirt shall be removed and then cleaned and prepared for painting. Apply treatment to zinc coated surfaces, which have not been mill phosphatized. Welded and chafed areas of zinc-coated surfaces shall be coated with galvanized repair paint.

E. Fabrication details:

Refer to the contract drawings and itemized specifications for the fabrication details. Where the fabrication details have not been called out in the contract drawings or the itemized specifications then the custom equipment shall be fabricated according to the fabrication details shown below:

1. Tubular frame base:
   Construct 16 gauge S/S legs in 1 5/8" overall dimensions, with 1 5/8" longitudinal and lateral cross bracings. All S/S gussets shall be fully welded to 14 ga S/S channels and 1 5/8” legs shall be fully welded to the gussets. The welding between legs and bracing shall be ground, smooth and polished and have a uniform finish. Fit each leg with a S/S, fully enclosed circular gusset and S/S adjustable security type of bullet feet with a modified toe portion to receive # 5/16 floor pin. Provide floor pins for all units, which have plumbing connections. All bullet feet shall be welded in place with heavy tack welds.
2. Sinks:
   Construct sinks with all interior corners rounded to a 1/4" minimum NSF radius, both horizontally and vertically, forming a cove in the bottom. All joints shall be butt edged, electrically welded, ground, and polished so no evidence of welding shall appear. All sink sizes established in the specifications to be inside measurements. Bottom of each compartment shall be creased to the center and fitted with a S/S and cast brass, chrome-plated 2" lever operated waste outlet with a S/S strainer plate fitted in back of each compartment at a proper level and directly connected to the waste outlet with 1 ¼" chrome-plated brass role with faucet decks punched to accommodate faucets. The front shall be finished on the top edge, 3" above the working level, with a 1½" diameter 180 degree integral roll. When adjacent to wall, turn edges up minimum of 8" and back 45 degree angle to wall with 1" turn down edge. The ends where they are exposed shall be boxed. The turn down edge shall be fastened to the wall with 14 gauge galvanized “z” clips at 30" on center using tamper proof hardware. Exterior corners shall be

finished on the front and back edges only and left with a straight edge on the ends so that the drain boards may be continuously electrically welded thereto forming integral units with the top edge of the rolled rim curbing formed on one horizontal place across the front of the unit through the surfaces of the drain boards. The drain boards shall be pitched to the sinks per NSF requirements. Multiple compartment sinks shall be divided with double wall S/S partitions, having all corners rounded the same as other corners in sinks, continuously electrically welded in place with welds ground smooth and polished. The back, bottom and front shall be of one continuous piece with no overlapping joints or open spaces between the compartments.

3. Drain boards:
   Construct drain boards of S/S full width of sink having a 3" high curbing at front and ends. When adjacent to wall, turn edges up minimum of 8" and back 45 degree angle to wall with ends boxed. All corners shall be continuously smooth and polished to appear as one continuous piece with no overlapping joints or open spaces between the compartments.
4. Angles:
   All angles used in the framing shall be 2" x 2" x ½". Angles shall be fabricated from S/S, or galvanized. They must be rustproof and free of runs. Angle frame members on enclosed cabinet base shall be installed on the outside surface and must be flush and of smooth construction.

2.4 ELECTRICAL SERVICE REQUIREMENTS

A. Unless and except where otherwise directed in these specifications, all the equipment shall be completely wired and all connections to equipment specified herein shall be made under the electrical Division 26 and security Division 28 of these specifications, unless they are an integral part of the machine supplied.

B. All electrical outlets and receptacles mounted on or in fabricated equipment shall be furnished and installed by the electrical contractor, who will run all lines to a suitable terminal box (sub-panel, starter or disconnect switch as applicable), with all wires neatly tagged showing item number, voltage characteristics and load information.

C. Any and all control wiring necessary to complete the installation of Food Service Equipment shall be installed completely under the Division 26 specifications.

D. All starters shall have thermal overload protection and each electrically operated machine shall have a start and stop push button station mounted on the machine except those machines, which are factory equipped with snap switch control. Starter and thermal overload protection shall be in accordance with electrical Division 26 specifications. All equipment having plug-in connections shall be provided with a multi-conductor cable having sufficient number of conductors for equipment operations plus a grounding type cap to match the receptacle, installed to accept the specific item of equipment installed. Plug-in connections shall be coordinated per the electrical Division 26 so that the receptacles provided shall match the specific plugs installed as part of the plug-in equipment. If necessary, the furnished cords shall be shortened by the electrical contractor so they do not interfere with other equipment.

E. Circuit breakers and thermal overload protection devices shall be used on equipment. Fuses, fuse stats, and fusetrons shall not be permitted.

F. It shall be the responsibility of the electrical contractor to install and Interconnect when necessary all electrical controls, switches or other units, which are separately furnished.

G. All electrically heated equipment shall be internally wired to a thermostatic control and an on/off red neon light indicator, both to be mounted in a terminal box on a removable access panel.

H. Only rigid steel conduit shall be used, zinc coated where unexposed and chrome-plated where exposed. All wiring shall be run concealed wherever possible.

I. The electrical contractor shall supply on each motor driven equipment or electrical heating units a suitable control switch or starter of proper type and in accordance with UL code wherever such equipment is not so built. All other line switches, safety cutouts, control panels, fuse boxes, other control fittings and connections, when not an integral part of the units, shall be furnished and installed per the electrical section unless otherwise specified.
It shall be the responsibility of the GC as part of the work included under this division of the specification to ensure that all equipment furnished under this contract shall be so wired, wound, or constructed as to conform to the characteristics of electrical and other services at the premises. Lubricated bearings and gears of equipment shall be constructed so that unsafe lubricants cannot contaminate the food or food contact surfaces.

J. Equipment shall be new, or manufacturer's current production and furnished complete with motors, driving mechanism, starters and controllers, including master switches, timers, cutouts, reversing mechanism and other electrical equipment if and as applicable. Wiring and connection diagrams shall be furnished with electrically operated machines and for all electrically wired fabricated equipment. If any electrical components, parts, etc., are not provided by the food service equipment manufacturer as part of the equipment then these parts, components, etc., shall be furnished and installed by the electrical contractor as necessary to make the equipment operational.

K. Equipment shall be of rigid construction, free from objectionable vibration. Quietness of operation of all kitchen equipment is a requirement and KEC shall be required to remove or repair any equipment producing objectionable noise and/or vibration.

L. Motors shall be of the drip-proof, splash-proof or totally enclosed type, having a continuous duty cycle and ball bearings except small timing motors, which may have a sleeve bearing. All motors shall have windings impregnated to resist moisture. Motors located where subject to deposits of dust, lint or other similar matter from the machine they shall be totally enclosed type. Motors shall have ample power to operate the machine for which designated under full load operating conditions without exceeding their nameplate ratings. The manufacturer shall determine based on normal operation at maximum capacities the horsepower requirements on driven equipment. The nominal rated motor horsepower shall be not less than the horsepower required for normal

operation of the equipment at the maximum capacity.

M. All electrical components shall be UL approved and all wiring shall be in accordance with NEC or electrical codes in effect at the job site, whichever is appropriate.

N. S/S cover plates shall be furnished and installed for all electrical outlets, receptacles, switches, etc., furnished by the GC and shall match the material and finish of the equipment to which it shall be fastened, **fasteners shall be tamper proof and non removable.**

2.5 MECHANICAL SERVICE REQUIREMENTS

A. Water inlets shall be located above the positive water level to prevent siphoning of liquids into the water system. Wherever conditions shall require submerged inlet, suitable type of check valve and vacuum breaker shall be placed on the fixture to form a part of the same to prevent siphoning. Where exposed, piping and fittings shall be S/S.

B. All necessary faucets shall be furnished by the KEC with his equipment and shall be supplied with non-splash aerator.

C. The KEC, if possible, where applicable, shall provide suitable pipe slots and/or do all drilling, punching, and cutting of his equipment required to provide access for mechanical connections and/or runs. Such work when performed at the job site shall be of the same quality as similar to the work performed in the shop.

D. So as to ensure proper clearance for cleaning, all horizontal piping lines shall be run at the highest possible elevation and not less than 8" above floor, through equipment, wherever possible.

E. No exposed piping at fixtures or in other conspicuous places show tool marks, or more than one thread at the fitting.

F. The mechanical contractor shall supply suitable expansion valves for all refrigerated units.

G. All fasteners shall be tamper proof and non-removable.

PART 3: EXECUTION

3.1 DELIVERY STORAGE AND HANDLING

A. KEC shall uncrate and inspect all equipment prior to delivery at the job site. Arrange for immediate replacement of damaged or incorrect items so as not to delay the completion of the project.

B. Store equipment in packages to prevent it from being abused, damaged, dirty, lost or stolen.

3.2 PREPARATION

A. KEC shall examine roughed-in mechanical and electrical services, installation of floors, walls, columns, ceilings and conditions under which the work has to be installed. Verify dimensions of services, substrates, ceiling heights, door openings, walls, floors, loading dock, service elevator, etc., that affects his work. Notify GC in writing of the unsatisfactory locations and dimensions of other trades' work and of unsatisfactory conditions for proper installation of Food service equipment. Do not proceed with installation until unsatisfactory dimensions and conditions have been rectified in a manner acceptable to KEC and the A/E team.

B. The GC/KEC shall install equipment according to the location shown in the drawings. The GC/KEC shall coordinate location of adjacent equipment so the equipment next to each other is aligned.

C. The A/E reserves the right to require the KEC to make reasonable modification in the scheduling of the work and relocation of equipment without cost (labor and material) to the owner.

3.3 FINAL CONNECTIONS

A. The GC shall provide all final electrical and mechanical connections to the kitchen equipment using skilled workmen licensed to do such work. Such final connections may be provided under direct coordination and supervision of the KEC. It is KEC's responsibility to install all Food Service equipment (Section 114000) regardless of whether the equipment needs utility connections or not.

B. After final locations are set and equipment connections are satisfactory, all joints between stationary equipment and building structures shall be caulked with FDA approved clear silicone sealant. For security joint sealant requirements please refer to Specification Section 079222 SECURITY JOINT SEALANTS

C. The entire Food Service Facility and all equipment shall be cleaned.

3.4 INSPECTION AND TESTING

A. After final connection, KEC shall test all equipment for proper operation. Two weeks shall be allocated for testing the equipment before GC/KEC sets up an appointment with the A/E for close out inspection. During this period, multiple tests shall be conducted by the GC/KEC to accomplish "bug free" equipment.

B. KEC shall be responsible for close out inspections (punch lists) for the Food Service Facility. During inspections KEC shall be present and operate the equipment for the owner and the A/E representatives.

C. Obtain inspections and final approval of the installation from Local and State regulating agencies, especially DHMH.

D. If any costs are involved, to fulfill the requirements of DHMH, then those costs shall be borne by the KEC and not by the owner.

3.5 OPERATING INSTRUCTIONS

A. The GC/KEC shall be responsible for insuring that all Section 114000 equipment is fully tested and operational for the owner's acceptance. Provide operating instructions and servicing data by a qualified instructor who will demonstrate to the owner operating, repair and maintenance procedures.

B. Along with the live demonstration, KEC shall film the demonstration. Within 30 days of demonstration KEC shall furnish five copies of demonstration DVD to the owner.

C. KEC shall provide 5 copies of operating and maintenance manuals. Manuals shall contain the following data:

1. Operating and maintenance data with replacement parts list for each item of equipment bound in numerical sequence.
2. List of names, addresses and telephone numbers of local service agencies for each item of equipment.
3. List of equipment serial numbers and copies of manufacturer's warranties on all equipment.

D. KEC shall provide as built documents in coordination with the GC.

3.6 ITEMIZED EQUIPMENT SPECIFICATIONS

Along with the general specifications, KEC shall refer to the detailed (itemized) specifications of each item. IT IS DPSCS/DOC REQUIREMENT that all Equip. shall be provided with CORRECTIONAL/SECURITY PACKAGE APPROPRIATE TO BE USED IN CORRECTIONAL FOOD SERVICE FACILITY.

In addition to the above, GC/KEC shall refer to the specifications section 11400 for Item Numbers 1 through 47 allocated for the equip. of the Food service Facility.

ITEM	MANUFACTURER	MODEL NUMBER	QTY.
1.	Mars	NH236-1U	2

DESCRIPTION: **Air curtain (NSF, ETL & USDA).**
The cabinet of this unit shall be self-contained one piece housing. The cabinet shall be constructed of fire retardant and corrosion proof paint lock metal. The unit shall be 14" high. The unit shall have a correctional package. The motor control panel of the unit shall be mounted on the air curtain. The unit shall have 20 Amp Micro switch with delayed relay. Switch shall be mounted such that the air curtain shall turn on as the door begins to open. If necessary, the unit shall be provided with extended wall mounting brackets.

FINISH: Metal cabinet with grey baked rust preventative electrostatic polyurethane powder coating.

REQUIREMENTS: **Electrical:**
- **a.** 115/60/1
- **b.** 9.0 Amperes (Amps)
- **c.** 1 Horse Power (Hp) for Motor

WARRANTY: 5 years on all parts

NOTES: KEC shall field verify dimensions prior to the ordering of Air Curtains.

2.	Intermetro	A2436NS	12
		A2448NS	20
		A2460NS	8
		86PS	40

DESCRIPTION: **Shelving for Ambient & Non Food Storage (NSF).**
A total of 10 units. Each unit shall have 4 tiers with **correctional package.** The bottom shelf shall be installed at 18" aff. The height of other shelves shall be determined in the field confirming with the using agency

FINISH: 16 Gauge (ga) Stainless Steel (S/S)

NOTES:
- **a.** Units shall be field assembled.
- **b.** KEC shall field verify dimensions prior to the ordering of shelves.

3.	Intermetro	HDP55S	1

DESCRIPTION: **Ambient for Dunnage Rack (NSF).**

ITEM	MANUFACTURER	MODEL NUMBER	QTY.

Dunnage rack shall be capable of holding up to 3,000 Lbs. of weight. Each unit shall have a correctional package.

FINISH: 18 ga S/S

NOTES:
a. Units shall be field assembled.
b. KEC shall field verify dimensions prior to the ordering of dunnage rack.
c. KEC shall weld mat to the frame.

4. **IMC Teddy** **WS-SEC** **3**

DESCRIPTION: **Hand Sink w/ Soap Dispenser (NSF & UL).**
The unit shall be integral welded construction with a removable front access panel secured with tamper proof screws. Each unit shall have a backsplash, non-drip marine edges, a hands-free automatic electronic faucet and built-in soap and towel dispenser.

FINISH:
a. 16 ga 304 S/S
b. 14 ga 304 S/S fasteners

REQUIREMENTS: **Electrical:**
a. (2)120/60/1
b. 20 Amps

Plumbing:
a. ½" Hot Water (HW)
b. ½" Cold Water (CW)
c. 1½" Direct Waste (DW)

NOTES: The unit shall be field assembled.

5. **World Dryer** **K-973P** **3**

DESCRIPTION: **Hand Drier (NSF & UL).**
This surface mounted hand dryer shall be automatic. Infrared sensor shall detect hands, initiate and terminates the process of drying of hands.

FINISH: 14 ga. 304 brushed stainless steel cover

REQUIREMENTS: **Electrical:**
a. 120/60/1
b. 15 Amps
c. 1200 Wattage (Watts)

ITEM	MANUFACTURER	MODEL NUMBER	QTY.
6.	**Norlake**	**Fineline**	
		16'-4" x 8'-0" x 9'-3 5/8" (Beverage Cooler)	**1**
		16'-4" x 11'-0" x 9'-3 5/8" (Cooler)	**1**
	Jamison	**Plyfoam II**	**2**

DESCRIPTION: **Walk-in Coolers with Plastic Strip Curtains (NSF & UL).**
The walk-in Beverage Cooler and Cooler will be located adjacent to each other but separated by a building structural column. Each walk-in box shall be manufactured with environmentally friendly panels to assist going toward the goal of LEED. The floorless combination walk-in box shall be 9'-3 5/8" high. For the actual dimensions of the walk-in box please refer to the contract drawings. Each walk-in box shall be provided with actual (full size) dimensions and not with nominal dimensions. Each walk-in box shall be prefabricated modular construction. The panels shall be manufactured by injecting HFC 134A polyurethane foam insulation with a minimum of 2.0 cubic feet density. Insulation shall be 97% closed cell structure, 4" thick, UL Class 1 and have flame spread rating according to ASTME-84/UL 723 of 25 or less. Each wall panel skin shall be foamed using a double 90 degree bend on each edge to add strength and durability. The walk-in box panels shall be manufactured with perimeter wall panel strapping. Latches and receiver housing shall be connected with 2" wide steel straps permanently foamed in place within the panels. The ceiling panels shall be installed with suspended ceiling support systems. The walk-in box shall have four fluorescent light fixtures with low temperature ballasts and eight bulb sleeves. Two fluorescent light fixtures shall be assigned to the Beverage Cooler and two to the Cooler. The walk-in shall have 2 low temperature occupancy sensors with control panels. All components of walk-in box requiring, electrical power shall be provided with concealed electrical conduits through the walk-in panel. Panels shall be foamed with conduits stubbed to a junction box on the exterior ceiling so final connection for all components, fixtures, equipment etc., can be connected easily. The walk-in box shall have exterior 1/8" thick aluminum diamond tread wall plate 60" high shall be installed on all exterior exposed portions of the box (excluding doors); interior 1/8" thick aluminum diamond tread wall plate 48" high shall be required for the entire walk-in; 8" high neoprene, 1 ¼" thick, high impact polyurethane continuous Aero, Model # E-2 bumper shall be provided by the walk-in manufacturer and installed by the KEC under the supervision of the manufacturer. The Aero Bumper shall be installed on all interior walls of the walk-in above the diamond tread. To give a finish look of the bumper the KEC shall provide and install end caps and corner caps as required. The walk-in manufacturer shall provide 12" high backing to install the bumper; high/low digital alarm system shall be installed in walk-in wall panel of each compartment. 304 S/S Control box for Digital alarm system shall be provided with correctional package; 304 S/S Trim strips shall be provided as required

ITEM	MANUFACTURER	MODEL NUMBER	QTY.

above the walk-in and adjacent to the walls; each Low temperature Occupancy sensor control panel shall have light switch with pilot light, keyed by-pass switch, which shall actuate Occupancy sensor, red flashing indicator light and audio alarm; 1'- 8" wide x door width x ½" thick 304 S/S thresholds in diamond pattern shall be installed for all the doors; two 3'-0" x 7'-0" high 304 S/S manual swing Jamison Plyfoam II doors with flush seal shall have inside and outside 4'-0" high kick plates. These doors shall have 14" x 24" view window. The doors shall have chrome hardware with heavy duty prison type locking provisions on front with thru door safety release. The door alarm switch shall be provided. The doors shall have K-55 latch, 3 self-rising hinges and # 400 door closure with tamper resistant fasteners; and Jamison shall also provide plastic strip curtains for both the doors along with all the necessary hardware to install the strip curtains.

FINISH:

a. 22 ga. Bright spangled smooth galvanized steel interior and exterior wall
b. 22 ga. smooth painted white zinc prep steel interior ceiling.
c. All Jamison doors shall have 20 ga. 304 S/S finish on doors, 24 ga. 304 S/S frame casing and 16 ga. 304 S/S interior and exterior kick plates, 304 S/S carriage bolt fasteners, 304 S/S inside trim and 304 S/S jambs.

REQUIREMENTS: **Electrical:**

a. 115/60/1
b. 20 Amps. Required two separate circuits, one for lights and one for heaters.

WARRANTY: 15 years on walk-in panels

NOTES:

a. KEC shall field verify dimensions including 2" space between building wall and the box prior to ordering walk-in box. KEC shall take a special note of existing structural column.
b. If necessary, security type access panels above walk-in box shall be furnished and installed by the GC. For specifications refer to the architectural documents.
c. Under the supervision of the manufacturer, the KEC shall install the S/S trim strips and Diamond tread wall plate, which shall be glued with Silicone sealant to the face of the panel and occasionally secured by S/S pop rivets.
d. GC shall install fluorescent light fixtures and all other electrical components of the walk-in box.
e. All holes created for the penetration of utilities shall be filled with gray silicone.
f. Exposed conduit on the interior or exterior of the walk-in box is not permitted.
g. GC shall provide conduit, cabling, connections etc., for all door Ajar Alarms and Digital Alarms.
h. KEC shall coordinate with GC the installation of the

ITEM	MANUFACTURER	MODEL NUMBER	QTY.

Thresholds.

i. GC/KEC shall coordinate the installation of doors with tile and grout thickness.

7. Cooltec CRS-4 Lot

DESCRIPTION: **Remote Refrigeration System (NSF & UL).**

This system shall be air cooled and include scroll, hermetic type compressors operating with CFC free refrigerant R-404A**.**
This rack refrigeration package with control panel shall be pre-engineered and factory assembled. The preassembled outdoor system shall be equipped with winter controls. The package shall have factory mounted and pre wired control panel complete with interlocked main fused disconnect, compressor circuit breakers, contactors and time clocks wired for single point power connection. All low temperature systems shall have suction line accumulators, which shall be installed by the manufacturer.
Each compressor shall be preassembled and equipped with large pump down capacity vibration eliminator, high low pressure control; crank case heater and flood back head pressure for low ambient temperature.
The compressors of the refrigeration package system shall be Copeland compressors. The system shall include pre-piped tubing, which shall be securely supported and anchored with clamps. This system shall be comprised of the following:

Compressor Model #	Qty.	Hp	Amps	For item #
ZS19KAE-TF5	1	2.0	23.9	8 (Cooler)
ZS13KAE-TFS	1	1.5	17.8	11 (Bev. Cooler)

FINISH:

a. Heavy gauge carbon steel enclosures and panels
b. Structural steel frame. The frame shall be preassembled, welded and painted.

REQUIREMENTS: **Electrical:**

a. 208/60/3
b. 40.0 Amps

WARRANTY: 5 years for compressors

NOTES: The unit shall be located on the pad. Refer to the A/E drawings for the actual location of the remote rack refrigeration system.

8 Bohn/Cooltec SM208AEE 1

DESCRIPTION: **Evaporator Coil (NSF & UL).**

ITEM	MANUFACTURER	MODEL NUMBER	QTY.

The cooler coil shall be a part of the total remote, air cooled, rack refrigeration system (Item # 7). Low profile evaporator coil shall be center mounted and not directly located over the product storage. Coil shall be designed for off cycle, air defrost and not provided with electrical defrost. Thermostats, solenoid valves and expansion valves shall be factory mounted on the coil. Coil shall be designed to provide a room temperature of **35 degree F**. with suction temperature of **25 degree F**.

REQUIREMENTS:

Electrical:
a. 115/60/1
b. 12.3 Amps
Plumbing:
3/4" Indirect Waste (IW) to Funnel Floor Drain (FFD)

NOTES:

a. Electrical service for this unit shall be provided by the GC from the kitchen electrical panel.
b. GC shall provide quick disconnect switches as needed.
c. GC shall furnish copper drain lines pitched at ½" per foot of run.
d. GC shall trap the drain line outside of refrigerated space to avoid entrance of warm and moist air.
e. Nonconductive hanging rods shall be utilized to mount evaporator coil from the walk-in ceiling**.**

9. Intermetro **MQ2460G** **6**
MX86P **24**

DESCRIPTION: **Walk-in Shelving (NSF).**
Total of 6 units. Each unit shall have 4 tiers with **correctional package.** The bottom shelf shall be installed at 18" aff. The height of other shelves shall be determined in the field confirming with the using agency

FINISH:

a. Shelf mat shall be Injection molded polypropylene with exclusive built-in Microban antimicrobial protection
b. Shelf frame and posts shall be steel with electroplated substrate and highly durable abrasion resistant epoxy finish with exclusive built-in Microban antimicrobial protection

NOTES:

a. Units shall be field assembled.
b. KEC shall field verify dimensions prior to the ordering of shelves.

10 Intermetro **HP2260PDMB** **5**

DESCRIPTION: **Dunnage Racks in Beverage Cooler (NSF).**
Dunnage rack shall be capable of holding up to 3,000 Lbs. of

ITEM	MANUFACTURER	MODEL NUMBER	QTY.

weight. Each unit shall have a correctional package.

FINISH: Molded Grey Polyethylene construction

NOTES: KEC shall field verify dimensions prior to the ordering of dunnage racks.

11. **Bohn/Cooltec** **SM179AEE** **1**

DESCRIPTION: **Evaporator Coil (NSF & UL).**
The Beverage Cooler coil shall be a part of the total remote, air cooled, rack refrigeration system (Item # 7). Low profile evaporator coil shall be center mounted and not directly located over the product storage. Coil shall be designed for off cycle, air defrost and not provided with electrical defrost. Thermostats, solenoid valves and expansion valves shall be factory mounted on the coil. Coil shall be designed to provide a room temperature of **35 degree F**. with suction temperature of **25 degree F**.

REQUIREMENTS: **Electrical:**
a. 115/60/1
b. 8.7 Amps
Plumbing:
3/4" IW to FFD

NOTES:
a. Electrical service for this unit shall be provided by the GC from the kitchen electrical panel.
b. GC shall provide quick disconnect switches as needed.
c. GC shall furnish copper drain lines pitched at ½" per foot of run.
d. GC shall trap the drain line outside of refrigerated space to avoid entrance of warm and moist air.
e. Nonconductive hanging rods shall be utilized to mount evaporator coil from the walk-in ceiling**.**

12. **Open Number**

13. **Open Number**

14. **Open Number**

ITEM	MANUFACTURER	MODEL NUMBER	QTY.
15.	**LTI, Inc.**	**SSWT-36-36**	**1**

DESCRIPTION: **Work Table (NSF).**
This unit shall be 36" x 36" with 12" high splash on rear and right side. The under shelf shall be installed at 18" aff and shall be permanently welded to the legs. The legs shall be permanently welded to the leg gussets and the leg gussets shall be fully welded to the channels. The channels shall be welded to the tops, studs and fasteners shall not be allowed and cannot be substituted for welding. The adjustable bullet feet shall be welded into legs with 4 heavy tack welds. A convenience outlet located at the table shall be installed in the wall. The rear legs of the equipment shall be located at a minimum of 4" away from the back wall to clear the tile cove base.

FINISH:
a. 12 ga 304 S/S top and under shelf
b. 14 ga S/S under shelf and channels
c. 16 ga 304 S/S legs with 4 heavy tack welds
d. Security type bullet feet

REQUIREMENTS: **Electrical for Convenience Outlets:**
a. 120/60/1
b. 20 Amps

NOTES: KEC shall field verify dimensions prior to ordering this table and coordinate the locations of the convenience outlet.

16.	**LTI, Inc.**	**Custom**	**1**

DESCRIPTION: **Tray Pick Up Stand (NSF).**
The tray Pick up stand shall have a low platform to hold trays, mugs and bins for plastic ware. The overall dimension of this section shall be 24" x 39" x 18" high. The unit shall have 6" high legs with bullet feet with a flange, which will be anchored to the floor. **At the top of the unit there shall be a welded 4" x 24" wide shelf with supports so that the shelf can sustain the weight of the coil door**. The coil door will be fastened to this shelf. The shelf shall have lock and hasp. The overall height of the shelf shall match the overall height of the counter item # 17.

FINISH:
a. 12 ga S/S top, body, shelf and channels
b. 16 ga 304 S/S legs
c. Security type S/S bullet feet with flange

NOTES: KEC shall silicone the flanged bullet feet.

ITEM	MANUFACTURER	MODEL NUMBER	QTY.
17.	**LTI, Inc.**	**Custom**	**1**

DESCRIPTION: **Serving Counter (NSF& UL).**

The overall size of the Inmate serving counter shall be 19'-10" x 3'-9" x 3'-0" high excluding sneeze guard and tray slide. The entire serving counter shall have 6" high legs with bullet feet with a flange, which will be anchored to the floor. The legs shall be permanently welded to the leg gussets and the leg gussets shall be fully welded to the channels. The channels shall be welded to the tops, studs and fasteners shall not be allowed and cannot be substituted for welding.

The serving counter shall consist of three drop-in hot food wells, two drop-in quick switch wells, two drop-in cold food wells and a beverage section.

A continuous sneeze guard shall span over hot, quick switch and cold food sections. The overall dimension of the sneeze guard shall be approximately 132" x 12" x 16" high. The top of the sneeze guard shall be stainless steel and three sides of the sneeze guard shall be lexan. The serving counter shall have a "V" grooved solid tray slide in front of the beverage section. The overall dimensions of the tray slide shall be 12" wide x 78" long. The hot food, quick switch and cold food sections shall have individual thermostats, sneeze guard and locked storage underneath. Thermostats for hot, quick switch and cold food sections shall be located behind locked lexan control cover. S/S chains shall be welded to each control cover.

The compressor for quick switch and cold food section shall be located behind a perforated door with a S/S welded hasp and have a s/s perforated front, rear and side panels and will be located under beverage section. The beverage section shall have 3'-0" wide urn trough, as well as storage space on the top for mugs and glasses. The entire serving counter shall have locked storages underneath. The locked storage shall have welded S/S hasp.

The serving counter shall have two convenience outlets. Refer to FS-301 and FS-400 drawings for locations of convenience outlets. Item # 19, two convenience outlets, and the hot food, quick switch and cold food sections shall be connected to the breaker panel. The breaker panel shall be located behind a perforated door with a S/S welded hasp and have s/s perforated front, rear and side panels and will be located on the right end of the serving counter.

FINISH:

- **a.** 12 ga 304 S/S top, body, shelves, tray slides, doors, top of the sneeze guard and channels
- **b.** 16 ga 304 S/S legs
- **c.** 1/4" thick Lexan sides with S/S trim for sneeze guard
- **d.** Security type S/S bullet feet with flange

REQUIREMENTS: **Electrical:**

Breaker Panel:

- **a.** 120/60/1

ITEM	MANUFACTURER	MODEL NUMBER	QTY.

b. 208/60/1
c. 40 Amps
Spare Outlets:
a. 120/60/1
b. 20.00 Amps circuit for each spare outlet
Plumbing:
1" IW from drop in wells and urn trough (refer to Plumbing spot connections drawing).

NOTES:

a. Tray slides shall be installed in the field.
b. Legs shall be installed in the field and welded.
c. KEC shall verify the dimensions of the doors leading to the inmate serving counters prior to fabricating this unit.
d. KEC shall provide all necessary holes in the counter to make Item # 19 operational. All holes where applicable shall be covered with grommets or filled, sanded and polished.
e. KEC shall silicone the flanged bullet feet.

18. **Open Number**

19. **Crathco*** **D15-3** **1**

DESCRIPTION: **Juice Dispenser (NSF & UL).**
This Pre-mix dispenser with 5 gallon bowl shall dispense Juice.

FINISH: S/S

REQUIREMENTS: **Electrical:**
a. 120/60/1
b. 3 Amps

NOTES: Owners shall furnish and install this item.

20. **Avtec** **AWWO** **1**

DESCRIPTION: **Water Wash Hood (NSF & UL).**
The overall dimensions of this water wash canopy hood shall be 14’-0” long x 5'-0" deep x 2’-6” high. The unit shall be fabricated in 2 sections, each 7'-0" long. Each section is designed to accommodate 2,450 exhaust CFMS. The hood shall have two 10” x 20” exhaust duct collar and the total exhaust CFM shall be 4,900 CFMS and the static pressure at the collar shall be 1.30. One foot overhang shall be provided in front and two sides of the hood.
100% Make up air **shall not** be supplied in the kitchen through

ITEM	MANUFACTURER	MODEL NUMBER	QTY.

the hood but shall be **provided in the kitchen as part of the HVAC system.**
The hood shall be installed at a minimum of 6'-8" aff. The control panel shall control the exhaust, water wash features of the hood along with its lights, fans and fire system and will be located in the office.
The hood manufacturer shall provide pre wired conduit and fittings. The hood shall have 2 fluorescent fixtures with T8 lamps and programmed start electronic ballasts per Specifications Section 265100 Interior lighting. The unit shall be provided with Ansul fire suppression system.

FINISH:

a. 300 series 18 ga S/S throughout.
b. All external seams and joints shall be welded and be liquid tight. All exposed welds shall be ground and polished.
c. All exposed piping and fittings shall be stainless steel.

REQUIREMENTS:

General:
a. Air velocity at leading edge of cooking surface shall meet 50 FPM minimum.
b. Hood shall meet requirements of NFPA 96
Electrical:
Exhaust Hood
a. 120/60/1
b. 20 Amps
Control Panel
a. 120/60/1 uninterrupted power supply
b. 20 Amps
Plumbing:
Exhaust Hood
a. (2) 1” HW
b. (2) 2” IW
Control Panel
a. 1” HW
b. 1” IW to FFD (located in Staff Toilet)

NOTES:

a. KEC shall verify the dimensions of the doors leading into the kitchen prior to fabricating this unit.
b. KEC shall deliver and hang hood. KEC shall verify that installer obtain permit for hanging hood only.
c. All mechanical, plumbing and electrical connections shall be done by GC.
d. All ductwork beyond ventilator duct take off collar shall be provided and installed by GC.
e. Electrical connections to lights and fans shall be done by GC.
f. GC shall inter connect wire from magnetic starter for exhaust fans to the exhaust hood**.**
g. GC shall provide interconnect wiring from control panel to hoods and exhaust fan controls. All control wiring shall be installed by GC.

ITEM	MANUFACTURER	MODEL NUMBER	QTY.

h. GC shall reconnect electrical field joints on each hood section after the hood is installed.

i. If required, GC shall reconnect plumbing and drain connections between each hood section after the hood is installed.

j. The exhaust fans will be furnished and installed by GC (plumbing and electrical contractor) and not by KEC.

21. **Avtec/Ansul** **R-102** **LOT**

DESCRIPTION: **Fire System (NSF & UL).**
It shall be pre-engineered fixed, automatic fire extinguishing system. The single tank fire suppression system shall discharge a wet chemical-agent, through the nozzles. Two remote pull stations of the fire system shall be recessed into wall with concealed piping from pull station through the wall above the ceiling. The fire system shall provide exhaust duct protection, plenum protection, and overhead equipment protection with S/S drops. Double dual micro switch shall be provided on automan for interconnection to the hood control panel and for building control system interlocks.

FINISH:

a. S/S piping where exposed and black iron piping where unexposed

b. Dual Chrome Plated Automan and Auxiliary tank

REQUIREMENTS: **Electrical:**
Power interconnection shall be provided from the hood control panel

a. 120/60/1

b. 1.0 Amp

22. **LTI, Inc.** **Custom** **1**

DESCRIPTION: **Floor Trough for Kettle (NSF).**
The unit shall be anti-spill type, fully welded and coved. The overall exposed dimensions shall be 4'-6" x 2'-0". The unit shall have an exposed perimeter reveal of 1" except at long sides where reveal is extended to 2" to provide entrapment of grates making them removable one at a time. Trough bottom shall be pitched towards 4" drain. Drain sleeve shall be covered with a tamper proof perforated, inverted strainer. S/S strainer shall be held in place with S/S studs and S/S cap nuts. The strainer shall have 1/4" diameter holes on top and 3/8" diameter holes on sides. Grating shall be "V" bar anti-slip, anti-splash type with (2) ½" diameter S/S support rod running lengthwise. Grating shall be made in 3 equal sections. The center section shall have the "V" bars running in the opposite direction to facilitate the pour path of kettle.

ITEM	MANUFACTURER	MODEL NUMBER	QTY.

FINISH:
a. 12 ga 304 S/S trough and grate
b. 12 ga 304 S/S sleeve

REQUIREMENTS:
Plumbing:
4" DW

NOTES:
a. KEC shall determine the exact location of the floor trough, **to ensure that it meets the pour path**.
b. GC shall verify and coordinate with KEC the required depth and exact location of trough prior to rough-in for plumbing and pouring the slab.

23. **Groen** **DEE/4-20** **1**

DESCRIPTION:
Kettle (NSF & UL).
20 gallon kettle shall be self-contained, tilting, and electric heated, stainless steel steam jacketed kettle. The kettle temperature shall range from 150-295 degrees F. This ASME code constructed kettle shall be registered to operate up to 50 PSI working steam pressure. The 2" tangent drawoff valve with strainer shall have a correctional package. Tangent valve restraint shall be provided with solid S/S star handle welded to valve stem and armored restraint cable. Hot and cold water faucet with swing spout shall be installed on the kettle. Reinforced faucet bracket shall be welded to the kettle. The kettle shall come with Kettle accessories kit.

FINISH:
a. 18 ga 316 S/S Interior
b. 18 ga 316 S/S Exterior

REQUIREMENTS:
Electrical:
a. 208/60/3
b. 10.8 KW
c. 30 Amps
Plumbing:
a. ½" CW
b. ½" HW

24. **Blodgett** **BCX-14E** **1**

DESCRIPTION:
Combi Oven (NSF & UL).
The overall dimension of the Single deck Combination oven shall be 42.30" x 40.19" x 61" high. The Combination oven shall have the ability to cook with pressureless steam 212 degree F. hot air or combination of steam and hot air with an operating range of 140-500 degree F. The unit shall be installed on 25" high adjustable legs.

ITEM	MANUFACTURER	MODEL NUMBER	QTY.

FINISH: 16 ga 304 S/S construction

REQUIREMENTS:

Electrical:
- **a.** 208/60/3
- **b.** 53 Amps
- **c.** 19 KW

Plumbing:
- **a.** 3/4" CW at 40 PSI min. and 50 PSI max. with water quality of 7.0 PH
- **b.** 3/4" HW at 40 PSI min. and 50 PSI max. with water quality of 7.0 PH
- **c.** 2" IW to FS

25. **Keating** **30 x 30 FT** **1**

DESCRIPTION: **Griddle (NSF & UL).**
The unit shall have cabinet, front drain trough, electrical elements, two thermostats and a security package with a welded lock and hasp. The griddle plate shall be 30" W x 24" D x 3/4" thick. The stand shall have under shelf. The unit shall have a cover over the operating controls.

FINISH:
- **a.** Hard high carbon ¾"steel trivalent chromium
- **b.** 14 ga 304 S/S cabinet exterior
- **c.** 14 ga 304 S/S perimeter and grease trough
- **d.** 304 S/S stand
- **e.** 16 ga 304 S/S cover with Lexan window

REQUIREMENTS:

Electrical:
- **a.** 208/60/3
- **b.** 5.4 KW
- **c.** 22 Amps

26. **LTI, Inc.** **Custom** **1**
T & S **B-231** **1**

DESCRIPTION: **Two Compartment Siink with Faucet (NSF).**
This sink shall be 9'-0" x 3'-0" x 4'-0" high including 12" high back splash. The unit shall have two sinks 24" x 27" x 14" high. The unit shall have one faucet over the sink. The left and right drain boards shall be 2'-6" long. The unit shall have welded brackets for twist handle wastes. There shall be an under shelf below the left drain board. Item # 27 garbage disposer shall be located on the right drain board with 12" cone. The disposer control panel located under this table shall be held in place with a permanently welded bracket. The under shelf shall be at 18" aff. and shall be permanently welded to the legs. Holes shall be punched in the back splash for Vacuum breaker. A fully welded bracket for a

ITEM	MANUFACTURER	MODEL NUMBER	QTY.

pre rinse spray (item #40) shall be secured to the back splash. 1 ¼" cross bracings shall be installed at 10" aff and shall be permanently welded to 1 5/8" legs. The legs shall be permanently welded to the leg gussets and the leg gussets shall be fully welded to the channels. The channels shall be welded to the tops and drain boards, studs and fasteners shall not be allowed and cannot be substituted for welding. The adjustable bullet feet shall be welded into the legs with 4 heavy tack welds. The rear legs of the table shall be located at a minimum of 4" away from the back wall to clear the tile cove base.

FINISH:

a. 12 ga 304 S/S top, sinks, under shelf, channels, disposer control panel bracket and pre rinse bracket
b. 16 ga 304 S/S braces and legs
c. Security type S/S bullet feet with 4 heavy tack welds
d. Flexible 304 S/S hose

REQUIREMENTS:

Plumbing:
a. ½" CW
b. ½" HW
c. (2) 2" IW to FS

NOTES: KEC shall field verify dimensions prior to fabricating this item.

27. **Redgoat** **A2P-07** **1**
RAC2-KP **1**
B-RSA **1**

DESCRIPTION:

2 Hp Garbage Disposer (NSF & UL).
This offset designed garbage disposal shall have Eco-Mizer, Positive Flush and correctional package. The unit shall be located in the 2 compartment sink Item# 26. The unit shall have 12" diameter cone. The disposer shall also come with water swirl inlet valve, vinyl silver trap scrapping ring, ½" solenoid valve, (2) 8 gallons per minute flow control valve and ½" vacuum breaker. The automatic reversing control panel shall have lighted start/ stop switch buttons, front disconnect switch, time delay and NEMA 4X water tight enclosure.

FINISH:

a. Red cast iron body
b. 304 S/S adjustable legs
c. FRP control panel

REQUIREMENTS:

Electrical:
a. 208/60/3
b. 2 Hp
c. 6 Amps
Plumbing:
a. ½" CW @ 20 Pound per Square Inch (PSI)
b. 2" Direct Waste (DW)

ITEM	MANUFACTURER	MODEL NUMBER	QTY.

NOTES: GC shall install electric solenoid valve, flow control and vacuum breaker assembly for this unit.

28. **LTI, Inc.** **SSWT-36-54** **1**

DESCRIPTION: **Work Table (NSF).**
This unit shall be 4'-6" x 3'-0" with 12" high splash on rear side. The under shelf shall be installed at 18" aff and shall be permanently welded to the legs. The legs shall be permanently welded to the leg gussets and the leg gussets shall be fully welded to the channels. The channels shall be welded to the tops. The adjustable bullet feet shall be welded into legs with 4 heavy tack welds. Convenience outlets located at the table shall be installed in the wall. The rear legs of the equipment shall be located at a minimum of 4" away from the back wall to clear the tile cove base.

FINISH:
a. 12 ga 304 S/S top, under shelf and channels
b. 16 ga 304 S/S legs
c. Security type bullet feet with 4 heavy tack welds

REQUIREMENTS: **Electrical for Convenience Outlets:**
a. 120/60/1
b. 20 Amps

NOTES: KEC shall field verify dimensions prior to ordering this table and coordinate the locations of the convenience outlet.

29. **T & S** **MV-0771-12CW** **1**

DESCRIPTION: **Hose Station (NSF).**
This hose station shall be recessed mounted in the Can Wash area.

FINISH:
a. Water Gun shall be 304 S/S Body and S/S interior parts and heavy rubber cover
b. Hose shall be braided high tensile synthetic textile cord rated @ 200 degrees F.
c. 304 S/S Hose rack
d. 304 S/S case for Thermometer

REQUIREMENTS: **Plumbing:**
a. ¾" HW
b. ¾" CW

NOTES: KEC shall verify location and height prior to installing.

ITEM	MANUFACTURER	MODEL NUMBER	QTY.
30.	**LTI, Inc.**	**Custom**	**1**

DESCRIPTION: **Floor Trough for Ice Maker (NSF).**
The unit shall be anti-spill type, fully welded and NSF coved. The overall exposed dimensions shall be 3'-0" x 1'-0". The unit shall have an exposed perimeter reveal of 1" except at long sides where reveal is extended to 2" to provide entrapment of grates making them removable one at a time. Trough bottom shall be pitched towards 4" drain. Drain sleeve shall be covered with a tamper proof perforated, inverted strainer. S/S strainer shall be held in place with S/S studs and S/S cap nuts. The strainer shall have 1/4" diameter holes on top and 3/8" diameter holes on sides. Grating shall be "V" bar anti-slip, anti-splash type with (1) ½" diameter S/S support rod running lengthwise. Grating shall be made in equal sections

FINISH:
a. 12 ga 304 S/S trough and grate
b. 12 ga 304 S/S sleeve

REQUIREMENTS: **Plumbing:**
4" DW

NOTES: GC shall verify and coordinate with KEC the required depth and exact location of trough prior to rough-in for plumbing and pouring the slab.

31.	**Manitowoc**	**ID-0452AP**	**1**
		B-400	**1**

DESCRIPTION: **Ice Maker w/Bin (NSF & UL).**
The air cooled ice maker shall have R-404A CFC free Refrigerant and be capable of producing 316 pounds of ice per day. Bin shall be able to hold 290 pounds of ice per day. The unit shall have correctional package. The bin shall be equipped with the bin adaptor and ice deflector.

FINISH: **Ice Maker:**
a. 304 S/S top and front panels
b. 304 S/S side panels with S/S louvers
Bin:
a. 304 S/S Exterior
b. 304 S/S Bin Top
c. 304 S/S Legs
d. 304 S/S Lock and Hasp on Bin door

REQUIREMENTS: Ice maker shall meet ARI standard of 70 degree F**.** water temperature and 90 degree F. air temperature
Electrical:
Ice maker:

ITEM	MANUFACTURER	MODEL NUMBER	QTY.

a. 115/60/1
b. 13.2 Amps

Plumbing: Potable Water Required and Water temperature shall range from 35 to 70 degree F.

a. 3/8" CW Inlet at 25 - 125 PSI to the water filters
b. 3/8" CW Outlet to ice maker from the filter
c. (2) ½" IW to FS from Ice maker
d. ¾" IW to FS from Bin

WARRANTY:

a. 5 years parts and labor coverage on ice machine evaporator.
b. 5 years parts and 3 years labor coverage on ice machine compressor.
c. 3 years parts and labor coverage on all other ice machine components including bin.
d. 3 year parts and labor coverage on head, shroud, hardware and mounting assembly of water filter.

NOTES:

a. Plumber shall first connect CW inlet to filter item #33.
b. Plumber shall provide quick disconnect and then pipe it to the ice maker.
c. Mounting plate rack shall have correctional package.

32. **Manitowoc** **iAUCS-161** **1**

DESCRIPTION: **Cleaning System for Ice Maker (NSF & UL).**
The base of the water automatic cleaning system shall be installed in line with the base of the ice machine.

FINISH: Stainless Steel exterior

REQUIREMENTS: **Electrical:**
a. 115/60/1
b. 0.1 Amps

33. **Everpure** **EV9324-21** **1**

DESCRIPTION: **Filter for Ice maker (NSF & UL).**
The filter shall be Insurice Single PF-i2000 . The unit shall have 1.67 gallons per minute flow and shall be rated for 9000 gallons. The unit shall be 25.3” x 14.1” x 6.7”.

ITEM	MANUFACTURER	MODEL NUMBER	QTY.
34.	Victory	FS-3D-S1	1

DESCRIPTION: **Three Door Reach-in Freezer (NSF & UL).**
The unit shall come with CFC free foam and Refrigerant. The refrigerant shall be R 404A. The unit shall have full height extra heavy duty hinged doors. The hinges and the die cast metal handle shall have tamper proof screws. The door handles, hinges, locks and hasps shall be guaranteed for life of the unit. This unit shall bear Energy Star Label. The unit shall have 304 S/S security cover louvered grill and panel; digital thermometer with Lexan cover; and 304 S/S Heavy gauge hasps with locking bar.

FINISH:
a. 304 S/S exterior and interior, sides, door, door liner and perimeter door jamb
b. Seamless exterior sides

REQUIREMENTS: **Electrical:**
a. 208-230/60/1
b. 3/4Hp
c. 12.9 Amps

WARRANTY: 5 years on compressors

NOTES: GC/KEC shall furnish cord and plug for this unit.

35.	**LTI, Inc.**	**Custom**	**1**

DESCRIPTION: **Wall Shelf (NSF).**
The overall dimension of wall shelf shall be 12" x 36" long. The shelf shall be mounted with three wall support brackets. These brackets shall be plug welded to the shelf. The shelf shall have 2" space between the shelf and the wall. The unit shall have 1½" rear turn up.

FINISH: 12 ga 304 S/S shelf and brackets

NOTES: KEC shall field verify dimensions prior to fabrication of this item.

36.	**Advance/Tabco**	**9-OP-40**	**1**
	T & S	**K-240**	**1**
		K-242	**1**

DESCRIPTION: **Mop Sink w/Heavy Duty Faucet (NSF).**
The overall dimensions of the mop sink shall be 25" x 21" x 16" high. The floor mounted mop sink shall be secured to wall and floor. The service faucet shall have vacuum breaker. The

ITEM	MANUFACTURER	MODEL NUMBER	QTY.

unit shall come with S/S aprons on two sides and 16" high splashes on three sides. The mop sink, faucet and mop hanger shall have a correctional package. The drain with the basket shall be welded to the bottom of the sink. KEC shall tack weld the security screws of the mop hanger.

FINISH: 16 ga 304 S/S sink, skirt and splashes

REQUIREMENTS: **Plumbing:**
a. ½" HW
b. ½" CW
c. 2" DW

NOTES: KEC shall field verify dimensions prior to fabrication of this item including installation height of the faucet.

37. **LTI, Inc.** **Custom** **1**
T & S **B-231** **2**

DESCRIPTION: **3 Compartment Sink w/Clean & Soiled Drain boards and Faucets (NSF).**
The 3 compartment sink's overall dimensions shall be 3'-0" x 12'-0" x 48" high including back splash. The sink shall have 12" high splash on left and rear sides. The end splashes shall be fully enclosed. The dimensions of all the 3 sink bowls shall be 24" x 30" x 14" deep. The soiled and the clean drain boards shall be 36" x 36". 1 ¼" cross bracings shall be installed at 10" above finished floor (aff) and shall be permanently welded to legs. The 1 5/8" legs shall be permanently welded to the leg gussets and the leg gussets shall be fully welded to the channels. The channels shall be fully welded to the tops and drain boards, studs and fasteners shall not be allowed and cannot be substituted for welding. The adjustable bullet feet shall be welded into legs with 4 heavy tack welds. The unit shall have three 2" lever handle wastes with overflow drain. The lever waste handles shall be supported by welded support brackets. The rear legs of the equipment shall be located 4" to 5" away from the back wall to clear the tile cove base.

FINISH:
a. 12 ga 304 S/S top, sinks, channels and brackets
b. 16 ga 304 S/S legs and braces
c. Security type bullet feet with 4 heavy tack welds

REQUIREMENTS: **Plumbing:**
a. (2) ½" HW
b. (2) ½" CW
c. (3) 2" IW to FS

NOTES: KEC shall field verify the dimensions prior to fabricating this item.

ITEM	MANUFACTURER	MODEL NUMBER	QTY.
38.	OPEN NUMBER		
39.	OPEN NUMBER		
40.	T & S	B-0113-BC	2

DESCRIPTION: **Pre Rinse Spray (NSF).**
One unit will be located on item #26 and second unit will be located on item #41.

REQUIREMENTS: **Plumbing:**
a. ½" HW
b. ½" CW

41.	LTI, Inc.	Custom	1

DESCRIPTION: **Soiled Dish table (NSF).**
The Soiled dish table shall be 8'-6" x 2'-6" x 3'-6" high including the back splash. The dish table shall have 8" high splash on rear and left side and the top shall be extended to accommodate tray drop off. The tray drop off shelf shall be 24" long x width of the wall. The opening to accommodate tray drop off shall be 24" wide x 12" high. The opening shall be completely covered with Stainless Steel (S/S) panels for ease of cleaning. This dish table shall have two scrapping sinks. One of the scrapping sink shall be 24" x 24" x 6" deep and have welded rack bar guides. The garbage disposer, item # 42 shall be attached to this sink. The other scrapping sink shall be 4" x 26" x 3" deep and shall have a welded nipple drain and welded rack guide bars. The disposer control panel located under this table shall be held in place with a permanently welded bracket. Holes shall be punched in the back splash for Vacuum breaker. A fully welded bracket for a pre rinse spray shall be secured to the back splash. A 3'-0" wide under shelf shall be located under this table 10" above finished floor. 1 ¼" cross bracings shall be installed at 10" above finished floor (aff) and shall be permanently welded to 1 5/8" legs. The legs shall be permanently welded to the leg gussets and the leg gussets shall be fully welded to the channels. The channels shall be welded to the tops and drain boards, studs and fasteners shall not be allowed and cannot be substituted for welding. The adjustable bullet feet shall be welded into the legs with 4 heavy tack welds. The rear legs of the soiled dish table shall be located at a minimum of 4" away from the back wall to clear the tile cove base.

ITEM	MANUFACTURER	MODEL NUMBER	QTY.

FINISH:
- **a.** 12 Gauge (ga) 304 S/S top, channels, disposer control panel bracket, pre rinse bracket and under shelf.
- **b.** 16 ga 304 S/S braces and legs
- **c.** Security type S/S bullet feet with 4 heavy tack welds
- **d.** Flexible 304 S/S hose

REQUIREMENTS:

Plumbing:
1" IW to FS

NOTES:
- **a.** KEC shall coordinate fabrication of the soiled dish table along with Item #s 42 and 43.
- **b.** KEC shall field verify dimensions along with the soiled dish table fabricator prior to fabricating.

42.	**Redgoat**	**B3P-O-CP-HC**	**1**
		RAC2-KP	**1**
		B-RSA	**1**

DESCRIPTION:

Sink Mounted 3 Hp Garbage Disposer (NSF & UL).
This offset designed garbage disposal shall have Eco-Mizer, Positive Flush and correctional package. The unit shall be located in the soiled dish table Item# 41. The unit shall have sink mount and 7" throat assembly. The disposer shall also come with water swirl inlet valve, vinyl silver trap scrapping ring, ½" solenoid valve, (2) 8 gallons per minute flow control valve and ½" vacuum breaker. The automatic reversing control panel shall have lighted start/stop switch buttons, front disconnect switch, time delay and NEMA 4X water tight enclosure.

FINISH:
- **a.** Red cast iron body
- **b.** 304 S/S adjustable legs
- **c.** FRP control panel

REQUIREMENTS:

Electrical:
- **a.** 208/60/3
- **b.** 3 Hp
- **c.** 9.5 Amps

Plumbing:
- **a.** ½" CW @ 20 Pound per Square Inch (PSI)
- **b.** 2" Direct Waste (DW)

NOTES:
GC shall install electric solenoid valve, flow control and vacuum breaker assembly for this unit.

ITEM	MANUFACTURER	MODEL NUMBER	QTY.
43.	**Meiko**	**DV80.2**	**1**

DESCRIPTION: **Dishwasher (NSF & UL).**
This hot water sanitizing door type dishwasher shall have double wall insulated construction on front, top and back to conserve heating energy, reduce noise and heat loss into the dish room and improve operator safety. Ware washer shall be capable to wash 61 racks per hour. The unit shall have NSF approved water usage of .74 gallons/per rack. It shall have electric tank heat and built in electric internal booster heater for 70 degree F. rise.

FINISH: All 304 S/S construction.

REQUIREMENTS: **Electrical:**
Ware washer:
a. 208/60/3
b. 1 Hp for Wash Pump
c. 50.1 Amps
d. 6 KW
Booster Heater:
a. 208/60/3
b. 9 KW
Plumbing:
Recommended hardness: 1-6 grains per gallon
a. ½" HW at 140 degree F. @ 15-25 PSI
b. 2" IW to FS

NOTES: KEC shall obtain tray samples from the DPSCS and send to the Manufacturer.

44.	**LTI, Inc.**	**Custom**	**1**

DESCRIPTION: **Clean Dish Table (NSF).**
This Clean dish table shall be 6'-0" x 2'-6". The dish table shall have 8" high enclosed back splash on rear and one side. The under shelf located underneath the clean dish table shall be 4'-0" long. The cross bracings and the under shelf shall be at 18" aff and shall be permanently welded to the legs. The cross bracings shall be 1 ¼" tubing. The 1 5/8" legs shall be permanently welded to the leg gussets and the leg gussets shall be fully welded to the channels. The channels shall be welded to the tops and studs or fasteners shall not be used. The adjustable bullet feet shall be welded into legs with 4 heavy tack welds. The rear legs of the equipment shall be located 4" to 5" away from the back wall to clear the tile cove base.

FINISH:
a. 12 ga 304 S/S top, under shelf and channels
b. 16 ga 304 S/S braces and legs

ITEM	MANUFACTURER	MODEL NUMBER	QTY.

c. Security type S/S bullet feet with 4 heavy tack welds

REQUIREMENTS: **Plumbing:**
1" IW to FS

NOTES: KEC shall field verify dimensions prior to fabricating the above dish table

45. **Avtec** **NCH-42-42** **1**

DESCRIPTION: **Condensate Hood (NSF).**
This condensate hood shall be 42" x 42" x 24" high. The unit shall have 10" x10" exhaust duct collar and the total exhaust CFM shall be 700 CFM and the static pressure at the collar shall be .25. The unit shall have ½" drain. KEC shall take into account the height of high tank ware washer item # 43 to determine the installation height of the condensation hood but make sure that the unit shall not be installed lower than 7'-0" aff.

FINISH: 16 ga 304 S/S

46. **Intermetro*** **PR48VX4** **1**

DESCRIPTION: **Pot & Pan Shelving Unit (NSF).**
Mobile Pot and Pan rack shall be 26" x 50' x 68" high.

FINISH: Shelf Mat: Mineral reinforced Polypropylene

NOTES:
a. Owner representative shall field verify dimensions prior to the ordering of this item.
b. Owners shall furnish and install this item.

47. **Intermetro*** **C5T9** **1**

DESCRIPTION: **Tray Delivery Cart with casters (NSF & UL).**
This Heavy duty full height Heated Holding Cart shall be utilized to deliver prepared meal trays to the inmates in Medical or Segregation**.** Unit shall be equipped with heavy duty 6" high casters 2 with brakes and 2 without brakes. The cart shall have protective perimeter bumpers.

FINISH:
a. 304 20 ga. S/S polished exterior
b. 304 22 ga. S/S interior

ITEM	MANUFACTURER	MODEL NUMBER	QTY.

REQUIREMENTS: **Electrical:**

- **a.** 120/60/1
- **b.** 12 Amps
- **c.** NEMA 5-15P

NOTES:

- **a.** Owner representative shall field verify dimensions prior to the ordering of this item.
- **b.** Owners shall furnish and install this item.

Notes:

* **Not provided by GC but provided by the Owners. Owner shall furnish and install this item**.

END of SECTION

SECTION 11 45 70 – VIDEO ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Ceiling Mounts for Owner-Furnished Video Projectors and Flat Screen Televisions.
   2. Wall mounts for Owner-Furnished televisions.

B. Related Sections include the following:
   1. Division 16 Sections for electrical service and connections including metal device boxes for switches and conduit for data and power wiring.
   2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 SUSTAINABLE DESIGN REQUIREMENTS

A. MRc2: Construction Waste Management
   1. No less than the specified minimum proportion of all construction waste from the project shall be diverted from disposal in a landfill and/or incineration in accordance with the project requirements for Construction Waste Management. See Section 018113 Sustainable Design Requirements.

B. EQc4.1: Low-Emitting Materials – Sealants and Adhesives
   1. All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the project requirements for Low-Emitting Materials – Sealants and Adhesives. See Section 018113 Sustainable Design Requirements.

C. EQc4.2: Low-Emitting Materials – Paints and Coatings
   1. All paints and coatings used in the building interior comply with the project requirements for Low-Emitting Materials – Paints and Coatings. See Section 018113 Sustainable Design Requirements.
   2. Contractor shall provide LEED credit verification as per Section 013300 Submittal Procedures.

1.4 SUBMITTALS

A. Product Data: For each type of projector mount indicated.

B. Shop Drawings: Show layouts and types of projector mounts and other components:
   1. Location of wiring connections.
   2. Anchorage details.
   3. Accessories.

C. Maintenance Data: For projector mounts to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain projector mounts through one source from a single manufacturer. Obtain each mount as a complete unit, including necessary mounting hardware and accessories.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver projector mounts until building is enclosed and other construction within spaces where mounts will be installed is substantially complete and ready for mount installation.
   1. Contractor is responsible for coordinating final equipment with installed room finishes.

B. Owner supplied equipment: All projectors and flat screen televisions.
   1. Prior to ordering any video equipment contractor shall confirm owner's final selection for projector and television.

1.7 COORDINATION

A. Coordinate layout and installation of projector mounts with adjacent construction, including ceiling framing, light fixtures, HVAC equipment, fire-suppression system, and partitions.

PART 2 - PRODUCTS

2.1 CEILING MOUNT BRACKETS

A. Ceiling mount brackets, General: Projector/Television mount consisting of projector/television bracket, extension column, ceiling plate and other components necessary for a complete installation. Provide complete assembly at locations where all mounts are indicated.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Draper Inc.
   b. Premier Mounts
   c. Peerless Industries, Inc.

C.

D. Projector/Television Bracket: Universal projector bracket compatible with all invertible LCD/DLP projectors.
   1. Television: 46”
   2. Security System: Integrated security system with tamper-resistant parts locking mount at all key connection points.
   3. Adjustment Capabilities: Bracket shall allow roll adjustment of +/- 4 degrees up or down, pitch adjustment of +/- 25 degrees on each side of the mount, and yaw adjustment of 360 degrees by turning the mount on the threaded column.

E. Column Extension: 1-1/2 inch diameter two-piece threaded extension column allowing adjustable drop from 12 to 24 inches.

F. Ceiling Plate: Reinforcing plate designed for installation in place of 2 foot x 2 foot ceiling tile, incorporating multiple mount attachment points and knockout panels for outlet boxes, and attached to structure above.
   1. Weight Capacity: 300 lbs.

G. Accessories: Include all accessories necessary for a complete installation, including tie wire supports and fasteners suitable for attachment to substrate at each location.

2.2 WALL MOUNTED BRACKETS

A. Wall mount brackets, General: Television mount consisting of television bracket, extension column, and other components necessary for a complete installation. Provide complete assembly at locations where all mounts are indicated.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Draper Inc.
   2. Premier Mounts
   3. Peerless Industries, Inc

C. Television Bracket: Universal projector/television bracket compatible with all invertible LCD/DLP projectors.
   1. Weight Capacity: 160 lbs.
   2. Screen Size: 42”-50”
   3. Adjustment Capabilities: Provides movement in/out and side by side.
   4. Includes ambient air fans intake.

D. Television Bracket: Universal projector/television bracket compatible with all invertible LCD/DLP projectors.
   1. Weight Capacity: 160 lbs.
   2. Screen Size: 37”-61”
   3. Lateral Shift Lock.
   4. Leveling Feet.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install projector mounts at locations indicated to comply with manufacturer's written instructions. It is the responsibility of the installer to verify that the mount attachment method will safely support the combined loads of all attached components and equipment.

B. Install suspended ceiling reinforcing plate according to manufacturer's instructions for the floor or roof structure located above each projector mount and future mount location, including safety cable installation.

C. Install projector mounts, including extension columns, at locations indicated to receive projector mounts.

D. Install owner-furnished video projectors to the reinforcing plate according to instructions supplied with mounting components. After all components are attached, adjust tension on tie wires and safety cables.

3.2 PROTECTING AND CLEANING

A. After installation, protect projector mounts from damage during construction. If damage occurs despite such protection, remove and replace damaged components or entire unit as required to provide units in their original, undamaged condition.

END OF SECTION 11457

SECTION 11 66 23 - GYMNASIUM EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Basketball equipment.
2. Volleyball equipment.
3. Safety pads.

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for installation of floor insert sleeves to be cast in concrete slabs and footings.
2. Section 096766 "Fluid-Applied Athletic Flooring" for game lines and markers.
3. Section 116653 "Gymnasium Dividers."
4. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 SUSTAINABLE DESIGN REQUIREMENTS

A. MRc2: CONSTRUCTION WASTE MANAGEMENT

1. No less than the specified minimum proportion of all construction waste from the project shall be diverted from disposal in a landfill and/or incineration in accordance with the project requirements for Construction Waste Management. See Section 018113 Sustainable Design Requirements.

B. MRc4: Recycled Content Material

1. No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the project requirements for Recycled Content Materials. All materials counted toward the computation of the proportion of the Recycled Content Materials shall comply with the standard for the minimum percentages of post-consumer waste materials and for the minimum percentage of pre-consumer waste materials. See Section 018113 Sustainable Design Requirements.
2. Contractor shall provide LEED credit verification as per section 013300 Submittal Procedures.

C. MRc5: Regionally manufactured harvested materials

1. No less than the specified proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the project site in accordance

with the project requirements for Regionally Manufactured and/or Harvested Materials. See Section 018113 Sustainable Design Requirements.
2. Contractor shall provide LEED credit verification as per Section 013300 Submittal Procedures.

D. MRc7: Certified Wood

1. No less than the specified minimum proportion of the building permanently installed wood-based materials and products shall be certified by the Forest Stewardship Council in accordance with the project requirements for Certified Wood. See Section 018113 Sustainable Design Requirements.
2. Contractor shall provide LEED credit verification as per Section 013300 Submittal Procedures.

E. EQc3.1: Construction Indoor Air Quality Management Plan - During Construction

1. Selection and installation of all materials described in this section must comply with the requirements of the approved project Indoor Air Quality Management Plan and with the project requirements for Construction Indoor Air Quality Management Plan - During Construction. See Section 018113 Sustainable Design Requirements.
2. Contractor shall provide LEED credit verification as per Section 013300 Submittal Procedures.

F. EQc4.2: LOW-EMITTING MATERIALS – PAINTS AND COATINGS

1. All paints and coatings used in the building interior comply with the project requirements for Low-Emitting Materials – Paints and Coatings. See Section 018113 Sustainable Design Requirements.
2. Contractor shall provide LEED credit verification as per Section 013300 Submittal Procedures.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. If applicable, include assembly, disassembly, and storage instructions for removable equipment.
2. Motors: Show nameplate data, ratings, characteristics, and mounting arrangements.

B. Shop Drawings: For gymnasium equipment.

1. Include plans, elevations, sections, details, and attachments to other work.
2. Include details of field assembly for removable equipment, connections, installation, mountings, floor inserts, attachments to other work, and operational clearances.
3. Include transport and storage accessories for removable equipment.

C. Samples for Verification: For the following products:
1. Pad Fabric: Wall padding not less than 3 inches (76 mm) square, with specified treatments applied. Mark face of material.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Court layout plans, drawn to scale, and coordinated with floor inserts, game lines, and markers applied to finished flooring.

B. Qualification Data: For Installer.

C. Product Certificates: For each type of gymnasium equipment.

D. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For gymnasium equipment to include in emergency, operation, and maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not install gymnasium equipment until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Verify position and elevation of floor inserts and layout for gymnasium equipment.

1.9 COORDINATION

A. Coordinate installation of floor inserts with structural floors and finish flooring installation and with court layout and game lines and markers on finish flooring.

B. Coordinate layout and installation of overhead-supported gymnasium equipment and suspension-system components with other construction including light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.

1.10 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of gymnasium equipment that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Basketball backboard failures including glass breakage.
b. Faulty operation of basketball backstops.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS, GENERAL

A. Source Limitations: Obtain gymnasium equipment from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Basketball backstops and anchors shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

2.3 BASKETBALL EQUIPMENT

A. Basis-of-Design Product: Subject to compliance with requirements, provide Porter Athletic Equipment Company or a comparable product by one of the following:

1. AALCO Manufacturing.
2. ADP Lemco.
3. Basketball Products International.
4. Douglas Industries, Inc.
5. Draper Inc.
6. IPI by Bison.
7. L. A. Steelcraft Products, Inc.
8. Performance Sports Systems.
9. Spalding Equipment.

B. General: Provide equipment complying with requirements in NFHS's "NFHS Basketball Rules Book."

C. Protruding fasteners or exposed bolt heads on front face of backboards are not permitted.

D. Provide manufacturer's recommended connections complying with Section 055000 "Metal Fabrications" of size and type required to transfer loads to building structure.

E. Primary Backstop:

1. Basis-of-Design: “312 Stationary Series” by Porter Athletic Equipment Company.
2. Support framework: Backstop mounted to wall at four fixed points with two welded, adjustable, rectangular side frames constructed from 2-1/2 inches diameter, 13 gage outer tube and 2-1/4 inches diameter, 14 gage inner tube.
    a. Extension adjustment: Plus or minus 6 inches.
    b. Wall anchor plates: 1/4 inch thick steel plates.
    c. Cross braces: 1-1/2 inches diameter, 11 gage steel
3. Distance from face of backboard to supporting wall: Per 4’-6’.
4. Wall pads: Provide 2 by 8 inches southern yellow pine pads with chamfered edges and clear polyurethane finish for support frame attachment points.

F. Cross Court Backstop:

1. Basis-of-Design: “312 Stationary Series” by Porter Athletic Equipment Company.

2. Support framework: Backstop mounted to wall at four fixed points with two welded, adjustable, rectangular side frames constructed from 2-1/2 inches diameter, 13 gage outer tube and 2-1/4 inches diameter, 14 gage inner tube.
    a. Extension adjustment: Plus or minus 6 inches.
    b. Wall anchor plates: 1/4 inch thick steel plates.
    c. Cross braces: 1-1/2 inches diameter, 11 gage steel
3. Distance from face of backboard to supporting wall: Per 4'-6'.
4. Wall pads: Provide 2 by 8 inches southern yellow pine pads with chamfered edges and clear polyurethane finish for support frame attachment points.

G. Backboard:
1. Distance from face of backboard to supporting wall: Per drawings.
1. Shape and Size
    a. Rectangular, 72" x 48"
2. Backboard material: With predrilled holes or preset inserts for mounting goals.
    a. Steel: Single-piece, steel face sheet, not less than 0.1046-inch (2.7-mm) nominal thickness, with 1-1/2-inch- (38-mm-) deep, roll-edged perimeter flange and with steel-reinforced, welded frame welded to back side of backboard; with mounting slots for mounting backboard frame to backboard support framing at standard mounting centers.
3. Distance from face of backboard to supporting wall: As shown on the drawings.
4. Support framework: Backstop mounted to wall at three fixed points with adjustable legs constructed from 2-1/2 inches diameter, 13 gage outer tube and 2-1/4 inches diameter, 14 gage inner tube.
    a. Two legs attached to top corners of backboard and one attached directly behind goal.
    b. Extension adjustment: Plus or minus 6 inches.
    c. Wall anchor plates: 1/4 inch thick steel plates.
    d. Diagonal Braces: 1-1/2 inches diameter, 11 gage steel tubes.
    e. Cross braces for top legs: 1/4 by 1-1/4 inches flat steel bars.
5. Target Area and Border Markings: Marked in pattern, stripe width, and color according to referenced rules orange, with manufacturer's standard pattern and stripe width.
6. Finish: Manufacturer's standard factory-applied, white background.

H. Basketball Goals and net: Complete with flanges, braces, attachment plate, and evenly spaced loops welded around underside of ring.
1. Basis-of-Design Product: "Double Rim Playground Goal' by Porter Athletic Equipment Company.
2. Double-Rim Basket Ring Competition Goal: Materials, dimensions, and fabrication per manufacturer's standard design.
3. Mount: Rear.
4. Finish: Powder-coat finish. Color: Red

I. Backboard Safety Pads: Designed for backboard thickness indicated and extending continuously along bottom and up sides of backboard and over goal mounting and backboard supports as per manufacturer's standard design.
1. Basis-of-Design: "312 Stationary Series" by Porter Athletic Equipment Company.
2. Attachment: Bolt-on.
3. Color: As selected by Architect from manufacturer's full range.
    a. Fasteners shall be per Division 11. Section: Tamper-Proof Metal Fasteners Steel: Single-piece, steel face sheet, not less than 0.1046-inch

(2.7-mm) nominal thickness, with 1-1/2-inch- (38-mm-) deep, roll-edged perimeter flange and with steel-reinforced, welded frame welded to back side of backboard; with mounting slots for mounting backboard frame to backboard support framing at standard mounting centers.

J. Basketball Nets: 12-loop-mesh net, between 15 and 18 inches (380 to 460 mm) long, sized to fit rim diameter, and as follows:

1. Cord: Made from white nylon.
2. Competition Cord: Antiwhip, made from white nylon cord not less than 120-gm thread and not more than 144-gm thread.

2.4 VOLLEYBALL EQUIPMENT

A. General: Provide equipment complying with requirements in NFHS's "NFHS Volleyball Rules Book."

B. Basis-of-Design Product: Subject to compliance with requirements, provide Porter Athletic Equipment Company, model ImpactSafe Wall Pad, or a comparable product by one of the following:

1. AALCO Manufacturing.
2. ADP Lemco.
3. Basketball Products International.
4. Douglas Industries, Inc.
5. Draper Inc.
6. IPI by Bison.

C. Floor Insert: Chrome-finished steel floor plate; and steel pipe sleeve, concealed by floor plate, with capped bottom end, sized with ID to fit post standards, not less than length required to securely anchor pipe sleeve in structural floor; with anchors designed for securing floor insert to floor substrate indicated; one per post standard.

D. Post Standards: Removable, paired volleyball post standards as indicated. Adjustable, telescoping height. Designed for easy removal from permanently placed floor insert supports. Fabricated from manufacturer's standard metal pipe or tubing, with nonmarking plastic or rubber end cap or floor bumper to protect permanent flooring. Finished with manufacturer's standard factory-applied, polyester powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness or plated metal finish.

1. Basis-of-Design: 00852-9xx Center Standards with 00717-1xx pad” by Porter Athletic Equipment Company.

E. Net:
1. Badminton net:
   a. Basis-of-Design: “02236-110” by Porter Athletic Equipment Company.
2. P.E. Tennis net:
   a. Basis-of-Design: “02991-340” by Porter Athletic Equipment Company.

2.5 SAFETY PADS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Porter Athletic Equipment Company, or a comparable product by one of the following:

1. AALCO Manufacturing.
2. ADP Lemco.
3. Basketball Products International.
4. Douglas Industries, Inc.
5. Draper Inc.
6. IPI by Bison.
7. L. A. Steelcraft Products, Inc.
8. Performance Sports Systems.
9. Spalding Equipment.

B. Safety Pad Surface-Burning Characteristics: ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 450 or less.

C. Pad Coverings: Provide safety pad fabric covering that is fabricated from puncture- and tear-resistant, PVC-coated polyester or nylon-reinforced PVC fabric, not less than 14-oz./sq. yd (475-g/sq. m) and treated with fungicide for mildew resistance; with surface-burning characteristics indicated, and lined with fire-retardant liner.

D. Wall Safety Pads: Padded wall wainscot panels designed to be attached in a continuous row; each panel section consisting of fill laminated to backer board with visible surfaces fully covered by seamless fabric covering, free of sag and wrinkles and firmly attached to back of backer board.

1. Backer Board: Not less than 3/8-inch- (9.5-mm-) thick fire-retardant-treated plywood according to AWPA U1, UCFA Fire Retardant Interior.
2. Fire-Resistive Fill: Multiple-impact-resistant foam not less than 2-inch- (50-mm-) thick, fire-resistive neoprene; 6.0-lb/cu. ft. (96-kg/cu. m) density.
3. Size: 3” th x 2’ w x 6’ h.
   Number of Modular Panel Sections: As indicated.
4. Fabric Covering Color(s): As selected by Architect from manufacturer's full range.

E. Cut-out Trim: Provide manufacturer's standard flanged cut-out trim kits for fitting pads around switches, receptacles, and other obstructions.

2.6 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for use and finish type indicated.

1. Extruded Bars, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
2. Cast Aluminum: ASTM B 179.
3. Flat Sheet: ASTM B 209 (ASTM B 209M).

B. Steel: Comply with the following:

1. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
2. Steel Tubing: ASTM A 500/A 500M or ASTM A 513, cold formed.
3. Steel Sheet: ASTM A 1011/A 1011M.

C. Support Cable: Manufacturer's standard galvanized-stranded-steel wire rope with a breaking strength of 7000 lb (3175 kg). Provide fittings complying with wire rope manufacturer's written instructions for size, number, and installation method.

D. Castings and Hangers: Malleable iron, complying with ASTM A 47/A 47M; grade required for structural loading.

E. Composite Wood Products: Products shall be made without urea formaldehyde.

F. Particleboard: ANSI A208.1.

G. Anchors, Fasteners, Fittings, and Hardware: Manufacturer's standard corrosion-resistant or noncorrodible units; concealed; tamperproof, vandal- and theft-resistant design.

H. Grout: Nonshrink, nonmetallic, premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout, complying with ASTM C 1107/C 1107 with minimum strength recommended in writing by gymnasium equipment manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for play court layout, alignment of mounting substrates, installation tolerances, operational clearances, and other conditions affecting performance of the Work.

1. Verify critical dimensions.
2. Examine supporting structure,subfloors, and footings below finished floor.
3. Examine wall assemblies, where reinforced to receive anchors and fasteners, to verify that locations of concealed reinforcements are clearly marked. Locate reinforcements and mark locations.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. General: Comply with manufacturer's written installation instructions and competition rules indicated for each type of gymnasium equipment. Complete equipment field assembly where required.

B. Unless otherwise indicated, install gymnasium equipment after other finishing operations, including painting, are completed.

C. Permanently Placed Gymnasium Equipment and Components: Install rigid, level, plumb, square, and true; anchored securely to supporting structure; positioned at

locations and elevations indicated; in proper relation to adjacent construction; and aligned with court layout.

1. Floor Insert Location: Coordinate location with application of game lines and markers.
2. Floor Insert Elevation: Coordinate installed heights of floor insert with installation of finish flooring and floor-plate type.
3. Operating Gymnasium Equipment: Verify clearances for movable components of gymnasium equipment throughout entire range of operation and for access to operating components.

D. Floor Insert Setting: Position sleeve in oversized, recessed voids in concrete slabs. Clean voids of debris. Fill void around sleeves with grout, mixed and placed to comply with grout manufacturer's written instructions. Protect portion of sleeve above subfloor from splatter. Verify that sleeves are set plumb, aligned, and at correct height and spacing; hold in position during placement and finishing operations until grout is sufficiently cured. Set insert so top surface of completed unit is flush with finished flooring surface.

E. Cut-out Trim: Limit cuts in face of padding from trim unit's corner-to-corner outside dimensions. Install with ends of cuts concealed behind trim flange.

F. Anchoring to In-Place Construction: Use anchors and fasteners where necessary to secure built-in and permanently placed gymnasium equipment to structural support and to properly transfer load to in-place construction.

3.3 ADJUSTING

A. Adjust movable components of gymnasium equipment to operate safely, smoothly, easily, and quietly, free from binding, warp, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Lubricate hardware and moving parts.

3.4 CLEANING

A. After completing gymnasium equipment installation, inspect components. Remove spots, dirt, and debris and touch up damaged shop-applied finishes according to manufacturer's written instructions.

B. Replace gymnasium equipment and finishes that cannot be cleaned and repaired, in a manner approved by Architect, before time of Substantial Completion.

END OF SECTION 11 66 23

SECTION 11 66 53 - GYMNASIUM DIVIDERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Fold-up divider systems.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Motors: Show mounting arrangements and wiring diagram to power source and controls.

B. Shop Drawings: For gymnasium dividers.
   1. Include plans showing alignment of curtains in relation to court layout.
   2. Include elevations, sections, details, and attachments to other work.
   3. Include system clearances, stacking requirements, and limits for fitting into adjacent construction.
   4. Include loads, point reactions, and locations for attachment of gymnasium dividers to structure.

C. Delegated-Design Submittal: For the attachment of the divider to the buildings structural framing, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
   1. Contractor is responsible for designing and providing the support structure required to tie the divider to the building structure.

D. Samples for Initial Selection: For each type of gymnasium divider curtain fabric.

E. Samples for Verification: For divider curtain fabric, not less than 12 inches (305 mm) square of mesh.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For each type of gymnasium divider.

C. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For gymnasium dividers to include in operation and maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not install gymnasium dividers until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Verify size of space, available clearances, obstructions, and position for gymnasium dividers.

1.8 COORDINATION

A. Coordinate installation of overhead-supported gymnasium dividers and suspension-system components with other construction including light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.

B. Electrically Operated Dividers: Coordinate electrical requirements for type and location of power supply, conduit, wiring, and control boxes.

1.9 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design stairs and railings.
   1. Contractor is responsible for designing and providing the support structure required to tie the divider to the building structure.

1.10 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of gymnasium dividers that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Faulty operation of gymnasium dividers.
      b. Tearing or deterioration of fabric, seams, or other materials beyond normal use.
   2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS, GENERAL

A. Source Limitations: Obtain gymnasium dividers from single source from single manufacturer.

2.2 FOLD-UP DIVIDER SYSTEMS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Porter Athletic Equipment Company; 670N Fold-up. Divider or a comparable product by one of the following:
1. ADP Lemco.
2. Draper Inc
3. IPI by Bison.
4. Performance Sports Systems.
5. Porter Athletic Equipment Company.

B. Divider Curtain System: Electrically operated, upward folding, cable suspended, and as follows:
1. Top Hem: Double-thickness mesh or solid vinyl for continuous pipe batten.
2. Outer Edge Hems: Triple turned and welded.
3. Bottom Curtain Pocket: 6 inches (152 mm) with manufacturer's standard pipe batten with padding.
4. Grommets: Manufacturer's standard material, size, and spacing; for lift cables to pass through curtain material.
5. Support Cables: 1/8-inch- (3.2-mm-) diameter galvanized-stranded-steel wire rope with a breaking strength of 2000 lb (907 kg). Provide fittings complying with cable manufacturer's written instructions for size, type, number, and installation method.
6. Support Chain and Fittings: Hardened alloy steel chain rated for lifting loads indicated, with commercial-quality, corrosion-resistant steel connectors and hangers.
7. Curtain Battens and Drive Pipe: Fabricate from steel pipe or tubing with a minimum number of joints, as necessary for required lengths. Provide galvanized battens and drive pipe, or shop prime and shop finish with black paint.
   a. Drive Pipe: 2-3/8-inch- (60-mm-) nominal diameter steel pipe.
   b. Top and Bottom Battens: 1-1/2-inch- (38-mm-) nominal diameter steel pipe.
   c.

2.3 MATERIALS

A. Support Chain and Fittings: For chains used for overhead lifting, provide Grade 80 heat-treated alloy steel chains, complying with ASTM A 391/A 391M, with commercial-quality, hot-dip galvanized or zinc-plated steel connectors and hangers.

B. General-Purpose Chain: For chains not used for overhead lifting, provide carbon steel chain, complying with ASTM A 413/A 413M, Grade 30 proof coil

chain or other grade recommended by gymnasium divider manufacturer. Provide coating type, chain size, number, and installation method complying with manufacturer's written instructions.

C. Anchors, Fasteners, Fittings, and Hardware: Manufacturer's standard corrosion-resistant or noncorrodible units; concealed; tamperproof, vandal-resistant design.

2.4 ELECTRIC OPERATORS

A. General: Factory-assembled electric operation system of size and capacity recommended and provided by gymnasium divider manufacturer for gymnasium dividers specified, with electric motors, thermal-overload protection, factory-prewired motor controls, control devices, and accessories required for proper operation. Include wiring from control stations to motors. Coordinate operator wiring requirements and electrical characteristics with building electrical system.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Motor Electrical Characteristics:
1. Voltage: NEMA standard voltage selected to operate on nominal circuit voltage to which motor is connected.
2. Phase: Single.
3. Hertz: 60.
4. Horsepower: Manufacturer's standard.

D. Limit Switches: Adjustable switches, interlocked with motor controls and set to automatically stop dividers at fully extended and fully retracted positions.

E. Control System:
1. Key Operation: NEMA ICS 6, Type 1 enclosure, momentary-contact, three-position switch-operated control.
a. Keys: Provide 5 key(s) per station.

2.5 DIVIDER CURTAINS

A. Curtain Mesh: Woven mesh of polyester yarn coated with vinyl, weighing not less than 13 oz./sq. yd. (440 g/sq. m).
1. Mesh Color: As selected by Architect from full range of industry colors and color densities.

B. Hems: Folded and electronically welded.

C. Seams: Electronically welded.

D. Overall Curtain Height: Floor to ceiling, within installation clearances required.

E. Bottom of Curtain: Approximately 2 inches (50 mm) above finished floor.

F. Divider Curtain Flame-Resistance Ratings: Passes NFPA 701, Test 2.

2.6 DIVIDER ACCESSORIES

A. Safety Lock: Locks drive system when speed exceeds manufacturer's recommended speed.

B. Audible Motion Alarm: Provide alarm with intermittent warning tone when curtain is raised or lowered.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for alignment of mounting substrates, installation tolerances, operational clearances, building electrical system connection types and locations, and other conditions affecting performance of the Work.
   1. Verify critical dimensions.
   2. Examine supporting structure.
   3. Examine wall assemblies, where reinforced to receive anchors and fasteners, to verify that locations of concealed reinforcements are clearly marked. Locate reinforcements and mark locations.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. General: Comply with manufacturer's written installation instructions.

B. Unless otherwise indicated, install gymnasium dividers after other finishing operations, including painting, are completed.

C. Gymnasium Dividers and Components: Install level, plumb, square, and true; anchored securely to supporting structure; positioned at locations and elevations indicated; in proper relation to adjacent construction; and aligned with court layout.
   1. Verify clearances for movable components of gymnasium dividers throughout entire range of operation and for access to operating components.

D. Anchoring to In-Place Construction: Use anchors and fasteners where necessary to secure gymnasium dividers to structural support and to properly transfer load to in-place construction.
   1.

E. Connections: Connect automatic operators to building electrical system.

3.3 ADJUSTING

A. Adjust movable components of gymnasium dividers to operate safely, smoothly, easily, and quietly, free from binding, warp, distortion, uneven

tension, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Lubricate hardware and moving parts.

B. Limit Switch Adjustment: Set and adjust upper and lower limit controls.

3.4 CLEANING

A. After completing gymnasium divider installation, inspect components. Remove spots, dirt, and debris and touch up damaged shop-applied finishes according to manufacturer's written instructions.

B. Replace gymnasium divider components and finishes that cannot be cleaned and repaired, in a manner approved by Architect, before time of Substantial Completion.

3.5 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain gymnasium dividers.

END OF SECTION 11 66 53

SECTION 12 35 53.19 - WOOD LABORATORY CASEWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Wood laboratory casework.
2. Utility-space framing at backs of countertops.
3. Filler and closure panels.
4. Laboratory countertops and sink.

B. Related Requirements:

1. Section 061053 "Miscellaneous Rough Carpentry" for wood blocking for anchoring laboratory casework.
2. Division 07 section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
3. Section 096513 "Resilient Base and Accessories" for resilient base applied to wood laboratory casework.
4. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 DEFINITIONS

A. Exposed Surfaces of Casework: Surfaces visible when doors and drawers are closed, including bottoms of cabinets more than 48 inches above floor, and visible surfaces in open cabinets or behind glass doors.

1. Ends of cabinets, including those installed directly against walls or other cabinets, are defined as "exposed."
2. Ends of cabinets indicated to be installed directly against and completely concealed by walls or other cabinets are defined as "concealed."

B. Semiexposed Surfaces of Casework: Surfaces behind opaque doors, such as cabinet interiors, shelves, and dividers; interiors and sides of drawers; and interior faces of doors. Tops of cases 78 inches or more above floor and bottoms of cabinets more than 24 inches but less than 48 inches above floor are defined as semiexposed.

C. Concealed Surfaces of Casework: Include sleepers, web frames, dust panels, and other surfaces not usually visible after installation.

D. MDF: Medium-density fiberboard.

E. Hardwood Plywood: A panel product composed of layers, or plies, of veneer, or of veneers in combination with lumber core, hardboard core, MDF core, or particleboard core, joined with adhesive and faced both front and back with hardwood veneers.

1.4 PREINSTALLATION MEETINGS

A. Keying Conference: Conduct conference at Project site. Incorporate keying conference decisions into final keying requirements.

1.5 COORDINATION

A. Coordinate layout and installation of framing and reinforcements for support of laboratory casework.

B. Coordinate installation of laboratory casework with installation of fume hoods and other laboratory equipment.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each regional material.
2. Chain-of-Custody Certificates: For certified wood products. Include statement of costs.
3. Chain-of-Custody Qualification Data: For manufacturer and vendor.
4. Product Data: For adhesives, indicating that product contains no urea formaldehyde.
5. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
6. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.
7. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: For laboratory casework. Include plans, elevations, sections, and attachment details.

1. Indicate types and sizes of cabinets.
2. Indicate locations of hardware and keying of locks.
3. Indicate locations and types of service fittings.
4. Indicate locations of blocking and reinforcements required for installing laboratory casework.
5. Include details of utility spaces showing supports for conduits and piping.
6. Include details of support framing system.
7. Include coordinated dimensions for laboratory equipment specified in other Sections.

D. Keying Schedule: Include schematic keying diagram, and index each key set to unique designations that are coordinated with the Contract Documents.

E. Samples for Initial Selection: For cabinet finishes and other materials requiring color selection.

F. Samples for Verification: For each type of cabinet finish and each type of countertop material, in manufacturer's standard sizes.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer.

B. Product Test Reports for Casework: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating compliance of laboratory casework with requirements of specified product standard.

C. Product Test Reports for Countertop Surface Material: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating compliance of laboratory countertop surface materials with requirements specified for chemical and physical resistance.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that produces casework of types indicated for this Project that has been tested for compliance with SEFA 8 W.

B. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.

C. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Protect finished surfaces during handling and installation with protective covering of polyethylene film or other suitable material.

1.10 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install laboratory casework until building is enclosed, utility roughing-in and wet work are complete and dry, and temporary HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Locate concealed framing, blocking, and reinforcements that support casework by field measurements before being enclosed, and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Collegedale; as manufactured by Hamilton Scientific or a comparable product by one of the following:

1. Keur Industries, Inc.
2. Kewaunee Scientific Corporation.
3. Sheldon Laboratory Systems.

B. Source Limitations: Obtain laboratory casework from single source from single manufacturer unless otherwise indicated.

1. Obtain countertops accessories and from casework manufacturer.

C. Product Designations: Drawings indicate sizes and configurations of laboratory casework by referencing designated manufacturer's catalog numbers. Other manufacturers' laboratory casework of similar sizes and similar door and drawer configurations and complying with Specifications may be considered. See Section 016000 "Product Requirements."

2.2 PERFORMANCE REQUIREMENTS

A. System Structural Performance: Laboratory casework and support framing system shall withstand the effects of the following gravity loads and stresses without permanent deformation, excessive deflection, or binding of drawers and doors:

1. Support Framing System: 600 lb/ft..
2. Suspended Base Cabinets (Internal Load): 160 lb/ft..
3. Work Surfaces (Including Tops of Suspended Base Cabinets): 160 lb/ft..
4. Shelves: 40 lb/sq. ft..

2.3 CASEWORK, GENERAL

A. Casework Product Standard: Comply with SEFA 8 W, "Laboratory Grade Wood Casework."

B. Regional Materials: Wood products shall be manufactured within 500 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

C. Certified Wood: Wood products shall be certified as "FSC Pure" according to FSC STD-01-00 and FSC STD-40-004.

2.4 WOOD CASEWORK

A. Design: Reveal overlay with square edges.

1. Provide 1/8-inch reveals between doors and drawers that are adjacent.

B. Wood Species: Red oak.

C. Cut: Plain sliced/sawn.

D. Matching:

1. None required; select and arrange components for compatible grain and color.
2. Provide veneers for each cabinet from a single flitch, book matched.

a. Provide continuous matching of adjacent drawer fronts within each cabinet.

E. Grain Direction:
1. Vertical on doors, horizontal on drawer fronts.

F. Exposed Materials:

1. General: Provide materials that are selected and arranged for compatible grain and color. Do not use materials adjacent to one another that are noticeably dissimilar in color, grain, figure, or natural character markings.
2. Plywood: Hardwood plywood, either veneer core or particleboard core, made without urea formaldehyde with face veneer of species indicated. Grade A exposed faces, at least 1/50 inch thick, and Grade J crossbands. Provide backs of same species as faces.

G. Semiexposed Materials:

1. Plywood: Hardwood plywood of same species as exposed plywood. Grade B faces and Grade J crossbands. Provide backs of same species as faces.

H. Concealed Materials:
1. Plywood: Hardwood plywood. Provide backs of same species as faces.

2.5 WOOD CABINET MATERIALS

A. General:

1. Maximum Moisture Content for Lumber: 7 percent for hardwood and 12 percent for softwood.

B. Composite Wood Products: Products shall be made without urea formaldehyde.

C. Composite Wood Products: Products shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

D. Hardwood Plywood: HPVA HP-1, particleboard core except where veneer core is indicated.

E. MDF: ANSI A208.2, Grade 130.

F. Particleboard: ANSI A208.1, Grade M-2.

G. Hardboard: ANSI A135.4, Class 1 Tempered.

H. Adhesives: Do not use adhesives that contain urea formaldehyde.

I. Edgebanding for Wood-Veneered Construction: Minimum 1/8-inch- thick, solid wood of same species as face veneer Wood veneer of same species as face veneer Rigid PVC extrusions, through color with satin finish, 3 mm thick at doors and drawer fronts, 1 mm thick elsewhere.
   1. Colors: As selected by Architect from manufacturer's full range.

2.6 COUNTERTOP AND SINK MATERIALS

A. Epoxy: Factory-molded, modified epoxy-resin formulation with smooth, nonspecular finish.

   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

      a. Durcon Incorporated.
      b. Prime Industries, Inc.
      c. Thermo Fisher Scientific, Inc.

   2. Physical Properties:

      a. Flexural Strength: Not less than 10,000 psi.
      b. Modulus of Elasticity: Not less than 2,000,000 psi.
      c. Hardness (Rockwell M): Not less than 100.
      d. Water Absorption (24 Hours): Not more than 0.02 percent.
      e. Heat Distortion Point: Not less than 260 deg F.

   3. Chemical Resistance: Epoxy-resin material has the following ratings when tested with indicated reagents according to NEMA LD 3, Test Procedure 3.4.5:

      a. No Effect: Acetic acid (98 percent), acetone, ammonium hydroxide (28 percent), benzene, carbon tetrachloride, dimethyl formamide, ethyl acetate, ethyl alcohol, ethyl ether, methyl alcohol, nitric acid (70 percent), phenol, sulfuric acid (60 percent), and toluene.
      b. Slight Effect: Chromic acid (60 percent) and sodium hydroxide (50 percent).

   4. Color: Black.

2.7 FABRICATION

A. Construction: Provide wood-faced laboratory casework complying with SEFA 8 W.

B. Posts: Solid-hardwood legs, not less than 2 inches square with solid-hardwood stretchers as needed to comply with product standard. Bolt stretchers to legs and cross-stretchers, and bolt legs to table aprons.

   1. Leg Shoes: Black vinyl or rubber, open-bottom, slip-on type.

C. Utility-Space Framing: Steel framing units consisting of two steel slotted channels complying with MFMA-4, not less than 1-5/8 inches square by 0.105-inch nominal thickness, and connected at top and bottom by U-shaped brackets made from 1-1/4-by-1/4-inch steel flat bars. Framing units may be made by welding specified channel material into rectangular frames instead of using U-shaped brackets.

D. Removable Backs: Provide backs that can be removed from within cabinets at utility spaces. Provide tamper-proof metal fasteners.

E. Filler and Closure Panels: Provide where indicated and as needed to close spaces between cabinets and walls, ceilings, and indicated equipment. Fabricate from same material and with same finish as adjacent exposed cabinet surfaces unless otherwise indicated.

2.8 LABORATORY CASEWORK SYSTEM

A. Provide casework manufacturer's standard integrated system that includes support framing, suspended modular wood cabinets, filler and closure panels, countertops, and fittings needed to assemble system. System includes hardware and fasteners for securing support framing to permanent construction.

1. Cabinets can be removed and reinstalled without use of special tools for relocation within system.
2. Base cabinets can be removed without providing temporary support for, or removing, countertops.
3. Support framing has provision for fastening pipe supports at utility space in not more than 1-inch increments.
4. System includes filler and closure panels to close spaces between support framing, cabinets, shelves, countertops, floors, and walls unless otherwise indicated. Fabricate from same material and with same finish as adjacent exposed cabinet surfaces unless otherwise indicated.

B. Support Framing: Casework manufacturer's standard system consisting of vertical supports and connecting braces and rails as follows:

1. Cabinets, shelves, and countertops are supported from vertical supports except where floor-supported base cabinets are indicated. Vertical positioning of supported cabinets, shelves, and countertops can be varied in 1-inch increments through full height of supports.
2. Vertical supports rest on adjustable leveling bases and are secured to floor with metal clips fastened to floor.
3. Vertical supports are installed with braces and rails, connecting them to each other and to permanent building walls to create a stable, rigid structure with framed utility spaces where indicated.
4. Vertical supports are braced at floor with cantilevered horizontal leg members where indicated.

C. Countertops: Provide in modular lengths indicated, without seams.

2.9 WOOD FINISH

A. Preparation: Sand lumber and plywood before assembling. Sand edges of doors, drawer fronts, and molded shapes with profile-edge sander. Sand after assembling for

uniform smoothness at least equivalent to that produced by 220-grit sanding and without machine marks, cross sanding, or other surface blemishes.

B. Staining: Remove fibers and dust and apply stain to exposed and semiexposed surfaces as necessary to match approved Samples. Apply stain in a manner that produces a consistent appearance. Apply wash-coat sealer before applying stain to closed-grain wood species.

1. Stain Color: As selected by Architect from manufacturer's full range.

2.10 HARDWARE

A. General: Provide laboratory casework manufacturer's standard, commercial-quality, heavy-duty hardware complying with requirements indicated for each type.

B. Butt Hinges: Chrome, five-knuckle hinges complying with BHMA A156.9, Grade 1, with antifriction bearings and rounded tips. Provide two for doors 48 inches high or less and three for doors more than 48 inches high.

C. Pulls: Wire pulls. Provide two pulls for drawers more than 24 inches wide.

D. Door Catches: Dual, self-aligning, permanent magnet catches. Provide two catches on doors more than 48 inches high.

E. Drawer Slides: Side mounted, epoxy-coated steel, self-closing; designed to prevent rebound when drawers are closed; complying with BHMA A156.9, Type B05091.
1. Heavy Duty (Grade 1HD-100 and Grade 1HD-200): Full-extension, ball-bearing type.

F. Locks: Cam type with five-pin tumbler, brass with chrome-plated finish; complying with BHMA A156.11, Type E07281.

1. Provide a minimum of two keys per lock and two master keys.
2. Provide on all drawers and doors.
3. Keying: Key locks as directed by Owner.
4. Master Key System: Key all locks to be operable by master key.

G. Adjustable Wall Shelf Supports: Surface-type steel standards and steel shelf brackets, with epoxy powder-coated finish, complying with BHMA A156.9, Type B04102 and Type B04112.

2.11 COUNTERTOPS AND SINKS

A. Countertops, General: Provide units with smooth surfaces in uniform plane, free of defects. Make exposed edges and corners straight and uniformly beveled. Provide front and end overhang of 1 inch, with continuous drip groove on underside 1/2 inch from edge.

B. Sinks, General: Provide sizes indicated or laboratory casework manufacturer's closest standard size of equal or greater volume, as approved by Architect.

1. Outlets: Provide with strainers and tailpieces, NPS 1-1/2, unless otherwise indicated.

2. Overflows: provide overflow of standard beehive or open-top design with separate strainer. Height 2 inches less than sink depth. Provide in same material as strainer.

C. Epoxy Countertops and Sinks:

1. Countertop Fabrication: Fabricate with factory cutouts for sinks, holes for service fittings and accessories, and butt joints assembled with epoxy adhesive and concealed metal splines.

a. Countertop Configuration: Flat, 1 inch thick, with beveled edge and corners, and with drip groove and applied backsplash.
b. Countertop Configuration: As indicated.
c. Countertop Construction: Uniform throughout full thickness.

2. Sink Fabrication: Molded in one piece with smooth surfaces, coved corners, and bottom sloped to outlet; 1/2-inch minimum thickness.

a. Provide with polypropylene strainers and tailpieces.
b. Provide integral sinks in epoxy countertops, bonded to countertops with invisible joint line.
c. Provide manufacturer's recommended adjustable support system for table- and cabinet-type installations.

2.12 ELECTRICAL SERVICE FITTINGS

A. Service Fittings, General: Provide units complete with metal housings, receptacles, switches, pilot lights, cover plates, accessories, and gaskets required for mounting on laboratory casework.

1. Receptacles, switches, pilot lights, cover plates, and accessories are specified in Section 262726 "Wiring Devices."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances, location of reinforcements, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF CABINETS

A. Comply with installation requirements in SEFA 2.3. Install level, plumb, and true; shim as required, using concealed shims. Where laboratory casework abuts other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical. Do not exceed the following tolerances:

1. Variation of Tops of Base Cabinets from Level: 1/16 inch in 10 feet.

2. Variation of Faces of Cabinets from a True Plane: 1/8 inch in 10 feet.
3. Variation of Adjacent Surfaces from a True Plane (Lippage): 1/32 inch.
4. Variation in Alignment of Adjacent Door and Drawer Edges: 1/16 inch.

B. Utility-Space Framing: Secure to floor with two fasteners at each frame. Fasten to partition framing, wood blocking, or metal reinforcements in partitions and to base cabinets.

C. Base Cabinets: Fasten cabinets to utility-space framing, partition framing, wood blocking, or reinforcements in partitions, with fasteners spaced not more than 16 inches o.c. Bolt adjacent cabinets together with joints flush, tight, and uniform.

1. Where base cabinets are installed away from walls, fasten to floor at toe space at not more than 24 inches o.c. and at sides of cabinets with not less than two fasteners per side.

D. Install hardware uniformly and precisely. Set hinges snug and flat in mortises.

E. Adjust laboratory casework and hardware so doors and drawers align and operate smoothly without warp or bind and contact points meet accurately. Lubricate operating hardware as recommended by manufacturer.

3.3 INSTALLATION OF COUNTERTOPS

A. Comply with installation requirements in SEFA 2.3. Abut top and edge surfaces in one true plane with flush hairline joints and with internal supports placed to prevent deflection. Locate joints only where indicated on Shop Drawings.

B. Field Jointing: Where possible, make in same manner as shop-made joints using dowels, splines, fasteners, adhesives, and sealants recommended by manufacturer. Shop prepare edges for field-made joints.

1. Use concealed clamping devices for field-made joints in plastic-laminate countertops. Locate clamping devices within 6 inches of front and back edges and at intervals not exceeding 24 inches. Tighten according to manufacturer's written instructions to exert a uniform heavy pressure at joints.

C. Fastening:
1. Secure epoxy countertops to cabinets with epoxy cement, applied at each corner and along perimeter edges at not more than 48 inches o.c.
2. Where necessary to penetrate countertops with fasteners, countersink heads approximately 1/8 inch and plug hole flush with material equal to countertop in chemical resistance, hardness, and appearance.

D. Provide required holes and cutouts for service fittings.

E. Seal unfinished edges and cutouts in plastic-laminate countertops with heavy coat of polyurethane varnish.

F. Provide scribe moldings for closures at junctures of countertop, curb, and splash with walls as recommended by manufacturer for materials involved. Match materials and finish to adjacent laboratory casework. Use chemical-resistant, permanently elastic sealing compound where recommended by manufacturer.

G. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

3.4 INSTALLATION OF SINKS

A. Comply with installation requirements in SEFA 2.3.

B. Underside Installation of Epoxy Sinks: Use laboratory casework manufacturer's recommended adjustable support system for table- and cabinet-type installations. Set top edge of sink unit in sink and countertop manufacturers' recommended chemical-resistant sealing compound or adhesive, and firmly secure to produce a tight and fully leakproof joint. Adjust sink and securely support to prevent movement. Remove excess sealant or adhesive while still wet and finish joint for neat appearance.

3.5 INSTALLATION OF SERVICE FITTINGS

A. Comply with requirements in other Sections for installing electrical devices.

B. Install fittings according to Shop Drawings, installation requirements in SEFA 2.3, and manufacturer's written instructions. Set bases and flanges of sink- and countertop-mounted fittings in sealant recommended by manufacturer of sink or countertop material. Securely anchor fittings to laboratory casework unless otherwise indicated.

3.6 CLEANING AND PROTECTING

A. Clean finished surfaces, touch up as required, and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.

B. Protect countertop surfaces during construction with 6-mil plastic or other suitable water-resistant covering. Tape to underside of countertop at a minimum of 48 inches o.c.

END OF SECTION 123553.19

SECTION 12 36 16 - METAL COUNTERTOPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes stainless-steel countertops and sinks.

1. Division 06 Section "Miscellaneous Carpentry" for wood furring, blocking, shims, and hanging strips required for installing woodwork and concealed within other construction before woodwork installation.
2. Division 06 Section “Plastic-Laminate-Faced Architectural Cabinets”
3. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
4. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable LEED Credits

1. MRc2
2. MRc4
3. MRc5
4. IEQc4.1

B. LEED Requirements

1. MRc2: Construction Waste Management:

   No less than the specified portion of all construction waste from the Project shall be diverted from disposal in a landfill and/or incineration in with the Project Requirements for Construction Waste Management and Disposal. Refer to Specification Sections 017419 Construction Waste Management and Disposal and 013510 Sustainable Design Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

2. MRc4: Recycled Content Material:

   No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the Project Requirements for Recycled Content Materials. All materials counted towards the computations of the proportion of the Recycled Content Materials shall comply with the standard minimum percentages of post-consumer waste materials and for the minimum percentages of pre-consumer waste materials.

Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

3. MRc5: Regionally Manufactured and/or Harvested Materials:

   No less than the specified minimum proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the Project Site in accordance with the Project Requirements for Regionally Manufactured and/or Harvested Materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

4. IEQc4.1: Low Emitting Materials – Sealant and Adhesives:

   All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the Project Requirements for Low Emitting Materials – Sealants and Adhesives. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include plans, sections, details, and attachments to other work. Detail fabrication and installation, including field joints.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver metal countertops only after casework has been completed in installation areas.

B. Keep finished surfaces covered with polyethylene film or other protective covering during handling and installation.

1.6 FIELD CONDITIONS

A. Field Measurements: Verify actual dimensions of construction to receive metal countertops by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304.

B. Sealant for Countertops: Manufacturer's standard sealant of characteristics indicated below that complies with applicable requirements in Section 079200 "Joint Sealants."

1. Mildew-Resistant Joint Sealant: Mildew resistant, single component, nonsag, neutral curing, silicone.
2. Color: Clear.
3. Sealant shall have a VOC content of 250 g/L or less.
4. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.2 STAINLESS-STEEL COUNTERTOPS AND SINKS

A. Countertops: Fabricate from 0.062-inch- (1.59-mm-) thick, stainless-steel sheet. Provide smooth, clean exposed tops and edges in uniform plane, free of defects. Provide front and end overhang of 1 inch (25 mm) over the base cabinets.

1. Joints: Fabricate countertops without field-made joints.
2. Weld shop-made joints.
3. Sound deaden the undersurface with heavy-build mastic coating.
4. Extend the top down to provide a 1-inch- (25-mm-) thick edge with a 1/2-inch (12.7-mm) return flange.
5. Form the backsplash coved to and integral with top surface, with a 1/2-inch- (12.7-mm) thick top edge and 1/2-inch (12.7-mm) return flange.
6. Provide raised (marine) edge around perimeter of tops containing sinks; pitch tops containing sinks two ways to provide drainage without channeling or grooving.
7. Where stainless-steel sinks occur in stainless-steel tops, factory weld into one integral unit.

B. Stainless-Steel Sinks: Fabricate from stainless-steel sheet, not less than 0.050-inch (1.27-mm) nominal thickness. Fabricate with corners rounded and coved to at least 5/8-inch (16-mm) radius. Slope the sink bottoms to outlet without channeling or grooving. Provide continuous butt-welded joints.

1. Sizes:

   a. ‘D’ – 6” X 16” x 22”
   b. ‘E’ - 6” X 18” x 30”

2. Provide double-wall construction for sink partitions with top edge rounded to at least 1/2-inch (13-mm) diameter.
3. Factory punch holes for fittings.
4. Provide sinks with stainless-steel strainers and tailpieces.
5. Apply 1/8-inch- (3-mm-) thick coating of heat-resistant, sound-deadening mastic to undersink surfaces.

2.3 STAINLESS-STEEL FINISH

A. Grind and polish surfaces to produce uniform, directional satin finish matching No. 4 finish, with no evidence of welds and free of cross scratches. Run grain with long dimension of each piece. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces clean.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of metal countertops.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install metal countertops level, plumb, and true; shim as required, using concealed shims.

B. Field Jointing: Where possible, make field jointing in the same manner as shop jointing; use fasteners recommended by manufacturer. Prepare edges to be joined in shop so Project-site processing of top and edge surfaces is not required. Locate field joints where shown on Shop Drawings.

C. Secure tops to cabinets with Z- or L-type fasteners or equivalent; use two or more fasteners at each front, end, and back.

D. Abut top and edge surfaces in one true plane, with internal supports placed to prevent deflection.

E. Seal junctures of tops, splashes, and walls with mildew-resistant silicone sealant or another permanently elastic sealing compound recommended by countertop material manufacturer.

3.3 CLEANING AND PROTECTION

A. Repair or remove and replace defective work as directed on completion of installation.

B. Clean finished surfaces, touch up as required, and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.

C. Protection: Provide 6-mil (0.15-mm) plastic or other suitable water-resistant covering over the countertop surfaces. Tape to underside of countertop at a minimum of 48 inches (1220 mm) o.c. Remove protection at Substantial Completion.

END OF SECTION 12 36 16

SECTION 12 36 61 - SIMULATED STONE COUNTERTOPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Solid-surface-material countertops
2. Solid-surfacing-material sink bowls installed integrally with countertops.
3. Solid-surfacing window stools.

B. Related Sections:

1. Division 06 Section "Miscellaneous Carpentry" for wood furring, blocking, shims, and hanging strips required for installing woodwork and concealed within other construction before woodwork installation.
2. Division 06 Section “Plastic-Laminate-Faced Architectural Cabinets”
3. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
4. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 SUSTAINABLE DESIGN REQUIREMENTS

A. Applicable LEED Credits

1. MRc2
2. MRc4
3. MRc5
4. IEQc4.1

B. LEED Requirements

1. MRc2: Construction Waste Management:

   No less than the specified portion of all construction waste from the Project shall be diverted from disposal in a landfill and/or incineration in with the Project Requirements for Construction Waste Management and Disposal. Refer to Specification Sections 017419 Construction Waste Management and Disposal and 013510 Sustainable Design Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

2. MRc4: Recycled Content Material:

No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the Project Requirements for Recycled Content Materials. All materials counted towards the computations of the proportion of the Recycled Content Materials shall comply with the standard minimum percentages of post-consumer waste materials and for the minimum percentages of pre-consumer waste materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

3. MRc5: Regionally Manufactured and/or Harvested Materials:

   No less than the specified minimum proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the Project Site in accordance with the Project Requirements for Regionally Manufactured and/or Harvested Materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

4. IEQc4.1: Low Emitting Materials – Sealant and Adhesives:

   All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the Project Requirements for Low Emitting Materials – Sealants and Adhesives. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

1.4 ACTION SUBMITTALS

A. Product Data: For countertop materials and sinks.

B. Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.

C. Samples for Verification: For the following products:

1. Countertop material, 6 inches (150 mm) square.
2. One full-size solid-surface-material countertop, with front edge, 8 by 10 inches (200 by 250 mm), of construction and in configuration specified.
3. Colors, Patterns, and Finishes: Provide materials and products that result in colors of solid-surfacing material complying with the following requirements:

   a. As indicated on drawings

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.

B. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions of countertops by field measurements after base cabinets are installed but before countertop fabrication is complete.

1.7 COORDINATION

A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

PART 2 - PRODUCTS

2.1 SOLID-SURFACE-MATERIAL COUNTERTOPS

A. Solid-Surfacing Material: Homogeneous solid sheets of filled plastic resin complying with ISSFA-2.

B. Basis-of-Design Product: Subject to compliance with requirements, provide Formica Corporation, or a comparable product by one of the following:

a. Avonite, Inc.
b. E. I. du Pont de Nemours and Company.
c. LG Chemical, Ltd.
d. Nevamar Company, LLC; Decorative Products Div.
e. Swan Corporation (The).
f. Wilsonart International; Div. of Premark International, Inc.

C. Configuration: Provide countertops with the following front and backsplash style:

1. Front: Straight, slightly eased at top.
2. Backsplash: Straight, slightly eased at corner.
3. Endsplash: Matching backsplash.

D. Countertops: 1/2” thick, solid surface material with front edge built up with same material.

1. Colors: As indicated on drawings.

E. Backsplashes: 1/2-inch- (19-mm-) thick, solid surface material with wood-trimmed edges.

F. Fabrication: Fabricate tops in one piece with shop-applied edges and backsplashes unless otherwise indicated. Comply with solid-surface-material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.

1. Fabricate with loose backsplashes for field assembly.
2. Install integral sink bowls in countertops in the shop.

G. Solid-Surfacing Material Sink Bowls

1. Basis-of-Design Product: Subject to compliance with requirements, provide Formica Corporation, or a comparable product by one of the following:

a. Sink types:
   1) 'A' - Formica K250
   2) 'B' - Formica S075
   3) 'C' - Formica K100

2. Colors: As indicated on drawings.

2.2 COUNTERTOP MATERIALS

A. Certified Wood: Wood products shall be certified as "FSC Pure" or "FSC Mixed Credit" according to FSC STD-01-00 and FSC STD-40-004.

B. Composite Wood Products: Products shall be made without urea formaldehyde.

C. Composite Wood Products: Products shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

D. Wood under layment: Medium-density fiberboard made with exterior glue

E. Adhesives: Do not use adhesives that contain urea formaldehyde.

F. Solid Surface Material: Homogeneous solid sheets of filled plastic resin complying with ANSI SS1.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install countertops level to a tolerance of 1/8 inch in 8 feet (3 mm in 2.4 m).

B. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Pre-drill holes for screws as recommended by manufacturer. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

1. Install backsplashes and endsplashes to comply with manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.
2. Seal edges of cutouts in particleboard subtops by saturating with varnish.

END OF SECTION 123661

SECTION 12 93 00 - SITE FURNISHINGS

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Bicycle racks.
2. Combination Ash and Trash receptacles.
3. Bollards.

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for installing pipe sleeves cast or installing anchor bolts cast in concrete footings.
2. Section 312000 "Earth Moving" for excavation for installing concrete footings.

1.3 SUSTAINABLE DESIGN REQUIREMENTS

A. MRc2: Construction Waste Management

1. No less than the specified minimum proportion of all construction waste from the project shall be diverted from disposal in a landfill and/or incineration in accordance with the project requirements for Construction Waste Management. See Section 018113 Sustainable Design Requirements.

B. MRc4: Recycled Content Material

1. No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the project requirements for Recycled Content Materials. All materials counted toward the computation of the proportion of the Recycled Content Materials shall comply with the standard for the minimum percentages of post-consumer waste materials and for the minimum percentage of pre-consumer waste materials. See Section 018113 Sustainable Design Requirements.
2. Contractor shall provide LEED credit verification as per section 013300 Submittal Procedures.

C. MRc5: Regionally manufactured harvested materials

1. No less than the specified proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the project site in accordance with the project requirements for Regionally Manufactured and/or Harvested Materials. See Section 018113 Sustainable Design Requirements.
2. Contractor shall provide LEED credit verification as per Section 013300 Submittal Procedures.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
2. Chain-of-Custody Certificates: For certified wood products. Include statement of costs.
3. Chain-of-Custody Qualification Data: For manufacturer and vendor.

C. Samples: For each exposed product and for each color and texture specified.

D. Product Schedule: For site furnishings. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

A. Material Certificates: For site furnishings.

1. Wood Preservative Treatment: Include certification by treating plant stating type of preservative solution and pressure process used, net amount of preservative retained, and compliance with applicable standards.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For site furnishings to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.

B. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.

PART 2 - PRODUCTS

2.1 BICYCLE RACKS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Landscape Forms, Inc., “Ride” Bicycle Rack

B. Materials:

1. Frame: Aluminum casting, 319 ASTM B26 or 356 ASTM B108 & LFI 7.4.2-A1.
2. Adjustable Leveler: Stainless steel round bar, 303 ASTM A581, A582.
3. Anchor Cover: Aluminum casting, 319 ASTM B26 or 356 ASTM B108 & LFI 7.4.2-A1.
4. Anchor Set Screw: 1/4-20 x 1.50 set screw, cup point, hex drive, magni-coated.

5. Hardware Pack: Steel rod, 5/8-11 X 3 1/2 threaded rod with magni 565 silver top coat.
6. Installation Method: Cast in concrete.
7. Unit spacing: 30 inches on center or as recommended by manufacturer.

C. Aluminum Finish: Manufacturer's standard powder coat.

D. Color: As selected by Architect from manufacturer's full range

2.2 BOLLARDS

A. Steel Bollards Basis-of-Design Product: Subject to compliance with requirements, provide BRP by bison; BRB4-EM or a comparable product by one of the following:

a. Canterbury International.
b. Columbia Cascade Company.
c. Creative Pipe, Inc.
d. Dero Bike Rack Co.
e. DuMor Inc.
f. FairWeather Site Furnishings; a division of Leader Manufacturing, Inc.
g. L. A. Steelcraft Products, Inc.

1. Bollard Construction:

a. Pipe OD: Not less than 4-1/2 inches (115 mm).

1) Steel: Schedule 40 pipe.

b. Style: Dome top.
c. Overall Height: 42-inches.

a) Installation Method: Cast in concrete.

2. Steel Finish: Color coated.
a. Color: Safety yellow.

2.3 STAINLESS STEEL BOLLARDS

A. Steel Bollards Basis-of-Design Product: Subject to compliance with requirements, provide SSF000 series as manufactured by Calpipe. or a comparable product by one of the following:

a. Canterbury International.
b. Columbia Cascade Company.
c. Creative Pipe, Inc.
d. Dero Bike Rack Co.
e. DuMor Inc.
f. FairWeather Site Furnishings; a division of Leader Manufacturing, Inc.
g. L. A. Steelcraft Products, Inc.

2. Bollard Construction:

a. Pipe OD: 6”

1) Stainless-Steel .

b. Style: Flate.
c. Overall Height: 42-inches.

a) Installation Method: Cast in concrete.

d. Stainless-Steel Finish: No 6

2.4 MATERIALS

A. Steel and Iron: Free of surface blemishes and complying with the following:

1. Plates, Shapes, and Bars: ASTM A 36/A 36M.
2. Steel Pipe: Standard-weight steel pipe complying with ASTM A 53/A 53M, or electric-resistance-welded pipe complying with ASTM A 135/A 135M.
3. Tubing: Cold-formed steel tubing complying with ASTM A 500/A 500M.
4. Malleable-Iron Castings: ASTM A 47/A 47M, grade as recommended by fabricator for type of use intended.
5. Gray-Iron Castings: ASTM A 48/A 48M, Class 200.

B. Stainless Steel: Free of surface blemishes and complying with the following:

1. Sheet, Strip, Plate, and Flat Bars: ASTM A 666.
2. Pipe: Schedule 40 steel pipe complying with ASTM A 312/A 312M.
3. Tubing: ASTM A 554.

2.5 FABRICATION

A. Metal Components: Form to required shapes and sizes with true, consistent curves, lines, and angles. Separate metals from dissimilar materials to prevent electrolytic action.

B. Welded Connections: Weld connections continuously. Weld solid members with full-length, full-penetration welds and hollow members with full-circumference welds. At exposed connections, finish surfaces smooth and blended so no roughness or unevenness shows after finishing and welded surface matches contours of adjoining surfaces.

C. Pipes and Tubes: Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of handrail and railing components.

D. Exposed Surfaces: Polished, sanded, or otherwise finished; all surfaces smooth, free of burrs, barbs, splinters, and sharpness; all edges and ends rolled, rounded, or capped.

E. Factory Assembly: Assemble components in the factory to greatest extent possible to minimize field assembly. Clearly mark units for assembly in the field.

2.6 GENERAL FINISH REQUIREMENTS

A. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.7 STEEL AND GALVANIZED-STEEL FINISHES

A. Baked-Enamel, Powder-Coat Finish: Manufacturer's standard, baked, polyester, powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.

2.8 STAINLESS-STEEL FINISHES

A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.

1. Run directional finishes with long dimension of each piece.
2. Dull Satin Finish: No. 6.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for correct and level finished grade, mounting surfaces, installation tolerances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Comply with manufacturer's written installation instructions unless more stringent requirements are indicated. Complete field assembly of site furnishings where required.

B. Unless otherwise indicated, install site furnishings after landscaping and paving have been completed.

C. Install site furnishings level, plumb, true, and securely anchored at locations indicated on Drawings.

D. Post Setting: Set cast-in support posts in concrete footing with smooth top, shaped to shed water. Protect portion of posts above footing from concrete splatter. Verify that posts are set plumb or at correct angle and are aligned and at correct height and spacing. Hold posts in position during placement and finishing operations until concrete is sufficiently cured.

E. Pipe Sleeves: Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions, with top smoothed and shaped to shed water.

END OF SECTION 12 93 00

SECTION 14 21 00 - ELECTRIC TRACTION ELEVATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes electric traction machine-roomless passenger elevator.

B. Related Requirements:

1. Section 015000 "Temporary Facilities and Controls" for temporary use of elevators for construction purposes.
2. Section 033000 "Cast-in-Place Concrete" for setting sleeves, inserts, and anchoring devices in concrete.
3. Section 042000 "Unit Masonry" for setting sleeves, inserts, and anchoring devices in masonry and for grouting elevator entrance frames installed in masonry walls.
4. Section 055000 "Metal Fabrications" for the following:

    a. Attachment plates and angle brackets for supporting guide-rail brackets.
    b. Hoist beams.
    c. Structural-steel shapes for subsills.
    d. Pit ladders.
    e. Cants in hoistways made from steel sheet.

5. Division 07 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants;
6. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations indicated to receive security fasteners.
7. Division 26 Sections for electrical service for elevators to and including disconnect switches at machine room door and standby power source, transfer switch, and connection from auxiliary contacts in transfer switch to controller.
8. Division 27 Section "Communications Horizontal Cabling" for telephone service for elevators.
9. Division 28 Section "Access Control" for security access system equipment used to restrict elevator use.
10. Division 28 Section "Digital, Addressable Fire Alarm System" for smoke detectors in elevator lobbies to initiate emergency recall operation and heat detectors in shafts and machine rooms to disconnect power from elevator equipment before sprinkler activation and for connection to elevator controllers.
11. Division 28 Sections for integration with Building Security system including Central Control.
12. Division 36 Sections for commissioning requirements.

1.3 DEFINITIONS

A. Definitions in ASME A17.1/CSA B44 apply to work of this Section.

B. Defective Elevator Work: Operation or control system failure, including excessive malfunctions; performances below specified ratings; excessive wear; unusual deterioration or aging of materials or finishes; unsafe conditions; need for excessive maintenance; abnormal noise or vibration; and similar unusual, unexpected, and unsatisfactory conditions.

1.4 SUSTAINABLE DESIGN REQUIREMENTS

A. MRc2: CONSTRUCTION WASTE MANAGEMENT

1. No less than the specified minimum proportion of all construction waste from the project shall be diverted from disposal in a landfill and/or incineration in accordance with the project requirements for Construction Waste Management. See Section 018113 Sustainable Design Requirements.

B. EQc4.1: LOW-EMITTING MATERIALS – SEALANTS AND ADHESIVES

1. All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the project requirements for Low-Emitting Materials – Sealants and Adhesives. See Section 018113 Sustainable Design Requirements.
2. Contractor shall provide LEED credit verification as per Section 013300 Submittal Procedures.

C. EQc4.2: LOW-EMITTING MATERIALS – PAINTS AND COATINGS

1. All paints and coatings used in the building interior comply with the project requirements for Low-Emitting Materials – Paints and Coatings. See Section 018113 Sustainable Design Requirements.
2. Contractor shall provide LEED credit verification as per Section 013300 Submittal Procedures.

1.5 ACTION SUBMITTALS

A. Product Data: Include capacities, sizes, performances, operations, safety features, finishes, and similar information. Include product data for car enclosures, hoistway entrances, and operation, control, and signal systems.

B. Shop Drawings:

1. Include plans, elevations, sections, and large-scale details indicating service at each landing, machine room layout, coordination with building structure, relationships with other construction, and locations of equipment.
2. Include large-scale layout of car-control station and standby power operation control panel.
3. Indicate maximum dynamic and static loads imposed on building structure at points of support, and maximum and average power demands.

C. Samples for Initial Selection: For finishes involving color selection.

D. Samples for Verification: For exposed car, hoistway door and frame, and signal equipment finishes; 3-inch- (75-mm-) square Samples of sheet materials; and 4-inch (100-mm) lengths of running trim members.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Seismic Qualification Certificates: For elevator equipment, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Manufacturer Certificates: Signed by elevator manufacturer certifying that hoistway, pit, and control closet layout and dimensions, as shown on Drawings, and electrical service including standby power generator, as shown and specified, are adequate for elevator system being provided.

D. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For elevators to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include diagnostic and repair information available to manufacturer's and Installer's maintenance personnel.

B. Inspection and Acceptance Certificates and Operating Permits: As required by authorities having jurisdiction for normal, unrestricted elevator use.

C. Continuing Maintenance Proposal: Submit a continuing maintenance proposal from Installer to Owner, in the form of a standard one-year maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.

D. Continuing Maintenance Proposal: Submit a continuing maintenance proposal from Installer to Owner with terms, conditions, and obligations as set forth in, and in same form as, "Draft of Elevator Maintenance Agreement" at end of this Section, starting on date initial maintenance service is concluded.

E. Posted Instructions: Framed instructions under glass or in laminated plastic, including wiring and control diagrams showing the complete layout of the entire system, shall be posted in the ELEVATOR CONTROL ROOM where directed. Condensed operating instructions explaining preventive maintenance procedures, methods of checking the system for normal safe operation, and procedures for safely starting and stopping the system shall be prepared in typed form, framed as specified above for the wiring and

control diagrams and posted beside the diagrams. Proposed diagrams, instructions, and other sheets shall be submitted prior to posting. The framed instructions shall be posted before acceptance testing of the systems.

F. Training: The Contractor shall conduct a training course for the operating staff as designated by the Owner. The training period shall be no less than manufacturer's standard instruction period and may be extended at the Owner's request and shall start after the system is functionally completed but prior to final acceptance tests. The field instructions shall cover all of the items contained in the operating and maintenance manuals, as well as demonstrations of routine maintenance operations. The Owner shall be notified at least 14 days prior to date of proposed conduction of the training course.

G. Spare Parts Data: After approval of the detail drawings, and not later than one month prior to the date of beneficial occupancy, the Contractor shall furnish spare parts data for each different item of material and equipment specified. The data shall include a complete list of parts and supplies, with current unit prices and source of supply.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: Elevator manufacturer or an authorized representative who is trained and approved by manufacturer.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle materials, components, and equipment in manufacturer's protective packaging. Store materials, components, and equipment off of ground, under cover, and in a dry location.

1.10 COORDINATION

A. Coordinate installation of sleeves, block outs, elevator equipment with integral anchors, and other items that are embedded in concrete or masonry for elevator equipment. Furnish templates, sleeves, elevator equipment with integral anchors, and installation instructions and deliver to Project site in time for installation.

B. Coordinate locations and dimensions of other work relating to electric traction elevators including pit ladders; sumps and floor drains in pits; entrance subsills; electrical service; and electrical outlets, lights, and switches in hoistways, pits, and machine rooms.

1.11 WARRANTY

A. Manufacturer's Special Warranty: Manufacturer agrees to repair, restore, or replace elevator work that fails in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, operation or control system failure, including excessive malfunctions; performances below specified ratings; excessive wear; unusual deterioration or aging of materials or finishes; unsafe conditions; need for excessive maintenance; abnormal noise or vibration; and similar unusual, unexpected, and unsatisfactory conditions.
2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide KONE Inc EcoSpace, Gearless or a comparable product by one of the following:

1. ThyssenKrupp Elevator
2. Otis Elevator Co.
3. Schindler Elevator Corp.

B. Source Limitations: Obtain elevators from single manufacturer.

1. Major elevator components, including driving machines, controllers, signal fixtures, door operators, car frames, cars, and entrances, shall be manufactured by single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with ASME A17.1/CSA B44.

B. Accessibility Requirements: Comply with Section 407 in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and with ICC A117.1.

C. Electrical Requirements: ANSI/NFPA 70, National Electric Code

D. Inspection and Testing: Elevator Installer shall obtain and pay for all required inspections, tests, permits and fees for elevator installation. Arrange for inspections and make required tests. Deliver test reports and results to Owner upon completion and acceptance of elevator work.

E. Document Verification: In order to discover and resolve conflicts or lack of definition which might create construction documents for compatibility with their products prior to bidding. Review structural, architectural, electrical and mechanical drawings, and specifications. Attach specific, written exceptions and/or clarifications with quotation. Bidder’s compliance with all provisions of contract documents is assumed and required in absence of written exceptions. Owner will not pay for changes to structural, mechanical, electrical or other systems required to accommodate Bidder’s equipment if not identified before contract award.

F. Nameplates: Motors shall have the manufacturer's name, address, type or style, model or serial number, catalog number, and electrical and mechanical characteristics and plate secured to the item of equipment.

2.3 ELEVATORS

A. Elevator System, General: Manufacturer's standard elevator systems. Unless otherwise indicated, manufacturer's standard components shall be used, as included in standard elevator systems and as required for complete system.

B. Elevator Description:

1. Type: Gearless traction.
2. Machine Location: Machine-room-less – Elevator Control Room only.
3. Rated Load: 3500 lb (1589 kg)

4. Rated Speed: 150 fpm .
5. Operation System: Selective collective automatic operation;
6. Auxiliary Operations:

    a. Standby power operation.
    b. Standby powered lowering.
    c. Earthquake Emergency Operation: Comply with requirements in ASME A17.1.
    d. Automatic dispatching of loaded car.
    e. Nuisance call cancel.
    f. Emergency hospital and Priority service at all floors.
    g. Independent service for all cars in group.
    h. Loaded-car bypass.
    i. Distributed parking.

7. Car Enclosures:

    a. Front Walls (Return Panels): Satin stainless steel, No. 4 finish .
    b. Car Fixtures: Satin stainless steel, No. 4 finish .
    c. Side and Rear Wall Panels: Satin stainless steel, No. 4 finish .
    d. Reveals: Satin stainless steel, No. 4 finish .
    e. Door Faces (Interior): Satin stainless steel, No. 4 finish .
    f. Door Sills: Aluminum, mill finish.
    g. Ceiling: Satin stainless steel, No. 4 finish .
    h. Handrails: 1/2 by 2 inches (13 by 50 mm) rectangular satin stainless steel, No. 4 finish, at sides of car. Provide at rear of car for Synergy, 100S Series only
    i. Floor prepared to receive the following
        1) Provide 3/16” minimum stainless steel checkered plate floor with a turned-up edge to form the base.

8. Hoistway Entrances: As follows:

    a. Type: Two-speed side sliding
    b. Fire-Protection Rating: 1-1/2 hours with 30-minute temperature rise of 450 deg F (250 deg C).
    c. Frames: Satin stainless steel, No. 4 finish.
    d. Doors: Satin stainless steel, No. 4 finish.
    e. Sills: Aluminum, mill finish.

9. Hall Fixtures: Satin stainless steel, No. 4 finish; Recessed type with no exposed-metal surfaces.
10. Additional Requirements:

    a. Provide inspection certificate for each car to be kept at Central Control. .

2.4 TRACTION SYSTEMS

A. Elevator Machines: Provide variable-voltage, variable-frequency, AC-type hoisting machines . Provide solid-state power converters.

1. Provide regenerative system.
2. Limit total harmonic distortion of regenerated power to 5 percent per IEEE 519.
3. Provide means for absorbing regenerated power when elevator system is operating on standby power.
4. Provide line filters or chokes to prevent electrical peaks or spikes from feeding back into building power system.
5. Use embedded permanent magnets mounted at the top of the hoistway: AC gearless machine, with a synchronous permanent-magnet motor, dual solenoid service and emergency disc brakes, mounted at the top of the hoistway.
6. Provide polyurethane coated steel belts (CSB's) for elevator hoisting purposes
7. Governor: The governor shall be a tension type governor.
8. Hoistway Operating Devices:

    a. Emergency stop switch in the pit
    b. Terminal stopping switches.

9. Positioning System: Consists of an encoder, reader box, and door zone vanes.
10. Guide Rails and Attachments: Guide rails shall be Tee-section steel rails with brackets and fasteners. Side counterweight arrangements shall have a dual-purpose bracket that combines both counterweight guide rails, and one of the car guide rails to building fastening.
11. Coated Steel Belts: Polyurethane coated belts with high-tensile-grade, zinc-plated steel cords.
12. Governor Rope: Governor rope shall be steel and shall consist of at least eight strands wound about a sisal core center.

B. Counterweight Safeties: Counterweight safeties shall be applied to the counterweight frame, and shall be either a type "D" or "E", flexible guide clamp type.

C. Both the counterweight and the car are roped 2:1.

D. Fluid for Oil Buffers: If oil buffers are used, use only fire-resistant hydraulic fluid containing antioxidant, anticorrosive, antifoaming, and metal-passivating additives.

E. Inserts: Furnish required concrete and masonry inserts and similar anchorage devices for installing guide rails, machinery, and other components of elevator work where installation of devices is specified in another Section.

F. Machine Beams: Provide framing to support elevator hoisting machine and deflector sheaves from the building structure. Comply with Division 05 Section "Metal Fabrications" for materials and fabrication.

G. Car Frame and Platform: Bolted or welded steel units.

H. Guides: Provide roller guides or polymer-coated, nonlubricated sliding guides at top and bottom of car and counterweight frames.

I. Fasteners: Exposed fasteners must be security type and tamperproof as specified in Section 111993, Tamper-proof Metal Fasteners.

2.5 CONTROL ROOM COMPONENTS

A. Controller: A microcomputer based control system shall be provided to perform all of the functions of safe elevator operation. The system shall also perform car and group operational control.

1. All high voltage (110V or above) contact points inside the controller cabinet shall be protected from accidental contact in a situation where the controller doors are open.
2. Controller shall be separated into two distinct halves; Motor Drive side and Control side. High voltage motor power conductors shall be routed so as to be physically segregated from the rest of the controller.
3. Field conductor terminations points shall be segregated; high voltage (>30 volts DC and 110 VAC,) and low voltage (< 30 volts DC)

B. Controllers shall be designed and tested for Electromagnetic Interference (EMI) immunity according to the EN 12016 (May 1998): “EMC Product Family Standards for lifts, escalators, and passenger conveyors Part 2 – immunity”

2.6 OPERATION SYSTEMS

A. General: Provide manufacturer's standard microprocessor operation system for each group of elevators as required to provide type of operation system indicated.

1. Functional Intention:

a. General Description: Except for the First floor, the elevator shall be able to be called by standard hall call buttons from any floor or location. Once car arrives the first floor, the doors shall not open until Central Control authorizes doors to open.

b. Elevator car shall be monitored by both intercom and camera.

B. Simplex Collective Operation: Using a microprocessor-based controller, operation shall be automatic by means of the car and hall buttons.

1. If all calls in the system have been answered, elevator cars shall park at the lowest landing served, unless otherwise signal requested by security control to remain parked at a particular landing.

C. Single-Car Auxiliary Operations: In addition to primary operation system features, provide the following operational features for elevators where indicated:

1. Standby Power Operation: On activation of standby power, car is returned to a programmable designated floor and parked with doors closed until monitored by Central Control and then shall open for release of occupants and closed. Car can be manually put in service on standby power, either for return operation or for regular operation, by switches in control panel located at Central Control . Manual operation causes automatic operation to cease.
2. Standby Powered Lowering: On activation of standby power, if car is at a floor, it remains at that floor, opens its doors, and shuts down. If car is between floors, it is lowered to the next floor below, cycles its doors, and shuts down with its doors closed.

3. Automatic Dispatching of Loaded Car: When car load exceeds 80 percent of rated capacity, doors will begin closing.
4. Nuisance Call Cancel: When car calls exceed a preset number while car load is less than a predetermined weight, all car calls are canceled after car makes one run. Number of calls and predetermined weight can be adjusted.

D. Security Features: Provide the following security features, where indicated. Security features shall not affect emergency firefighters' service.

1. Secure Landing Operation: Allows each landing to be restricted or unrestricted. When a restricted landing button is pressed, a "Restricted Floor" lamp lights and remains lit until landing access code has been entered using car call buttons or predetermined time period has elapsed. Car calls for restricted landings do not register until landing access code is entered using the car call buttons within predetermined time period after landing button is pressed.

   a. User identification and access codes are programmed through a security PC System. Secure landing feature can be activated and deactivated by security keyswitch at Central Control.

2. Car-to-First Level Feature: Feature, activated by keyswitch at main lobby, that causes all cars in a group to return immediately to lobby and open doors for inspection. On deactivation by keyswitch, calls registered before keyswitch activation are completed and normal operation is resumed.

2.7 DOOR REOPENING DEVICES

A. Infrared Array: Provide door reopening device with uniform array of 36 or more microprocessor-controlled, infrared light beams projecting across car entrance. Interruption of one or more light beams shall cause doors to stop and reopen.

B. Nudging Feature: After car doors are prevented from closing for predetermined adjustable time, through activating door reopening device, a loud buzzer shall sound and doors shall begin to close at reduced kinetic energy.

2.8 CAR ENCLOSURES

A. General: Provide steel-framed car enclosures with nonremovable wall panels, with tamperproof fastened removable ceiling frame only possible by authorized maintenance personnel, power door operators, and ventilation.

1. Provide standard railings complying with ASME A17.1 on car tops where required by ASME A17.1.
2. Provide finished car including materials and finishes specified below.
3. There shall be no exposed fasteners within the Car Enclosure, except as noted herein for removal of a panel where indicated removable. Exposed fasteners must be security type and tamperproof as specified in Section 111993, Tamper-proof Metal Fasteners.

B. Materials and Finishes: Provide manufacturer's standards, but not less than the following:

1. Subfloor: Underlayment grade, exterior plywood, 5/8-inch (16-mm) nominal thickness.
2. Floor Finish: See Finish Schedule on Drawings and as Specified in a Division 09 Section . Where specified, provide 3/16" minimum stainless steel checkered plate floor with a turned-up edge to form the base. All joints shall be welded and ground smooth.
3. Stainless-Steel Wall Panels: Flush hollow-metal construction; fabricated from stainless-steel sheet. Where indicated below to be a security wall panel, provide stainless steel sheet backed with exterior grade plywood or other material or system to ensure that the sheet cannot be dented or damaged. If stainless steel is laminated to plywood, provide galvanized steel back balance sheet. Both sheets shall be 18 gage minimum.
4. Fabricate car with swing return recesses and cutouts for signal equipment.
5. Fabricate car door frame integrally with front wall of car.
6. Stainless-Steel Doors: Flush, hollow-metal construction; fabricated from two sheets of 14 ga. stainless-steel, internally reinforced and sound deadened as specified for security hollow metal doors. Provide bottom guides and emergency keyway. Provide continuous welds ground smooth, flush and square.
7. Sight Guards: Provide sight guards on car doors.
8. Sills: Extruded metal, of grooveless type with door(s) guided from below; 1/4 inch (6.4 mm) thick. Provide satin finish on aluminum.
9. Metal Security Ceiling: Satin #4 Stainless Steel Flush panels mounted to tamperproof fastened removable ceiling frame with custom cutouts to accommodate maximum-security lighting fixtures to be provided by Elevator contractor with the ceiling system. Align ceiling panel joints with joints between wall panels.
10. Ceiling Access Panels: Security key locked and tamperproof access doors with concealed hinges, and inconspicuous hairline joints;
11. Handrails: Manufacturer's standard handrails, of shape, metal, and finish indicated. Railings shall be attached with concealed tamperproof fasteners.

C. Security Lighting: Detention-grade, maximum security lighting fixture with an illuminance of 540-650 lx (50-60 fc). Provide one per ceiling panel. Fixture housings and their doors shall be made of 14 gage steel and have continuous corner welds. Doors shall have full length piano hinges and be retained by recessed-center pinned, tamper-resistant fasteners. Shielding shall be a minimum of 3/8 inch clear polycarbonate with a 1/8 inch acrylic prismatic lens overlay or approved equivalent. Recess the lighting fixture in the elevator cab ceiling. Lighting controls must not be accessible to or operable by inmates.

D. Emergency Car Lighting: Provide an integral 60-minute battery backup for all lighting and connect fixture to building emergency lighting system. An emergency power unit employing a 6-volt sealed rechargeable battery and totally static circuits shall be provided to illuminate the elevator car and provide current to the alarm bell in the event of building power failure.

E. Emergency Pulsating Siren: Siren mounted on top of the car that is activated when the Alarm button in the car operating panel is engaged. Siren shall have a rated sound pressure level of 80 dB(A) at a distance of 3.0 m from the device. Siren shall respond with a delay of not more than 1 second after the switch or push button has been pressed.

F. Fan: A two-speed 120 VAC fan will be mounted to the structural ceiling to facilitate in-car air circulation, meeting A17.1 code requirements. This two-speed fan produces airflow rates of 7.2 and 9.2 m^3/min on low and high setting respectively. The fan shall be rubber mounted to prevent the transmission of structural vibration and will include a

baffle to diffuse audible noise. A key accessed switch shall be provided in the car-operating panel to control the fan.

2.9 HOISTWAY ENTRANCES

A. Hoistway Entrance Assemblies: Manufacturer's standard horizontal-sliding, door-and-frame hoistway entrances complete with track systems, hardware, sills, and accessories. Frame size and profile shall accommodate hoistway wall construction.

B. Fire-Rated Hoistway Entrance Assemblies: Door and frame assemblies shall comply with NFPA 80 and be listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction based on testing at as close-to-neutral pressure as possible according to NFPA 252 or UL 10B.

1. Fire-Protection Rating: as indicated on drawings.

C. Materials and Fabrication: Manufacturer's standards, but not less than the following:
1. Stainless-Steel Frames: Formed from stainless-steel sheet.
2. Star of Life Symbol: Identify emergency elevators with star of life symbol, not less than 3 inches (76 mm) high, on both inside surfaces of hoistway door frames.
3. Stainless-Steel Doors: Flush, hollow-metal construction; fabricated from two sheets of 14 ga. stainless-steel, internally reinforced and sound deadened as specified for security hollow metal doors. Provide bottom guides and emergency keyway. Provide continuous welds ground smooth, flush and square.
4. Sight Guards: Provide sight guards on doors matching door edges.
5. Sills: Extruded metal, with grooved surface, 1/4 inch (6.4 mm) thick.
6. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M.

2.10 SIGNAL EQUIPMENT

A. General: Provide hall-call and car-call buttons that light when activated and remain lit until call has been fulfilled. Fabricate lighted elements with LEDs.

B. Swing-Return Car Control Stations: Provide car control stations mounted on rear of lockable hinged return panel adjacent to car door and with buttons, switches, controls, and indicator lights projecting through return panel but substantially flush with face of return panel.

1. Mark buttons and switches with standard identification for required use or function that complies with ASME A17.1. Use both tactile symbols and Braille.
2. Provide "No Smoking" sign matching car control station, either integral with car control station or mounted adjacent to it, with text and graphics as required by authorities having jurisdiction.
3. The car operating panel shall be equipped with the following features:

a. Raised markings and Braille shall be provided to the left hand side of each push-button.
b. Car Position Indicator at the top of and integral to the car operating panel. Provide Electroluminescent Display (ELD).
c. Door open and door close buttons.
d. Light key-switch.
e. Fan key-switch.

f. Inspection key-switch.
g. Elevator Data Plate marked with elevator capacity and car number.
h. Illuminated alarm button with raised markings.
i. In car stop switch (toggle or key unless local code prohibits use
j. Firefighter's hat
k. Firefighter's Phase II Key-switch
l. Call Cancel Button
m. Help Button – The help button shall initiate hands-free two-way communication between the car and Central Control where Officers are available who can take the appropriate action. Visual indicators are provided for call initiation and call acknowledgement.
n. Firefighter's Phase II emergency in-car operating instructions, worded according to A17.1 2000, Article 2.27.7.2.
o. Landing Passing Signal: A chime bell shall sound in the car to signal that the car is either stopping at or passing a floor served by the elevator.
p. Travel Direction indicator arrows if not provided in car control station

C. Emergency Communication System: Provide system that complies with ASME A17.1 and the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)." On activation, system dials preprogrammed number of monitoring station at Central Control and identifies elevator location to monitoring station. System provides two-way voice communication without using a handset and provides visible signals that indicate when system has been activated and when monitoring station has responded. System is contained in flush-mounted cabinet, or integrated into the car control station with identification, instructions for use, and battery backup power supply.

D. Firefighters' Two-Way Telephone Communication Service: Provide flush-mounted cabinet in each car and required conductors in traveling cable for firefighters' two-way telephone communication service specified in Division 28 Section "Fire Detection and Alarm."

E. Car Position Indicator: Provide illuminated, digital-type car position indicator, located above car door or above car control station. Also provide audible signal to indicate to passengers that car is either stopping at or passing each of the floors served.

1. Include travel direction arrows if not provided in car control station.

F. Provide jamb-mounted illuminated car call assignment panels in both car door jambs.

G. Hall Push-Button Stations: Provide one hall push-button stations at each landing for each single elevator or group of elevators, as indicated.

1. Provide manufacturer's standard wall-mounted units.
2. Provide units with flat faceplate for mounting with body of unit recessed in wall.
3. Equip units with buttons for calling elevator and for indicating direction of travel or destination as required by system. Provide a signaling system to verify floor selection, where destination registration is required, and to direct passengers to appropriate car.

a. Buttons shall have illuminated green halo, be located one above the other in flush mounted face frame; stainless steel;
b. Provide for connecting units that require destination registration to building security access system so a card reader can be used to register calls.

4. Provide telephone jack in each unit for firefighters' two-way telephone communication service specified in Division 28 Section "Fire Detection and Alarm."

H. Hall Lanterns: Units with illuminated arrows; but provide single arrow at terminal landings. Provide the following:

1. Manufacturer's standard wall-mounted units, for mounting above entrance frames.
2. Units with flat faceplate for mounting with body of unit recessed in wall and with illuminated elements projecting from faceplate for ease of angular viewing.
3. Car Lantern and Chime: A directional lantern visible from the corridor shall be provided in the car entrance. When the car stops and the doors are opening, the lantern shall indicate the direction in which the car is to travel and a chime will sound.

I. Hall Annunciator: With each hall lantern, provide audible signals indicating car arrival and direction of travel. Signals sound once for up and twice for down.

J. Hall Position Indicators: Provide illuminated, digital-display-type position indicators, located above each hoistway entrance at ground floor. Provide units with flat faceplate for mounting with body of unit recessed in wall.

1. Integrate ground-floor hall lanterns with hall position indicators.

K. Standby Power Elevator Selector Switches: Provide switches, as required by ASME A17.1, where indicated. Adjacent to switches, provide illuminated signal that indicates when normal power supply has failed.

L. Fire Command Center Annunciator Panel: At the Control Center, provide panel containing illuminated position indicators for each elevator, clearly labeled with elevator designation; include illuminated signal that indicates when elevator is operational and when it is at the designated emergency return level with doors open. Provide standby power elevator selector switch(es), as required by ASME A17.1, adjacent to position indicators. Provide illuminated signal that indicates when normal power supply has failed.

M. Corridor Call Station Pictograph Signs: Provide signs matching hall push-button stations, with text and graphics as required by authorities having jurisdiction, indicating that in case of fire elevators are out of service and exits should be used instead. Provide one sign at each hall push-button station, only where indicated as follows:

1. At secure inmate population areas, and call station sign shall not be provided:

2.11 FINISH MATERIALS

A. General: Provide the following materials for exposed parts of elevator car enclosures, car doors, hoistway entrance doors and frames, and signal equipment as indicated.

B. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, commercial steel, Type B, exposed, matte finish.

C. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, commercial steel, Type B, pickled.

D. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304.

E. Stainless-Steel Bars: ASTM A 276, Type 304.

F. Stainless-Steel Tubing: ASTM A 554, Grade MT 304.

G. Bronze Plate and Sheet: ASTM B 36/B 36M, Alloy UNS No. C28000 (muntz metal).

H. Bronze Extrusions: ASTM B 455, Alloy UNS No. C38500 (architectural bronze).

I. Bronze Tubing: ASTM B 135 (ASTM B 135M), Alloy UNS No. C23000 (red brass, 85 percent copper).

J. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063.

K. Nickel Silver Extrusions: ASTM B 151/B 151M, Alloy UNS No. C74500 or No. C77600.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elevator areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work. Examine hoistways, hoistway openings, pits, and machine rooms as constructed; verify critical dimensions; and examine supporting structure and other conditions under which elevator work is to be installed.

B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's written instructions.

B. Welded Construction: Provide welded connections for installing elevator work where bolted connections are not required for subsequent removal or for normal operation, adjustment, inspection, maintenance, and replacement of worn parts. Comply with AWS standards for workmanship and for qualifications of welding operators.

C. Sound Isolation: Mount rotating and vibrating equipment on vibration-isolating mounts to minimize vibration transmission to structure and structure-borne noise due to elevator system.

D. Lubricate operating parts of systems, including ropes, as recommended by manufacturers.

E. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with car. Where possible, delay final adjustment of sills and doors until car is operable in shaft. Reduce clearances to minimum, safe, workable dimension at each landing.

F. Leveling Tolerance: 1/8 inch (3 mm), up or down, regardless of load and travel direction.

G. Set sills flush with finished floor surface at landing. Fill space under sill solidly with nonshrink, nonmetallic grout.

H. Locate hall signal equipment for elevators as follows unless otherwise indicated:

1. For groups of elevators, locate hall push-button stations between two elevators at center of group or at location most convenient for approaching passengers.
2. Place hall lanterns either above or beside each hoistway entrance.
3. Mount hall lanterns at a minimum of 72 inches (1829 mm) above finished floor.

3.3 FIELD QUALITY CONTROL

A. Acceptance Testing: On completion of elevator installation and before permitting elevator use (either temporary or permanent), perform acceptance tests as required and recommended by ASME A17.1/CSA B44 and by governing regulations and agencies.

B. Operating Test: Load elevator to rated capacity and operate continuously for 30 minutes over full travel distance, stopping at each level and proceeding immediately to the next. Record temperature rise of elevator machine during 30-minute test period. Record failure to perform as required.

C. Advise Owner, Architect, and authorities having jurisdiction in advance of dates and times that tests are to be performed on elevators.

3.4 PROTECTION

A. Temporary Use: Comply with the following requirements for elevator used for construction purposes:

1. Provide car with temporary enclosure, either within finished car or in place of finished car, to protect finishes from damage.
2. Provide strippable protective film on entrance and car doors and frames.
3. Provide padded wood bumpers on entrance door frames covering jambs and frame faces.
4. Provide other protective coverings, barriers, devices, signs, and procedures as needed to protect elevator and elevator equipment.
5. Do not load elevators beyond their rated weight capacity.
6. Engage elevator Installer to provide full maintenance service. Include preventive maintenance, repair or replacement of worn or defective components, lubrication, cleanup, and adjustment as necessary for proper elevator operation at rated speed and capacity. Provide parts and supplies same as those used in the manufacture and installation of original equipment.
7. Engage elevator Installer to restore damaged work, if any, so no evidence remains of correction. Return items that cannot be refinished in the field to the shop, make required repairs and refinish entire unit, or provide new units as required.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to operate, adjust, and maintain elevator(s).

B. Check operation of elevator with Owner's personnel present before date of Substantial Completion and again not more than one month before end of warranty period. Determine that operation systems and devices are functioning properly.

3.6 MAINTENANCE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include two years full maintenance by skilled employees of elevator Installer. Include monthly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper elevator operation at rated speed and capacity. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

1. Perform maintenance during normal working hours.
2. Perform emergency callback service during normal working hours.
3. Include 24-hour-per-day, 7-day-per-week emergency callback service with response time of two hours or less.

B. Continuing Maintenance Proposal: Provide a continuing maintenance proposal from Installer to Owner with terms, conditions, and obligations as set forth in, and in same form as, "Draft of Elevator Maintenance Agreement" at end of this Section, starting on date initial maintenance service is concluded.

END OF SECTION 14 21 00

Set No._____

Project Manual
for
Construction of the

BCDC YOUTH DETENTION CENTER

at the
Baltimore City Detention Center
in the
Division of Pretrial Detention and Services (DPDS)

STATE OF MARYLAND
CONTRACT NO.: DPSCS KT-000-150-C01

5 FEBRUARY 2015

Department of Public Safety & Correctional Services
Stephen T. Moyer Secretary
David Bezanson, Assistant Secretary

Board of Public Works
Lawrence J. Hogan, Jr.,Governor
Peter Franchot, Comptroller
Nancy K. Kopp, Treasurer

Architect (A Joint Venture): **PSA-Dewberry + Penza Bailey Architects**

Joint Venture Prime / Contract Office
Penza Bailey Architects
401 Woodbourne Avenue
Baltimore, MD 21212

Joint Venture Prime / Security
PSA-Dewberry
401 SW Water Street #701
Peoria, IL 61602

Civil / Geotechnical / Environmental Engineer
EBA Engineering, Inc.
4813 Seton Drive
Baltimore, MD 21215

Structural Engineer
Hope Furrer Associates, Inc.
501 Fairmount Ave. Suite 205
Towson, MD 21286

Surveyor
Dewberry & Davis, LLC
3106 Lord Baltimore Drive
Baltimore, MD 21244

Mechanical / Plumbing / Elect. / IT / Telecom / MATV-CATV Fire Protection Engineer
Sidhu Associates, Inc.
11350 McCormick Drive #1000
Hunt Valley, MD 21031

Food Service / Laundry Consultant
R&R Designer, Inc.
5300 Holmes Run Parkway
Suite 1006
Alexandria, VA 22304

Landscape Architect
P.E.L.A. Design, Inc.
7400 York Road, Suite 403
Towson, MD 21204

Cost Estimator
Lewicki Estimating Services, Inc.
13600 Old Chatwood Place
Chantilly, VA 20151

Sustainability Consultant
TerraLogos Eco Architecture
2901 E. Baltimore Street, #300
Baltimore, MD 21224

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volume 4 of 6

Bid documents are available only online from eMaryland Marketplace (eMM). Those are the only official documents to be used by Bidders for this Invitation for Bid (IFB). The Bidders shall print on their own stationary the required documents for submitting their bid (as Construction BID Form, Bid Proposal Affidavit, BID Bond, etc.) and submit to the Owner (DPSCS, Division of Capital Construction and Facilities Maintenance) in a sealed envelope which clearly indicates that it contains a sealed bid for this project with the bid due date and the name and address of the Bidder.

Minority Business Enterprises (MBEs) are encouraged to participate and respond to this request for Bid.

CONFORMED DOCUMENT 3 APRIL 2015: This project manual contains sections revised during bidding, and is published for the Contractor's convenience for use during construction. It does not replace the Contract Documents, which comprise the Bid Documents plus revisions issued as Addenda.

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DIVISION 01 - GENERAL REQUIREMENTS

VOLUME 2

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DIVISION 03 - CONCRETE

DIVISION 04 – MASONRY

DIVISION 05 – METALS

DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

VOLUME 3

DIVISION 08 - OPENINGS

DIVISION 09 - FINISHES

DIVISION 10 - SPECIALTIES

DIVISION 11 - EQUIPMENT

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DIVISION 21 – FIRE SUPPRESSION

DIVISION 22 – PLUMBING

DIVISION 23 - HEATING VENTILATING AND AIR CONDITIONING

VOLUME 5

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DIVISION 27 - COMMUNICATIONS

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DIVISION 32 - EXTERIOR IMPROVEMENTS

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VOLUME 6

END OF TABLE OF CONTENTS

SECTION 21 05 13 - COMMON MOTOR REQUIREMENTS FOR FIRE SUPPRESSION EQUIPMENT.

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory.

1.3 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:

1. Motor controllers.
2. Torque, speed, and horsepower requirements of the load.
3. Ratings and characteristics of supply circuit and required control sequence.
4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

A. Comply with NEMA MG 1 unless otherwise indicated.

B. Comply with IEEE 841 for severe-duty motors.

2.2 MOTOR CHARACTERISTICS

A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet above sea level.

B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 POLYPHASE MOTORS

A. Description: NEMA MG 1, Design B, medium induction motor.

B. Efficiency: Energy efficient, as defined in NEMA MG 1.

C. Service Factor: 1.15.

D. Rotor: Random-wound, squirrel cage.

E. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.

F. Temperature Rise: Match insulation rating.

G. Insulation: Class F.

H. Code Letter Designation:

1. Motors 15 HP and Larger: NEMA starting Code F or Code G.
2. Motors Smaller than 15 HP: Manufacturer's standard starting characteristic.

I. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.

2.4 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

A. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.

B. Severe-Duty Motors: Comply with IEEE 841, with 1.15 minimum service factor.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 210513

SECTION 21 05 17 - SLEEVES AND SLEEVE SEALS FOR FIRE-SUPPRESSION PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Sleeves.
2. Stack-sleeve fittings.
3. Sleeve-seal systems.
4. Sleeve-seal fittings.
5. Grout.

B. Related Requirements:
1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.

C. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

2.2 SLEEVE-SEAL SYSTEMS

A. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.

1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Carbon steel.
3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.3 SLEEVE-SEAL FITTINGS

A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for imbedding in concrete slab or wall. Unit has plastic or rubber waterstop collar with center opening to match piping OD.

2.4 GROUT

A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in floors, partitions, and walls.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.

1. Sleeves are not required for core-drilled holes.

C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.

1. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.
2. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.

3. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.

D. Install sleeves for pipes passing through interior partitions.

1. Cut sleeves to length for mounting flush with both surfaces.

2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Section 079200 "Joint Sealants."

E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 078413 "Penetration Firestopping."

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.3 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using grout, seal the space around outside of sleeve-seal fittings.

3.4 SLEEVE AND SLEEVE-SEAL SCHEDULE

A. Use sleeves and sleeve seals for the following piping-penetration applications:

1. Exterior Concrete Walls above Grade:

   a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves
   b. Piping NPS 6 and Larger: Cast-iron wall sleeves.

2. Exterior Concrete Walls below Grade:

   a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves with sleeve-seal system.

      1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

   b. Piping NPS 6 and Larger: Cast-iron wall sleeves with sleeve-seal system.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

3. Concrete Slabs-on-Grade:

   a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves with sleeve-seal system.

      1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

   b. Piping NPS 6 and Larger: Cast-iron wall sleeves with sleeve-seal system.

      1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

4. Concrete Slabs above Grade:

   a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves.
   b. Piping NPS 6 and Larger: Galvanized-steel-pipe sleeves.

5. Interior Partitions:

   a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves.
   b. Piping NPS 6 and Larger: Galvanized-steel-sheet sleeves.

END OF SECTION 210517

SECTION 21 05 18 - ESCUTCHEONS FOR FIRE-SUPPRESSION PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Escutcheons.
2. Floor plates.

B. Related Requirements:
1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 ESCUTCHEONS

A. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.

B. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.

C. Split-Plate, Stamped-Steel Type: With chrome-plated finish, concealed hinge, and spring-clip fasteners.

2.2 FLOOR PLATES

A. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.

B. Split-Casting Floor Plates: Cast brass with concealed hinge.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.

B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. Escutcheons for New Piping:

a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
b. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.
c. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, stamped-steel type.
d. Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type.
e. Bare Piping in Equipment Rooms: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge.

2. Escutcheons for Existing Piping:
a. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-plate, stamped-steel type with concealed hinge.
b. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-plate, stamped-steel type with concealed hinge.
c. Bare Piping in Unfinished Service Spaces: Split-plate, stamped-steel type with concealed hinge.
d. Bare Piping in Equipment Rooms: Split-plate, stamped-steel type with concealed hinge.

C. Install floor plates for piping penetrations of equipment-room floors.

D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. New Piping: One-piece, floor-plate type.
2. Existing Piping: Split-casting, floor-plate type.

3.2 FIELD QUALITY CONTROL

A. Replace broken and damaged escutcheons and floor plates using new materials.

END OF SECTION 210518

SECTION 21 05 23 - GENERAL-DUTY VALVES FOR WATER-BASED FIRE-SUPPRESSION PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Two-piece ball valves with indicators.
2. Bronze butterfly valves with indicators.
3. Check valves.
4. Bronze OS&Y gate valves.
5. Iron OS&Y gate valves.
6. Trim and drain valves.

B. Related Requirements:
1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 DEFINITIONS

A. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

B. NRS: Nonrising stem.

C. OS&Y: Outside screw and yoke.

D. SBR: Styrene-butadiene rubber.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of valve.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, and weld ends.
3. Set valves open to minimize exposure of functional surfaces.

B. Use the following precautions during storage:

1. Maintain valve end protection.
2. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use operating handles or stems as lifting or rigging points.

D. Protect flanges and specialties from moisture and dirt.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. UL Listed: Valves shall be listed in UL's "Online Certifications Directory" under the headings listed below and shall bear UL mark:

1. Main Level: HAMV - Fire Main Equipment.

a. Level 1: HCBZ - Indicator Posts, Gate Valve.
b. Level 1: HLOT - Valves.

1) Level 3: HLUG - Ball Valves, System Control.
2) Level 3: HLXS - Butterfly Valves.
3) Level 3: HMER - Check Valves.
4) Level 3: HMRZ - Gate Valves.

2. Main Level: VDGT - Sprinkler System & Water Spray System Devices.

a. Level 1: VQGU - Valves, Trim and Drain.

B. FM Global Approved: Valves shall be listed in its "Approval Guide," under the headings listed below:

1. Automated Sprinkler Systems:

a. Indicator posts.
b. Valves.

1) Gate valves.
2) Check valves.

a) Single check valves.

3) Miscellaneous valves.

C. Source Limitations for Valves: Obtain valves for each valve type from single manufacturer.

D. ASME Compliance:

1. ASME B16.1 for flanges on iron valves.
2. ASME B1.20.1 for threads for threaded-end valves.

3. ASME B31.9 for building services piping valves.

E. AWWA Compliance: Comply with AWWA C606 for grooved-end connections.

F. NFPA Compliance: Comply with NFPA 24 for valves.

G. Valve Pressure Ratings: Not less than the minimum pressure rating indicated or higher as required by system pressures.

H. Valve Sizes: Same as upstream piping unless otherwise indicated.

I. Valve Actuator Types:

1. Worm-gear actuator with handwheel for quarter-turn valves, except for trim and drain valves.
2. Handwheel: For other than quarter-turn trim and drain valves.
3. Handlever: For quarter-turn trim and drain valves NPS 2 (DN 50) and smaller.

2.2 TWO-PIECE BALL VALVES WITH INDICATORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturer specified.
1. Crane Co.; Crane Valve Group; Crane Valves.
2. Hammond Valve.
3. Milwaukee valve Company
4. NIBCO.
5. Or approved equal.

B. Description:

1. UL 1091, except with ball instead of disc and FM Global standard for indicating valves (butterfly or ball type), Class Number 1112.
2. Minimum Pressure Rating: 175 psig.
3. Body Design: Two piece.
4. Body Material: Forged brass or bronze.
5. Port Size: Full or standard.
6. Seats: PTFE.
7. Stem: Bronze or stainless steel.
8. Ball: Chrome-plated brass.
9. Actuator: Worm gear or traveling nut.
10. Supervisory Switch: Internal or external.
11. End Connections for Valves NPS 1 through NPS 2: Threaded ends.
12. End Connections for Valves NPS 2-1/2: Grooved ends.

2.3 BRONZE BUTTERFLY VALVES WITH INDICATORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturer specified.
1. Crane Co.; Crane Valve Group; Crane Valves.
2. Hammond Valve.
3. Milwaukee valve Company
4. NIBCO.
5. Or approved equal.

B. Description:

1. Standard: UL 1091 and FM Global standard for indicating valves, (butterfly or ball type), Class Number 1112.
2. Minimum: Pressure rating: 175 psig.
3. Body Material: Bronze.
4. Seat Material: EPDM.
5. Stem Material: Bronze or stainless steel.
6. Disc: Bronze with EPDM coating.
7. Actuator: Worm gear or traveling nut.
8. Supervisory Switch: Internal or external.
9. Ends Connections for Valves NPS 1 through NPS 2: Threaded ends.
10. Ends Connections for Valves NPS 2-1/2: Grooved ends.

2.4 IRON BUTTERFLY VALVES WITH INDICATORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturer specified.
1. Crane Co.; Crane Valve Group; Crane Valves.
2. Hammond Valve.
3. Milwaukee valve Company
4. NIBCO.
5. Or approved equal.

B. Description:

1. Standard: UL 1091 and FM Global standard for indicating valves, (butterfly or ball type), Class Number 112.
2. Minimum Pressure Rating: 175 psig.
3. Body Material: Cast or ductile iron with nylon, EPDM, epoxy, or polyamide coating.
4. Seat Material: EPDM.
5. Stem: Stainless steel.
6. Disc: Ductile iron, nickel plated and EPDM or SBR coated.
7. Actuator: Worm gear or traveling nut.
8. Supervisory Switch: Internal or external.
9. Body Design: Lug or wafer Grooved-end connections.

2.5 CHECK VALVES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturer specified.
1. Crane Co.; Crane Valve Group; Crane Valves.
2. Hammond Valve.
3. Milwaukee valve Company
4. NIBCO.
5. Or approved equal.

B. Description:

1. Standard: UL 312 and FM Global standard for swing check valves, Class Number 1210.
2. Minimum Pressure Rating: 175 psig.
3. Type: Single swing check.
4. Body Material: Cast iron, ductile iron, or bronze.

5. Clapper: Bronze, ductile iron, or stainless steel[with elastomeric seal].
6. Clapper Seat: Brass, bronze, or stainless steel.
7. Hinge Shaft: Bronze or stainless steel.
8. Hinge Spring: Stainless steel.
9. End Connections: Flanged, grooved, or threaded.

2.6 BRONZE OS&Y GATE VALVES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturer specified.
   1. Crane Co.; Crane Valve Group; Crane Valves.
   2. Hammond Valve.
   3. Milwaukee valve Company
   4. NIBCO.
   5. Or approved equal.

B. Description:

   1. Standard: UL 262 and FM Global standard for fire-service water control valves (OS&Y- and NRS-type gate valves).
   2. Minimum Pressure Rating: 175 psig.
   3. Body and Bonnet Material: Bronze or brass.
   4. Wedge: One-piece bronze or brass.
   5. Wedge Seat: Bronze.
   6. Stem: Bronze or brass.
   7. Packing: Non-asbestos PTFE.
   8. Supervisory Switch: External.
   9. End Connections: Threaded.

2.7 IRON OS&Y GATE VALVES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturer specified.
   1. Crane Co.; Crane Valve Group; Crane Valves.
   2. Hammond Valve.
   3. Milwaukee valve Company
   4. NIBCO.
   5. Or approved equal.

B. Description:

   1. Standard: UL 262 and FM Global standard for fire-service water control valves (OS&Y- and NRS-type gate valves).
   2. Minimum Pressure Rating: 175 psig.
   3. Body and Bonnet Material: Cast or ductile iron.
   4. Wedge: Cast or ductile iron, or bronze with elastomeric coating.
   5. Wedge Seat: Cast or ductile iron, or bronze with elastomeric coating.
   6. Stem: Brass or bronze.
   7. Packing: Non-asbestos PTFE.
   8. Supervisory Switch: External.
   9. End Connections: Flanged.

2.8 TRIM AND DRAIN VALVES

A. Ball Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturer specified.
   a. Fire Protection Products, Inc.
   b. KITZ Corporation
   c. Milwaukee valve Company
   d. NIBCO.
   e. Or approved equal.
2. Description:

   a. Pressure Rating: 175 psig
   b. Body Design: Two piece.
   c. Body Material: Forged brass or bronze.
   d. Port size: Full or standard.
   e. Seats: PTFE.
   f. Stem: Bronze or stainless steel.
   g. Ball: Chrome-plated brass.
   h. Actuator: Handlever.
   i. End Connections for Valves NPS 1 through NPS 2-1/2: Threaded ends.
   j. End Connections for Valves NPS 1-1/4 and NPS 2-1/2: Grooved ends.

B. Angle Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturer specified.
   a. Fire Protection Products, Inc.
   b. KITZ Corporation
   c. United Brass Works
   d. Or approved equal.
2. Description:

   a. Pressure Rating: 175 psig.
   b. Body Material: Brass or bronze.
   c. Ends: Threaded.
   d. Stem: Bronze.
   e. Disc: Bronze.
   f. Packing: Asbestos free.
   g. Handwheel: Malleable iron, bronze, or aluminum.

C. Globe Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturer specified.
   a. NIBCO.
   b. United Brass Works
   c. Or approved equal.
2. Description:

   a. Pressure Rating: 175 psig
   b. Body Material: Bronze with integral seat and screw-in bonnet.
   c. Ends: Threaded.
   d. Stem: Bronze.
   e. Disc Holder and Nut: Bronze.
   f. Disc Seat: Nitrile.
   g. Packing: Asbestos free.
   h. Handwheel: Malleable iron, bronze, or aluminum.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3.2 GENERAL REQUIREMENTS FOR VALVE INSTALLATION

A. Comply with requirements in the following Sections for specific valve installation requirements and applications:
   1. Section 211200 "Fire-Suppression Standpipes" for application of valves in fire-suppression standpipes.
   2. Section 211313 "Wet-Pipe Sprinkler Systems" for application of valves in wet-pipe, fire-suppression sprinkler systems.

B. Install listed fire-protection shutoff valves supervised-open, located to control sources of water supply except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.

C. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water-supply sources.

D. Install valves having threaded connections with unions at each piece of equipment arranged to allow easy access, service, maintenance, and equipment removal without system shutdown. Provide separate support where necessary.

E. Install valves in horizontal piping with stem at or above the pipe center.

F. Install valves in position to allow full stem movement.

G. Install valve tags. Comply with requirements in Section 210553 "Identification for Fire-Suppression Piping and Equipment" for valve tags and schedules and signs on surfaces concealing valves; and the NFPA standard applying to the piping system in which valves are installed. Install permanent identification signs indicating the portion of system controlled by each valve.

H. Install listed fire-protection shutoff valves supervised-open, located to control sources of water supply except from fire-department connections.

I. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water-supply sources.

END OF SECTION 21 05 23

SECTION 21 05 53 - IDENTIFICATION FOR FIRE-SUPPRESSION PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.
4. Stencils.
5. Valve tags.
6. Warning tags.

B. Related Requirements:
1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For color, letter style, and graphic representation required for each identification material and device.

C. Equipment-Label Schedule: Include a listing of all equipment to be labeled and the proposed content for each label.

D. Valve Schedules: Valve numbering scheme.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Plastic Labels for Equipment:
1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, with predrilled holes for attachment hardware.
2. Letter Color: White.
3. Background Color: Black.
4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
7. Fasteners: Stainless-steel [rivets] [or] [self-tapping screws].
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), and the Specification Section number and title where equipment is specified.

C. Equipment-Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch) bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, with predrilled holes for attachment hardware.

B. Letter Color: White.

C. Background Color: Black.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Fasteners: Stainless-steel rivets or self-tapping screws.

H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Label Content: Include caution and warning information, plus emergency notification instructions.

2.3 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service and showing flow direction according to ASME A13.1.

B. Self-adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

C. Pipe-Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping-system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: At least 1/2 inch for viewing distances up to 72 inches and proportionately larger lettering for greater viewing distances.

D. Pipe-Label Colors:

1. Background Color: Safety Red.
2. Letter Color: White.

2.4 STENCILS

A. Stencils for Piping:

1. Lettering Size: At least 1/2 inch for viewing distances up to 72 inches and proportionately larger lettering for greater viewing distances.
2. Stencil Material: Aluminum.
3. Stencil Paint: Safety Red, exterior, gloss, acrylic enamel. Paint may be in pressurized spray-can form.
4. Identification Paint: White, exterior, acrylic enamel. Paint may be in pressurized spray-can form.

2.5 VALVE TAGS

A. Description: Stamped or engraved with 1/4-inch letters for piping-system abbreviation and 1/2-inch (numbers.

1. Tag Material: Brass, 0.032 inch thick, with predrilled holes for attachment hardware.
2. Fasteners: Brass wire-link chain or S-hook.
3. Valve-Tag Color: Safety Red.
4. Letter Color: White.

B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-tag schedule shall be included in operation and maintenance data.

2.6 WARNING TAGS

A. Description: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with matte finish suitable for writing.

1. Size: Approximately 4 by 7 inches.
2. Fasteners: Brass grommet and wire.
3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
4. Color: Safety Yellow background with black lettering.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of incompatible primers, paints, and encapsulants, as well as dirt, oil, grease, release agents, and other substances that could impair bond of identification devices.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be installed.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

3.3 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.4 PIPE LABEL INSTALLATION

A. Piping: Painting of piping is specified in Section 099600 "High-Performance Coatings."

B. Stenciled Pipe-Label Option: Stenciled labels may be provided instead of manufactured pipe labels, only by approval of the owner. Install stenciled pipe labels, with painted, color-coded bands or rectangles on each piping system.

1. Identification Paint: Use for contrasting background.
2. Stencil Paint: Use for pipe marking.

C. Pipe-Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection excluding short takeoffs. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations and on both sides of through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit a view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

D. Directional Flow Arrows: Arrows shall be used to indicate direction of flow in pipes including pipes where flow is allowed in both directions.

3.5 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in fire-suppression piping systems. List tagged valves in a valve-tag schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and with captions similar to those indicated in "Valve-Tag Size and Shape" Subparagraph below:

1. Valve-Tag Size and Shape:

a. Fire-Suppression Standpipe: 1-1/2 inches round.
b. Wet-Pipe Sprinkler System: 1-1/2 inches round.

3.6 WARNING-TAG INSTALLATION

A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION 210553

SECTION 21 11 19 - FIRE-DEPARTMENT CONNECTIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Exposed-type fire-department connections.

B. Related Requirements:
1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each fire-department connection.

PART 2 - PRODUCTS

2.1 EXPOSED-TYPE FIRE-DEPARTMENT CONNECTION

A. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturer specified.
1. Elkhart Brass Mfg. Co. Inc.
2. Fire Protection Products Inc.
3. Potter-Roemer; Fire-Protection Div.
4. Or approved equal.

B. Standard: UL 405.

C. Type: Exposed, projecting, for wall mounting.

D. Pressure Rating: 175 psig minimum.

E. Body Material: Corrosion-resistant metal.

F. Inlets: Brass with threads according to NFPA 1963 and matching local fire-department sizes and threads. Include extension pipe nipples, brass lugged swivel connections, and check devices or clappers.

G. Caps: Brass, lugged type, with gasket and chain.

H. Escutcheon Plate: Round, brass, wall type.

I. Outlet: Back, with pipe threads.

J. Number of Inlets: Two.

K. Escutcheon Plate Marking: Similar to "AUTO SPKR & STANDPIPE."

L. Finish: Polished chrome plated.

M. Outlet Size: NPS 4.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of fire-department connections.

B. Examine roughing-in for fire-suppression standpipe system to verify actual locations of piping connections before fire-department connection installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install wall-type fire-department connections.

B. Install three protective pipe bollards around each fire-department connection. Comply with requirements for bollards in Section 055000 "Metal Fabrications."

C. Install automatic (ball-drip) drain valve at each check valve for fire-department connection.

END OF SECTION 211119

SECTION 21 12 00 - FIRE-SUPPRESSION STANDPIPES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Pipes, fittings, and specialties.
2. Fire-protection specialty valves.
3. Hose connections.
4. Pressure gages.

B. Related Requirements:
1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

C. Related Requirements:

1. Section 210523 "General-Duty Valves for Water-Based Fire-Suppression Piping."
2. Section 211119 "Fire-Department Connections" for exposed wall-mounted and yard fire hydrants.
3. Section 211313 "Wet-Pipe Sprinkler Systems" for wet-pipe sprinkler piping.

1.3 DEFINITIONS

A. Standard-Pressure Standpipe Piping: Fire-suppression standpipe piping designed to operate at working pressure 175 psig maximum.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For fire-suppression standpipes.

1. Include plans, elevations, sections, and attachment details.

C. Delegated-Design Submittal: For standpipe systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by licensed Fire Protection Engineer in the State of Maryland responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Fire-suppression standpipes, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Domestic water piping.
2. HVAC hydronic piping.

B. Qualification Data: For Installer and professional engineer.

C. Approved Standpipe Drawings: Working plans, prepared according to NFPA 14, signed and sealed by licensed Fire Protection Engineer in the State of Maryland, that have been approved by authorities having jurisdiction, including hydraulic calculations if applicable.

D. Welding certificates.

E. Fire-hydrant flow test report.

F. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 14. Include "Contractor's Material and Test Certificate for Aboveground Piping" and "Contractor's Material and Test Certificate for Underground Piping."

G. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire-suppression standpipes specialties to include in emergency, operation, and maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installer's responsibilities include designing, fabricating, and installing fire-suppression standpipes and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of fire-hydrant flow test.

a. Engineering Responsibility: Preparation of working plans, calculations, and field test reports by a qualified professional engineer.

B. Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. NFPA Standards: Fire-suppression standpipe equipment, specialties, accessories, installation, and testing shall comply with NFPA 14.

1.8 PROJECT CONDITIONS

A. Interruption of Existing Fire-Suppression Standpipe Service: Do not interrupt fire-suppression standpipe service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary fire-suppression standpipe service according to requirements indicated:

1. Notify Owner no fewer than two days in advance of proposed interruption of fire-suppression standpipe service.
2. Do not proceed with interruption of fire-suppression standpipe service without Owner's written permission.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTIONS

A. Automatic Wet-Type, Class I Standpipe System: Includes NPS 2-1/2 hose connections. Has open water-supply valve with pressure maintained and is capable of supplying water demand.

2.2 PERFORMANCE REQUIREMENTS

A. Standard-Pressure, Fire-Suppression Standpipe System Component: Listed for 175-psig minimum working pressure.

B. Delegated Design: Engage a fire protection engineer licensed in the State of Maryland, to design wet standpipe systems, including hydraulic calculations and other comprehensive engineering analysis, using performance requirements and design criteria indicated..

1. Conduct Fire Flow test and utilize the test records to design the fire suppression system.

C. Fire-suppression standpipe design shall be approved by authorities having jurisdiction.

1. Minimum residual pressure at each hose-connection outlet is as follows:
   a. NPS 2-1/2 (DN 65) Hose Connections: 100 psig.

2.3 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, and fitting materials and for joining methods for specific services, service locations, and pipe sizes.

2.4 BLACK STEEL PIPE AND ASSOCIATED FITTINGS

A. Schedule 40: ASTM A 53/A 53M, Type E, Grade B; with factory- or field-formed ends to accommodate joining method.

B. Uncoated, Steel Couplings: ASTM A 865/A 865M, threaded.

C. Uncoated, Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern.

D. Malleable- or Ductile-Iron Unions: UL 860.

E. Cast-Iron Flanges: ASME B16.1, Class 125.

F. Steel Flanges and Flanged Fittings: ASME B16.5, Class 150.

G. Steel Welding Fittings: ASTM A 234/A 234M and ASME B16.9.

H. Grooved-Joint, Steel-Pipe Appurtenances:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturer specified.
   a. Anvil International.
   b. Tyco Fire and Building Products
   c. Victaulic Company
   d. Or approved equal.
2. Pressure Rating: 175 psig minimum.
3. Grooved-End Fittings for Steel Piping: ASTM A 47/A 47M, malleable-iron casting or ASTM A 536, ductile-iron casting; with dimensions matching steel pipe.
4. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213, rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.

2.5 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8 inch thick.

1. Class 125, Cast-Iron Flanges and Class 150, Bronze Flat-Face Flanges: Full-face gaskets.
2. Class 250, Cast-Iron Flanges and Class 300, Steel Raised-Face Flanges: Ring-type gaskets.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

D. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.6 SPECIALTY VALVES

A. General Requirements:

1. Standard: UL's "Fire Protection Equipment Directory" listing or FM Global's "Approval Guide."
2. Pressure Rating:

   a. Standard-Pressure Piping Specialty Valves: 175 psig minimum.

3. Body Material: Cast or ductile iron.
4. Size: Same as connected piping.
5. End Connections: Flanged or grooved.

B. Automatic (Ball Drip) Drain Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturer specified.
   a. Kidde Fire Fighting; A UTC Business Unit.
   b. Reliable Automatic Sprinkler Co.(The)
   c. Tyco Fire and Building Products LP
   d. Or approved equal.
2. Standard: UL 1726.
3. Pressure Rating: 175 psig minimum.
4. Type: Automatic draining, ball check.
5. Size: NPS 3/4
6. End Connections: Threaded.

2.7 HOSE CONNECTIONS

A. Nonadjustable-Valve Hose Connections:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturer specified.
   a. Elkhart Brass Mfg. Co., Inc.
   b. Guardian Fire Equipment Inc..
   c. Kidde Fire Fighting; A UTC Business Unit.
   d. Tyco Fire and Building Products LP
   e. Or approved equal.
2. Standard: UL 668 hose valve for connecting fire hose.
3. Pressure Rating: 300 psig minimum.
4. Material: Brass or bronze.
5. Size: NPS 2-1/2.
6. Inlet: Female pipe threads.
7. Outlet: Male hose threads with lugged cap, gasket, and chain. Include hose valve threads according to NFPA 1963 and matching local fire-department threads.
8. Pattern: gate.
9. Finish: Polished chrome-plated.

2.8 PRESSURE GAGES
1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturer specified.
   a. AMETEK, Inc.
   b. Ashcroft, Inc..
   c. WISA Instrument Corporation.
   d. Or approved equal.

B. Standard: UL 393.

C. Dial Size: 3-1/2- to 4-1/2-inch diameter.

D. Pressure Gage Range: Zero to 250 psig.

E. Water System Piping Gage: Include "WATER" label on dial face.

PART 3 - EXECUTION

3.1 PREPARATION

A. Perform fire-hydrant flow test according to NFPA 14 and NFPA 291. Use results for system design calculations required in "Quality Assurance" Article.

B. Report test results promptly and in writing.

3.2 EXAMINATION

A. Examine roughing-in for hose connections and stations to verify actual locations of piping connections before installation.

B. Examine walls and partitions for suitable thickness, fire- and smoke-rated construction, and other conditions where hose connections and stations are to be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 SERVICE-ENTRANCE PIPING

A. Install shutoff valve, backflow preventer, pressure gage, drain, and other accessories at connection to fire-suppression water-service piping.

B. Install shutoff valve, check valve, pressure gage, and drain at connection to water service.

3.4 PIPING INSTALLATION

A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated, as far as practical.

1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.

B. Piping Standard: Comply with requirements in NFPA 14 for installation of fire-suppression standpipe piping.

C. Install listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

D. Install drain valves on standpipes. Extend drain piping to outside of building.

E. Install automatic (ball drip) drain valves to drain piping between fire-department connections and check valves. Drain to floor drain or outside building.

F. Install hangers and supports for standpipe system piping according to NFPA 14. Comply with requirements in NFPA 13 for hanger materials.

G. Install pressure gages on riser or feed main and at top of each standpipe. Include pressure gages with connection not less than NPS 1/4 and with soft-metal seated globe valve, arranged

for draining pipe between gage and valve. Install gages to permit removal, and install where they are not subject to freezing.

H. Fill wet-type standpipe system piping with water.

I. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 210517 "Sleeves and Sleeve Seals for Fire-Suppression Piping."

J. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 210518 "Escutcheons for Fire-Suppression Piping."

3.5 JOINT CONSTRUCTION

A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.

B. Install unions adjacent to each valve in pipes NPS 2 (DN 50) and smaller.

C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

D. Ream ends of pipes and tubes, and remove burrs. Bevel plain ends of steel pipe.

E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

F. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.

G. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

H. Steel-Piping, Cut-Grooved Joints: Cut square-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe joints.

I. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.

J. Welded Joints: Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators according to "Quality Assurance" Article.

1. Shop weld pipe joints where welded piping is indicated. Do not use welded joints for galvanized-steel pipe.

3.6 VALVE AND SPECIALTIES INSTALLATION

A. Install listed fire-protection valves, trim and drain valves, specialty valves and trim, controls, and specialties according to NFPA 14 and authorities having jurisdiction.

B. Install listed fire-protection shutoff valves supervised-open, located to control sources of water supply except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.

C. Install backflow preventers in water-supply sources.

D. Specialty Valves:

1. General Requirements: Install in vertical position for proper direction of flow, in main supply to system.

3.7 HOSE-CONNECTION INSTALLATION

A. Install hose connections adjacent to standpipes.

B. Install NPS 2-1/2 hose connections with quick-disconnect NPS 2-1/2 by NPS 1-1/2 reducer adapter and flow-restricting device.

3.8 FIRE-DEPARTMENT CONNECTION INSTALLATION

A. Install wall-type fire-department connections.

B. Install automatic (ball drip) drain valve at each check valve for fire-department connection.

3.9 IDENTIFICATION

A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 14.

3.10 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
3. Flush, test, and inspect standpipe systems according to NFPA 14, "System Acceptance" Chapter.
4. Coordinate with fire-alarm tests. Operate as required.
5. Coordinate with fire-pump tests. Operate as required.
6. Verify that equipment hose threads are same as local fire-department equipment.

C. Fire-suppression standpipe system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.11 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain specialty valves.

B. Refer Division 01 for administrative and procedural requirements for demonstration and training.

3.12 PIPING SCHEDULE

A. Standard-pressure, wet-type fire-suppression standpipe piping, NPS 4 and smaller, shall be the following:

1. Schedule 40, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.

B. Standard-pressure, wet-type fire-suppression standpipe piping, NPS 5 to NPS 8, shall be the following:

1. Schedule 40, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.

END OF SECTION 211200

SECTION 21 13 13 - WET-PIPE SPRINKLER SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Pipes, fittings, and specialties.
2. Cover system for sprinkler piping.
3. Specialty valves.
4. Sprinklers.
5. Alarm devices.
6. Pressure gages.

B. Related Requirements:

1. Section 211119 "Fire Department Connections" for exposed-, flush-, and yard-type fire department connections.
2. Section 230523 "General-Duty Valves for Water-Based Fire-Suppression Piping" for ball, butterfly, check, gate, post-indicator, and trim and drain valves.
3. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
4. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 DEFINITIONS

A. Standard-Pressure Sprinkler Piping: Wet-pipe sprinkler system piping designed to operate at working pressure of 175-psig maximum.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. LEED Submittals:

1. Product Data for Credit EQ 4.1: For solvent cements and adhesive primers, including printed statement of VOC content and chemical components.

C. Shop Drawings: For wet-pipe sprinkler systems.

1. Include plans, elevations, sections, and attachment details.
2. Include diagrams for power, signal, and control wiring.

D. Delegated-Design Submittal: For wet-pipe sprinkler systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by licensed Fire Protection Engineer in the State of Maryland responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Sprinkler systems, drawn to scale in AUTOCAD software, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Domestic water piping.
2. HVAC hydronic piping.
3. Items on finished ceiling include but not limited to the following:

a. Lighting fixtures.
b. Air outlets and inlets.
c. Security and other miscellaneous equipment.

B. Qualification Data: For qualified Installer and professional engineer.

A. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, signed and sealed by licensed Fire Protection Engineer in the State of Maryland, that have been approved by authorities having jurisdiction, including hydraulic calculations if applicable.

B. Welding certificates.

C. Fire-hydrant flow test report.

D. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13. Include "Contractor's Material and Test Certificate for Aboveground Piping."

E. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For wet-pipe sprinkler systems and specialties to include in emergency, operation, and maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Sprinkler Cabinets: Finished, wall-mounted, steel cabinet with hinged cover, and with space for minimum of six spare sprinklers plus sprinkler wrench. Include number of sprinklers required by NFPA 13 and sprinkler wrench. Include separate cabinet with sprinklers and wrench for each type of sprinkler used on Project.

1.8 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installer's responsibilities include designing, fabricating, and installing sprinkler systems and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of fire-hydrant flow test.

a. Engineering Responsibility: Preparation of working plans, calculations, and field test reports by a licensed Fire Protection Engineer in the State of Maryland.

B. Welding Qualifications: Qualify procedures and operators according to 2010 ASME Boiler and Pressure Vessel Code.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.9 FIELD CONDITIONS

A. Interruption of Existing Sprinkler Service: Do not interrupt sprinkler service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary sprinkler service according to requirements indicated:

1. Notify Owner no fewer than two days in advance of proposed interruption of sprinkler service.
2. Do not proceed with interruption of sprinkler service without Owner's written permission.

1.10 WARRANTY

A. Warranty for sprinkler system material and labor: Two years from the date of Fire Marshal’s approval.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Sprinkler system equipment, specialties, accessories, installation, and testing shall comply with the following:

1. NFPA 13.

B. Standard-Pressure Piping System Component: Listed for 175-psig minimum working pressure.

C. Delegated Design: Engage a fire protection engineer licensed in the State of Maryland, to design wet-pipe sprinkler systems, including hydraulic calculations and other comprehensive engineering analysis, using performance requirements and design criteria indicated.

1. Conduct Fire Flow test and utilize the test records to design the fire suppression system.

2. Sprinkler system design shall be approved by authorities having jurisdiction.

a. Margin of Safety for Available Water Flow and Pressure: 10 percent, including losses through water-service piping, valves, and backflow preventers.
b. Sprinkler Occupancy Hazard Classifications unless and otherwise approved by AHJ:
   1) Building Service Areas: Ordinary Hazard, Group 1.
   2) Electrical Equipment Rooms: Ordinary Hazard, Group 1
   3) General Storage Areas: Ordinary Hazard, Group 1
   4) Mechanical Equipment Rooms: Ordinary Hazard, Group 1.
   5) All other Areas: Light Hazard .

3. Minimum Density for Automatic-Sprinkler Piping Design:
   a. Light-Hazard Occupancy: [0.10 gpm over 1500-sq. ft. area.
   b. Ordinary-Hazard, Group 1 Occupancy: 0.15 gpm over 1500-sq. ft. area.
   c. Special Occupancy Hazard: As determined by authorities having jurisdiction.
4. Maximum Protection Area per Sprinkler:
   a. According to NFPA 13 recommendations unless otherwise indicated.

2.2 STEEL PIPE AND FITTINGS

A. Standard-Weight, Galvanized- and Black-Steel Pipe: ASTM A 53/A 53M, Type E, Grade B. Pipe ends may be factory or field formed to match joining method.

B. Galvanized- and Black-Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M, standard-weight, seamless steel pipe with threaded ends.

C. Galvanized- and Uncoated-Steel Couplings: ASTM A 865/A 865M, threaded.

D. Galvanized and Uncoated, Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern.

E. Malleable- or Ductile-Iron Unions: UL 860.

F. Cast-Iron Flanges: ASME 16.1, Class 125.

G. Steel Flanges and Flanged Fittings: ASME B16.5, Class 150.

1. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8 inch thick.

   a. Class 125 and Class 250, Cast-Iron, Flat-Face Flanges: Full-face gaskets.
   b. Class 150 and Class 300, Ductile-Iron or -Steel, Raised-Face Flanges: Ring-type gaskets.

2. Metal, Pipe-Flange Bolts and Nuts: Carbon steel unless otherwise indicated.

H. Steel Welding Fittings: ASTM A 234/A 234M and ASME B16.9.

1. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

I. Grooved-Joint, Steel-Pipe Appurtenances:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturer specified.
   a. Anvil International.
   b. Tyco Fire and Building Products

c. Victaulic Company
d. Or approved equal.

2. Pressure Rating: 175-psig minimum.
3. Galvanized Grooved-End Fittings for Steel Piping: ASTM A 47/A 47M, malleable-iron casting or ASTM A 536, ductile-iron casting, with dimensions matching steel pipe.
4. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213 rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.

J. Steel Pressure-Seal Fittings: UL 213, FM Global-approved, 175-psig (1200-kPa) pressure rating with steel housing, rubber O-rings, and pipe stop; for use with fitting manufacturers' pressure-seal tools.

2.3 SPECIALTY VALVES

A. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."

B. Pressure Rating:

1. Standard-Pressure Piping Specialty Valves: 175-psig minimum.

C. Body Material: Cast or ductile iron.

D. Size: Same as connected piping.

E. End Connections: Flanged or grooved.

F. Automatic (Ball Drip) Drain Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturer specified.
   a. Kidde Fire Fighting; A UTC Business Unit.
   b. Reliable Automatic Sprinkler Co.(The)
   c. Tyco Fire and Building Products LP
   d. Or approved equal.
2. Standard: UL 1726.
3. Pressure Rating: 175-psig minimum.
4. Type: Automatic draining, ball check.
5. Size: NPS ¾.
6. End Connections: Threaded.

2.4 SPRINKLER PIPING SPECIALTIES

A. Branch Outlet Fittings:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturer specified.
   a. Anvil International.
   b. Tyco Fire and Building Products LP.
   c. Victaulic Company
   d. Or approved equal.
2. Standard: UL 213.
3. Pressure Rating: 175-psig minimum.
4. Body Material: Ductile-iron housing with EPDM seals and bolts and nuts.
5. Type: Mechanical-tee and -cross fittings.

6. Configurations: Snap-on and strapless, ductile-iron housing with branch outlets.
7. Size: Of dimension to fit onto sprinkler main and with outlet connections as required to match connected branch piping.
8. Branch Outlets: Grooved, plain-end pipe, or threaded.

B. Flow Detection and Test Assemblies:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturer specified.
   a. Reliable Automatic Sprinkler Co.(The)
   b. Tyco Fire and Building Products LP.
   c. Victaulic Company.
   d. Or approved equal.
2. Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
3. Pressure Rating: 175-psig minimum.
4. Body Material: Cast- or ductile-iron housing with orifice, sight glass, and integral test valve.
5. Size: Same as connected piping.
6. Inlet and Outlet: Threaded or grooved.

C. Sprinkler Inspector's Test Fittings:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturer specified.
   a. Tyco Fire and Building Products LP.
   b. Victaulic Company.
   c. Viking Corporation
   d. Or approved equal.
2. Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
3. Pressure Rating: 175-psig minimum.
4. Body Material: Cast- or ductile-iron housing with sight glass.
5. Size: Same as connected piping.
6. Inlet and Outlet: Threaded.

D. Adjustable Drop Nipples:
1. Standard: UL 1474.
2. Pressure Rating: 250-psig minimum.
3. Body Material: Steel pipe with EPDM-rubber O-ring seals.
4. Size: Same as connected piping.
5. Length: Adjustable.
6. Inlet and Outlet: Threaded.

2.5 SPRINKLERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturer specified.
1. Central Sprinkler Corp.
2. Reliable Automatic Sprinkler Co., Inc.
3. Tyco Fire and Building Products LP.
4. Viking Corporation.
5. Or approved equal.

B. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."

C. Pressure Rating for Automatic Sprinklers: 175-psig minimum.

D. Automatic Sprinklers with Heat-Responsive Element:

1. Early-Suppression, Fast-Response Applications: UL 1767.
2. Nonresidential Applications: UL 199.
3. Characteristics: Nominal 1/2-inch orifice with Discharge Coefficient K of 5.6, and for "Ordinary" temperature classification rating unless otherwise indicated or required by application.

E. Sprinkler types, features, and options as follows:

1. Pendent Sprinklers: Standard, Institutional, recessed, quick response type with Fusible Strut and nominal; ½ inch orifice, Reliable model XL INST or approved equal.

2. Sidewall Sprinklers: Institutional, quick response, tamper proof, ½ inch nominal orifice, polished chrome or stainless steel finish, TYCO model TY3381 or approved equal.

F. Sprinkler Finishes: Chrome plated, or rough brass, as indicated.

G. Special Coatings: Wax and /or corrosion-resistant paint.

H. Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting applications. Escutcheons for concealed, flush, and recessed-type sprinklers are specified with sprinklers.

1. Ceiling Mounting: Chrome-plated steel, one piece, flat with 1-inch vertical adjustment.
2. Sidewall Mounting: Chrome-plated steel, one piece, flat.

I. Sprinkler Guards:
1. Standard: UL 199.
2. Type: Wire cage with fastening device for attaching to sprinkler.

2.6 ALARM DEVICES

A. Alarm-device types shall match piping and equipment connections.

B. Electrically Operated Alarm Bell:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturer specified.
   a. Potter Electric Signal Company.
   b. System Sensor
   c. Or approved equal.
2. Standard: UL 464.
3. Type: Vibrating, metal alarm bell.
4. Size: 6-inch minimum diameter.
5. Finish: Red-enamel factory finish, suitable for outdoor use.
6. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application

C. Water-Flow Indicators:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturer specified.
   a. Grinnell Fire Protection.
   b. ITT McDonnell & Miller.
   c. Potter Electric Signal Company.

d. System Sensor
e. Or approved equal

2. Standard: UL 346.
3. Water-Flow Detector: Electrically supervised.
4. Components: Two single-pole, double-throw circuit switches for isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal if removed.
5. Type: Paddle operated.
6. Pressure Rating: 250 psig.
7. Design Installation: Horizontal or vertical.

D. Pressure Switches:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturer specified.
a. Grinnell Fire Protection.
b. Potter Electric Signal Company.
c. System Sensor
d. Or approved equal
2. Standard: UL 346.
3. Type: Electrically supervised water-flow switch with retard feature.
4. Components: Single-pole, double-throw switch with normally closed contacts.
5. Design Operation: Rising pressure signals water flow.

E. Valve Supervisory Switches:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturer specified.
a. Fire-Lite Alarms, Inc.; a Honeywell International Company.
b. Potter Electric Signal Company.
c. System Sensor
d. Or approved equal
2. Standard: UL 346.
3. Type: Electrically supervised.
4. Components: Single-pole, double-throw switch with normally closed contacts.
5. Design: Signals that controlled valve is in other than fully open position.
6. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application

2.7 PRESSURE GAGES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturer specified.
1. AMETEK, Inc.
2. Ashcroft, Inc.
3. WISA Instrumentation Corporation
4. Or approved equal.

B. Standard: UL 393.

C. Dial Size: 3-1/2- to 4-1/2-inch diameter.

D. Pressure Gage Range: 0- to 250-psig minimum.

E. Label: Include "WATER" label on dial face.

PART 3 - EXECUTION

3.1 PREPARATION

A. Perform fire-hydrant flow test according to NFPA 13 and NFPA 291. Use results for system design calculations required in "Quality Assurance" Article.

B. Report test results promptly and in writing.

3.2 WATER-SUPPLY CONNECTIONS

A. Connect sprinkler piping to building's interior water-distribution piping. Comply with requirements for interior piping in Section 221116 "Domestic Water Piping."

B. Install shutoff valve, backflow preventer, pressure gage, drain, and other accessories indicated at connection to water-distribution piping.

C. Install shutoff valve, check valve, pressure gage, and drain at connection to water supply.

3.3 PIPING INSTALLATION

A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated on approved working plans.

1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.
2. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, and partition assemblies.

B. Piping Standard: Comply with NFPA 13 requirements for installation of sprinkler piping.

C. Use listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

D. Install unions adjacent to each valve in pipes NPS 2 and smaller.

E. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

F. Install "Inspector's Test Connections" in sprinkler system piping, complete with shutoff valve, and sized and located according to NFPA 13.

G. Install sprinkler piping with drains for complete system drainage.

H. Install sprinkler control valves, test assemblies, and drain risers adjacent to standpipes when sprinkler piping is connected to standpipes.

I. Install automatic (ball drip) drain valve at each check valve for fire-department connection, to drain piping between fire-department connection and check valve. Install drain piping to and spill over floor drain or to outside building.

J. Install alarm devices in piping systems.

K. Install hangers and supports for sprinkler system piping according to NFPA 13. Comply with requirements for hanger materials in NFPA 13.

L. Install pressure gages on riser or feed main, at each sprinkler test connection, and at top of each standpipe. Include pressure gages with connection not less than NPS 1/4 and with soft-metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and install where they are not subject to freezing.

M. Fill sprinkler system piping with water.

N. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 210517 "Sleeves and Sleeve Seals for Fire-Suppression Piping."

O. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 210517 "Sleeves and Sleeve Seals for Fire-Suppression Piping."

P. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 210518 "Escutcheons for Fire-Suppression Piping."

3.4 JOINT CONSTRUCTION

A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.

B. Install unions adjacent to each valve in pipes NPS 2 and smaller.

C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

D. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

F. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.

G. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

H. Twist-Locked Joints: Insert plain end of steel pipe into plain-end-pipe fitting. Rotate retainer lugs one-quarter turn or tighten retainer pin.

I. Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators according to "Quality Assurance" Article.

1. Shop weld pipe joints where welded piping is indicated. Do not use welded joints for galvanized-steel pipe.

J. Steel-Piping, Cut-Grooved Joints: Cut square-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe joints.

K. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.

3.5 VALVE AND SPECIALTIES INSTALLATION

A. Install listed fire-protection valves, trim and drain valves, specialty valves and trim, controls, and specialties according to NFPA 13 and authorities having jurisdiction.

B. Install listed fire-protection shutoff valves supervised open, located to control sources of water supply except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.

C. Install backflow preventers in potable-water-supply sources.

D. Specialty Valves:

1. Install valves in vertical position for proper direction of flow, in main supply to system.

3.6 SPRINKLER INSTALLATION

A. Install sprinklers in suspended ceilings in center of acoustical ceiling panels.

3.7 IDENTIFICATION

A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13.

B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.8 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
4. Energize circuits to electrical equipment and devices.
5. Coordinate with fire-alarm tests. Operate as required.
6. Coordinate with fire-pump tests. Operate as required.
7. Verify that equipment hose threads are same as local fire department equipment.

B. Sprinkler piping system will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.9 CLEANING

A. Clean dirt and debris from sprinklers.

B. Only sprinklers with their original factory finish are acceptable. Remove and replace any sprinklers that are painted or have any other finish than their original factory finish.

3.10 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain specialty valves..

B. Refer Division 01 for administrative and procedural requirements for demonstration and training.

3.11 PIPING SCHEDULE

A. Piping between Fire Department Connections and Check Valves: Galvanized, standard-weight steel pipe with grooved ends, grooved-end fittings, grooved-end-pipe couplings, and grooved joints.

B. Sprinkler specialty fittings may be used, downstream of control valves, instead of specified fittings.

C. Standard-pressure, wet-pipe sprinkler system, NPS 2 or less shall be the following:

1. Standard-weight, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.

D. Standard-pressure, wet-pipe sprinkler system, NPS 2-1/2 to NPS 4 shall be the following:

1. Standard-weight, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.

E. Standard-pressure, wet-pipe sprinkler system, NPS 5 and larger, shall be the following:

1. Standard-weight, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.

3.12 SPRINKLER SCHEDULE

A. Use sprinkler types in subparagraphs below for the following applications:

1. Rooms without Ceilings: Upright sprinklers.
2. Rooms with Suspended Ceilings: Pendent, recessed, flush, and concealed sprinklers as indicated.
3. Wall Mounting: Sidewall sprinklers.
4. Spaces Subject to Freezing: Upright, dry sprinklers
5. Special Applications: Extended-coverage, quick-response sprinklers, Institutional space sprinklers.

B. Provide sprinkler types in subparagraphs below with finishes indicated.

1. Concealed Sprinklers: Rough brass, with factory-painted white cover plate.
2. Flush Sprinklers: Bright chrome, with painted white escutcheon.
3. Recessed Sprinklers: Bright chrome, with bright chrome escutcheon.
4. Upright, Pendent and Sidewall Sprinklers: Chrome plated in finished spaces exposed to view; rough bronze in unfinished spaces not exposed to view; wax coated where exposed to acids, chemicals, or other corrosive fumes.

END OF SECTION 211313

SECTION 21 13 16 - DRY-PIPE SPRINKLER SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Pipes, fittings, and specialties.
2. Specialty valves.
3. Sprinkler specialty pipe fittings.
4. Sprinklers.
5. Alarm devices.
6. Pressure gages.

B. Related Requirements:
1. Section 230523 "General-Duty Valves for Water-Based Fire-Suppression Piping" for ball, butterfly, check, gate, post-indicator, and trim and drain valves.
2. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
3. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 DEFINITIONS

A. Standard-Pressure Sprinkler Piping: Dry-pipe sprinkler system piping designed to operate at working pressure of 175-psig maximum.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For dry-pipe sprinkler systems.

1. Include plans, elevations, sections, and attachment details.
2. Include diagrams for power, signal, and control wiring.

C. Delegated-Design Submittal: For dry-pipe sprinkler systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by licensed Fire Protection Engineer in the State of Maryland responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Sprinkler systems, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Domestic water piping.
2. Compressed air piping.
3. HVAC hydronic piping.
4. Items penetrating finished ceiling including the following:

a. Lighting fixtures.
b. Air outlets and inlets.

B. Qualification Data: For qualified Installer and professional engineer.

A. Approved Sprinkler Piping Drawings: : Working plans, prepared according to NFPA 13, signed and sealed by licensed Fire Protection Engineer in the State of Maryland, that have been approved by authorities having jurisdiction, including hydraulic calculations if applicable.

B. Fire-hydrant flow test report.

C. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13. Include "Contractor's Material and Test Certificate for Aboveground Piping."

D. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For dry-pipe sprinkler systems and specialties to include in emergency, operation, and maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Sprinkler Cabinets: Finished, wall-mounted, steel cabinet with hinged cover, and with space for minimum of six spare sprinklers plus sprinkler wrench. Include number of sprinklers required by NFPA 13 and sprinkler wrench. Include separate cabinet with sprinklers and wrench for each type of sprinkler used on Project.

1.8 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installer's responsibilities include designing, fabricating, and installing sprinkler systems and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of fire-hydrant flow test.

a. Engineering Responsibility: Preparation of working plans, calculations, and field test reports by a licensed Fire Protection Engineer in the State of Maryland.

1.9 FIELD CONDITIONS

A. Interruption of Existing Sprinkler Service: Do not interrupt sprinkler service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary sprinkler service according to requirements indicated:

1. Notify Owner no fewer than two days in advance of proposed interruption of sprinkler service.
2. Do not proceed with interruption of sprinkler service without Owner's written permission.

1.10 WARRANTY

A. Warranty for sprinkler system material and labor: Two years from the date of Fire Marshal's approval.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTIONS

A. Dry-Pipe Sprinkler System: Automatic sprinklers are attached to piping containing compressed air. Opening of sprinklers releases compressed air and permits water pressure to open dry-pipe valve. Water then flows into piping and discharges from opened sprinklers.

2.2 PERFORMANCE REQUIREMENTS

A. Sprinkler system equipment, specialties, accessories, installation, and testing shall comply with the following:

1. NFPA 13.

B. Standard-Pressure Piping System Component: Listed for 175-psig minimum working pressure.

A. Delegated Design: Engage a fire protection engineer licensed in the State of Maryland, to design wet-pipe sprinkler systems, including hydraulic calculations and other comprehensive engineering analysis, using performance requirements and design criteria indicated.

1. Conduct Fire Flow test and utilize the test records to design the fire suppression system.

B. Sprinkler system design shall be approved by authorities having jurisdiction.

1. Margin of Safety for Available Water Flow and Pressure: 10 percent, including losses through water-service piping, valves, and backflow preventers.
2. Sprinkler Occupancy Hazard Classifications:

a. Ordinary Hazard, Group 1.

3. Minimum Density for Automatic-Sprinkler Piping Design:
   a. Ordinary-Hazard, Group 1 Occupancy: 0.15 gpm over 1500-sq. ft.
   b. Special Occupancy Hazard: As determined by authorities having jurisdiction.
4. Maximum Protection Area per Sprinkler:

a. 130 sq. ft. unless otherwise approved by AHJ.

5. Total Combined Hose-Stream Demand Requirement: According to NFPA 13 unless otherwise indicated:
   a. Ordinary-Hazard Occupancies: 250 gpm for 60 to 90 minutes.

2.3 STEEL PIPE AND FITTINGS

A. Standard-Weight, Galvanized-Steel Pipe: ASTM A 53/A 53M, Type E, Grade B. Pipe ends may be factory or field formed to match joining method.

B. Galvanized-Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M, standard-weight, seamless steel pipe with threaded ends.

C. Galvanized-Steel Couplings: ASTM A 865/A 865M, threaded.

D. Galvanized, Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern.

E. Malleable- or Ductile-Iron Unions: UL 860.

F. Cast-Iron Flanges: ASME B16.1, Class 125.

G. Grooved-Joint, Steel-Pipe Appurtenances:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturer specified.
      a. Anvil International.
      b. Tyco Fire and Building Products
      c. Victaulic Company
      d. Or approved equal.
   2. Pressure Rating: 175-psig minimum.
   3. Galvanized Grooved-End Fittings for Steel Piping: ASTM A 47/A 47M, malleable-iron casting or ASTM A 536, ductile-iron casting, with dimensions matching steel pipe.
   4. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213 rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.

2.4 SPECIALTY VALVES

A. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."

B. Pressure Rating:

   1. Standard-Pressure Piping Specialty Valves: 175-psig (1200-kPa) minimum.

C. Body Material: Cast or ductile iron.

D. Size: Same as connected piping.

E. End Connections: Flanged or grooved.

F. Dry-Pipe Valves:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturer specified.
      a. Globe Fire Sprinkler Corporation.
      b. Reliable Automatic Sprinkler Co.(The)

c. Tyco Fire and Building Products LP
d. Viking Corporation
e. Or approved equal.

2. Standard: UL 260.
3. Design: Differential-pressure type.
4. Include UL 1486, quick-opening devices, trim sets for air supply, drain, priming level, alarm connections, ball drip valves, pressure gages, priming chamber attachment, and fill-line attachment.
5. Air Compressor:
   a. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturer specified.
      1) Reliable Automatic Sprinkler Co.(The)
      2) Tyco Fire and Building Products LP
      3) Viking corporation
      4) Or approved equal.
   b. Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
   c. Motor Horsepower: Fractional.
   d. Power: 120-V ac, 60 Hz, single phase.

A. Automatic (Ball Drip) Drain Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturer specified.
   a. Kidde Fire Fighting; A UTC Business Unit.
   b. Reliable Automatic Sprinkler Co.(The)
   c. Tyco Fire and Building Products LP
   d. Or approved equal.
2. Standard: UL 1726.
3. Pressure Rating: 175-psig minimum.
4. Type: Automatic draining, ball check.
5. Size: NPS ¾.
6. End Connections: Threaded.

2.5 SPRINKLER PIPING SPECIALTIES

A. General Requirements for Dry-Pipe System Fittings: UL listed for dry-pipe service.

A. Branch Outlet Fittings:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturer specified.
   a. Anvil International.
   b. Tyco Fire and Building Products LP.
   c. Victaulic Company
   d. Or approved equal.
2. Standard: UL 213.
3. Pressure Rating: 175-psig minimum.
4. Body Material: Ductile-iron housing with EPDM seals and bolts and nuts.
5. Type: Mechanical-tee and -cross fittings.
6. Configurations: Snap-on and strapless, ductile-iron housing with branch outlets.
7. Size: Of dimension to fit onto sprinkler main and with outlet connections as required to match connected branch piping.
8. Branch Outlets: Grooved, plain-end pipe, or threaded.

A. Flow Detection and Test Assemblies:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturer specified.
   a. Reliable Automatic Sprinkler Co.(The)
   b. Tyco Fire and Building Products LP.
   c. Victaulic Company.
   d. Or approved equal.
2. Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
3. Pressure Rating: 175-psig minimum.
4. Body Material: Cast- or ductile-iron housing with orifice, sight glass, and integral test valve.
5. Size: Same as connected piping.
6. Inlet and Outlet: Threaded or grooved.

B. Sprinkler Inspector's Test Fittings:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturer specified.
   a. Tyco Fire and Building Products LP.
   b. Victaulic Company.
   c. Viking Corporation
   d. Or approved equal.
2. Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
3. Pressure Rating: 175-psig minimum.
4. Body Material: Cast- or ductile-iron housing with sight glass.
5. Size: Same as connected piping.
6. Inlet and Outlet: Threaded.

C. Adjustable Drop Nipples:
1. Standard: UL 1474.
2. Pressure Rating: 250-psig minimum.
3. Body Material: Steel pipe with EPDM-rubber O-ring seals.
4. Size: Same as connected piping.
5. Length: Adjustable.
6. Inlet and Outlet: Threaded.

2.6 SPRINKLERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturer specified.
1. Central Sprinkler Corp.
2. Reliable Automatic Sprinkler Co., Inc.
3. Tyco Fire and Building Products LP.
4. Viking Corporation.
5. Or approved equal.

B. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."

C. Pressure Rating for Automatic Sprinklers: 175-psig minimum.

D. Automatic Sprinklers with Heat-Responsive Element:

1. Nonresidential Applications: UL 199.
2. Characteristics: Nominal 1/2-inch (12.7-mm) orifice with Discharge Coefficient K of 5.6, and for "Ordinary" temperature classification rating unless otherwise indicated or required by application.

E. Sprinkler Finishes: Bronze, unless otherwise indicated.

F. Special Coatings: Wax, if required.

G. Sprinkler Guards:
1. Standard: UL 199.
2. Type: Wire cage with fastening device for attaching to sprinkler.

2.7 ALARM DEVICES

A. Alarm-device types shall match piping and equipment connections.

B. Electrically Operated Alarm Bell:
1. Pressure Switches: Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturer specified.
   a. Potter Electric Signal Company.
   b. System Sensor
   c. Or approved equal.
2. Standard: UL 464.
3. Type: Vibrating, metal alarm bell.
4. Size: 6-inch minimum diameter.
5. Finish: Red-enamel factory finish, suitable for outdoor use.
6. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application

C. Water-Flow Indicators:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturer specified.
   a. Grinnell Fire Protection.
   b. ITT McDonnell & Miller.
   c. Potter Electric Signal Company.
   d. System Sensor
   e. Or approved equal
2. Standard: UL 346.
3. Type: Electrically supervised water-flow switch with retard feature.
4. Components: Single-pole, double-throw switch with normally closed contacts.
5. Design Operation: Rising pressure signals water flow.

D. Valve Supervisory Switches:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturer specified.
   a. Fire-Lite Alarms, Inc.; a Honeywell International Company.
   b. Potter Electric Signal Company.
   c. System Sensor
   d. Or approved equal
2. Standard: UL 346.
3. Type: Electrically supervised.
4. Components: Single-pole, double-throw switch with normally closed contacts.
5. Design: Signals that controlled valve is in other than fully open position.
6. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application

2.8 PRESSURE GAGES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturer specified.
   1. AMETEK, Inc.
   2. Ashcroft, Inc.
   3. WISA Instrumentation Corporation
   4. Or approved equal.

B. Standard: UL 393.

C. Dial Size: 3-1/2- to 4-1/2-inch diameter.

D. Pressure Gage Range: 0- to 250-psig minimum.

E. Label: Include "WATER" label on dial face.

PART 3 - EXECUTION

3.1 PREPARATION

A. Perform fire-hydrant flow test according to NFPA 13 and NFPA 291. Use results for system design calculations required in "Quality Assurance" Article.

B. Report test results promptly and in writing.

3.2 PIPING INSTALLATION

A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated on approved working plans.

   1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.

B. Piping Standard: Comply with NFPA 13 requirements for installation of sprinkler piping.

C. Use listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

D. Install unions adjacent to each valve in pipes NPS 2 and smaller.

E. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

F. Install "Inspector's Test Connections" in sprinkler system piping, complete with shutoff valve, and sized and located according to NFPA 13.

G. Install sprinkler piping with drains for complete system drainage.

H. Install automatic (ball drip) drain valves to drain piping between fire department connections and check valves. Drain to floor drain or to outside building.

I. Connect air compressor to the following piping and wiring:

1. Pressure gages and controls.
2. Electrical power system.
3. Fire-alarm devices, including low-pressure alarm.

J. Install alarm devices in piping systems.

K. Install hangers and supports for sprinkler system piping according to NFPA 13. Comply with requirements in NFPA 13.

L. Install pressure gages on riser or feed main, at each sprinkler test connection,. Include pressure gages with connection not less than NPS 1/4 and with soft-metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and install where they are not subject to freezing.

M. Drain dry-pipe sprinkler piping.

N. Pressurize and check dry-pipe sprinkler system piping and air compressors.

O. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 210517 "Sleeves and Sleeve Seals for Fire-Suppression Piping."

P. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 210517 "Sleeves and Sleeve Seals for Fire-Suppression Piping."

Q. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 210518 "Escutcheons for Fire-Suppression Piping."

3.3 JOINT CONSTRUCTION

A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.

B. Install unions adjacent to each valve in pipes NPS 2 and smaller.

C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

D. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

F. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.

G. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

H. Twist-Locked Joints: Insert plain end of steel pipe into plain-end-pipe fitting. Rotate retainer lugs one-quarter turn or tighten retainer pin.

I. Steel-Piping, Cut-Grooved Joints: Cut square-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe joints.

J. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.4 VALVE AND SPECIALTIES INSTALLATION

A. Install listed fire-protection valves, trim and drain valves, specialty valves and trim, controls, and specialties according to NFPA 13 and authorities having jurisdiction.

B. Install listed fire-protection shutoff valves supervised open, located to control sources of water supply except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.

C. Specialty Valves:

1. Install valves in vertical position for proper direction of flow, in main supply to system.
2. Install dry-pipe valves with trim sets for air supply, drain, priming level, alarm connections, ball drip valves, pressure gages, priming chamber attachment, and fill-line attachment.

    a. Install air compressor and compressed-air-supply piping.

3.5 SPRINKLER INSTALLATION

A. Install sprinklers in accordance with NFPA 13.

3.6 IDENTIFICATION

A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13.

B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.7 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.

2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
3. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
4. Energize circuits to electrical equipment and devices.
5. Start and run air compressors.
6. Coordinate with fire-alarm tests. Operate as required.
7. Coordinate with fire-pump tests. Operate as required.

B. Sprinkler piping system will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.8 CLEANING

A. Clean dirt and debris from sprinklers.

B. Only sprinklers with their original factory finish are acceptable. Remove and replace any sprinklers that are painted or have any other finish than their original factory finish.

3.9 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain specialty valves.

B. Refer Division 01 for administrative and procedural requirements for demonstration and training.

3.10 PIPING SCHEDULE

A. Sprinkler specialty fittings may be used, downstream of control valves, instead of specified fittings.

B. Standard-pressure, dry-pipe sprinkler system, NPS 2 and smaller, shall be the following:
1. Standard-weight, Schedule 40, galvanized-steel pipe with cut-grooved ends; galvanized, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.

C. Standard-pressure, dry-pipe sprinkler system, NPS 2-1/2 to NPS 4, shall be the following:
1. Standard-weight, Schedule 40, galvanized-steel pipe with cut-grooved ends; galvanized, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.

3.11 SPRINKLER SCHEDULE

A. Use sprinkler types in subparagraphs below for the following applications:
1. Spaces Subject to Freezing: Upright, or dry pendent sprinklers, as required.

B. Provide sprinkler types in subparagraphs below with finishes indicated.
1. Upright or Pendent Sprinklers: Chrome plated in finished spaces exposed to view; rough bronze in unfinished spaces not exposed to view; wax coated where exposed to acids, chemicals, or other corrosive fumes.

END OF SECTION 211316

SECTION 21 22 00 - CLEAN-AGENT FIRE-EXTINGUISHING SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Piping and piping specialties.
2. Extinguishing-agent containers for main and reserve assemblies.
3. Extinguishing agent.
4. Detection and alarm devices.
5. Control and alarm panels.
6. Accessories.
7. Connection devices for and wiring between system components.
8. Connection devices for power and integration into building's fire-alarm system.

B. Related Requirements:
1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 DEFINITIONS

A. ATS: Acceptance Testing Specifications.

B. EPO: Emergency Power Off.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. LEED Submittals:

1. Product Data for Credit EA 4: Documentation indicating that clean agents comply.

C. Shop Drawings: For clean-agent fire-extinguishing system signed and sealed by a Fire Protection Engineer licensed in the State of Maryland.

1. Include plans, elevations, sections, details, and attachments to other work.
2. Include design calculations.

3. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
4. Wiring Diagrams: For power, signal, and control wiring.

D. Delegated-Design Submittal: For clean-agent fire-extinguishing system signed and sealed by a Fire Protection Engineer licensed in the State of Maryland.

1. Indicate compliance with performance requirements and design criteria, including analysis data.
2. Include design calculations for weight, volume, and concentration of extinguishing agent required for each hazard area.
3. Indicate the Following on Plans:

    a. Ceiling penetrations and ceiling-mounted items such as but not limited to discharge nozzles, detectors and accessories.
    b. Complete system layout including but not limited to extinguishing-agent containers with sizes, piping size and routing, discharge nozzles, detectors, alarm devices and accessories.
    c. Method of attaching hangers to building structure.
    d. Other ceiling-mounted items including light fixtures, diffusers, grilles, speakers, and access panels.

1.5 INFORMATIONAL SUBMITTALS

A. Permit Approved Drawings: Working plans, prepared according to NFPA 2001, that have been approved by authorities having jurisdiction. Include design calculations.

B. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For special agent system to include in emergency, operation, and maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents. Deliver extra materials to Owner.

1. Detection Devices: Not less than 20 percent of amount of each type installed.
2. Container Valves: Not less than 10 percent of amount of each size and type installed.
3. Nozzles: Not less than 20 percent of amount of each type installed.
4. Extinguishing Agent: Not less than 100 percent of amount installed in largest hazard area. Include pressure-rated containers with valves.

1.8 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. FM Global Compliance: Provide components that are FM Approved and that are listed in FM Global's "Approval Guide."

C. UL Compliance: Provide equipment listed in UL's "Fire Protection Equipment Directory."

1.9 WARRANTY

A. Provide full labor and parts warranty for a minimum period of two years from the date of approval by the Fire Marshal, unless otherwise indicated.

PART 2 - PRODUCTS

2.1 CLEAN-AGENT SYSTEMS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturer specified.
1. Ansul Incorporated; Tyco International.
2. Chemetron Fire system
3. Kidde Fire Systems.
4. Or approved equal.

B. Description: Clean-agent fire-extinguishing system shall be an engineered system for total flooding of the hazard area including the room cavity above the ceiling, and below the ceiling.

C. Delegated Design: Design clean-agent fire-extinguishing system and obtain approval from authorities having jurisdiction. Design system for Class A, B, and C fires as appropriate for areas being protected, and include safety factor. Use clean agent indicated and in concentration suitable for normally occupied areas.

D. Performance Requirements: Discharge HFC 227ea within 10 seconds and maintain 7.1 percent concentration by volume at 70 deg F for 10-minute holding time in hazard areas.

1. HFC 227ea concentration in hazard areas greater than 9.0 percent immediately after discharge or less than 5.8 percent throughout holding time will not be accepted without written authorization from authorities having jurisdiction.
2. System Capabilities: Minimum 620-psig calculated working pressure and 360-psig initial charging pressure.

E. Cross-Zoned Detection: Devices located in two separate zones. Sound alarm on activating single-detection device, and discharge extinguishing agent on actuating single-detection device in other zone.

F. System Operating Sequence:

1. Actuating First Detector: Visual indication on annunciator panel. Energize audible and visual alarms (slow pulse), shut down air-conditioning and ventilating systems serving protected area, close doors in protected area, and send signal to fire-alarm system.
2. Actuating Second Detector: Visual indication on annunciator panel. Energize audible and visual alarms (fast pulse), shut down power to protected equipment, start time delay for extinguishing-agent discharge for 30 seconds, and discharge extinguishing agent.
3. Extinguishing-agent discharge will operate audible alarms and strobe lights inside and outside the protected area.

G. Manual stations shall immediately discharge extinguishing agent when activated.

H. Operating abort switches will delay extinguishing-agent discharge while being activated, and switches must be reset to prevent agent discharge. Release of hand pressure on the switch will cause agent discharge if the time delay has expired.

I. EPO: Will terminate power to protected equipment immediately on actuation.

J. Low-Agent Pressure Switch: Initiate trouble alarm if sensing less than set pressure.

K. Power Transfer Switch: Transfer from normal to stand-by power source.

L. Main to Reserve assembly Transfer Switch: Transfer from Main to Reserve assembly when main assembly is out of agent supply.

2.2 PIPING MATERIALS

A. See "HFC 227ea Agent Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

B. Piping, Valves, and Discharge Nozzles: Comply with types and standards listed in NFPA 2001, Section "Distribution," for charging pressure of system.

2.3 PIPE AND FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, Type S, Grade B or ASTM A 106/A 106M, Grade A; Schedule 40, seamless steel pipe.

1. Threaded Fittings:

a. Malleable-Iron Fittings: ASME B16.3, Class 300.
b. Flanges and Flanged Fittings: ASME B16.5, Class 300 unless Class 600 is indicated.
c. Fittings Working Pressure: 620 psig minimum.
d. Flanged Joints: Class 300 minimum.

B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.

C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel.

D. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

E. Steel, Keyed Couplings: UL 213, AWWA C606, approved or listed for clean-agent service, and matching steel-pipe dimensions. Include ASTM A 536, ductile-iron housing, rubber gasket, and steel bolts and nuts.

2.4 VALVES

A. General Valve Requirements:

1. UL listed or FM Approved for use in fire-protection systems.
2. Compatible with type of clean agent used.

B. Container Valves: With rupture disc or solenoid and manual-release lever, capable of immediate and total agent discharge and suitable for intended flow capacity.

C. Valves in Sections of Closed Piping and Manifolds: Fabricate to prevent entrapment of liquid, or install valve and separate pressure relief device.

D. Valves in Manifolds: Check valve; installed to prevent loss of extinguishing agent when container is removed from manifold.

2.5 EXTINGUISHING-AGENT CONTAINERS

A. Description: Steel tanks complying with ASME Boiler and Pressure Vessel Code: Section VIII, for unfired pressure vessels. Include minimum working-pressure rating that matches system charging pressure, valve, pressure switch, and pressure gage.

1. Finish: Red, enamel or epoxy paint.
2. Manifold: Fabricate with valves, pressure switches, selector switch, and connections for main- and reserve-supply banks of multiple storage containers.
3. Storage-Tank Brackets: Factory- or field-fabricated retaining brackets consisting of steel straps and channels; suitable for container support, maintenance, and tank refilling or replacement.

2.6 FIRE-EXTINGUISHING CLEAN AGENT

A. HFC 227ea Clean Agent: Heptafluoropropane.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturer specified.
   a. Dupont.
   b. Great Lakes Chemical Corporation.
   c. Or approved equal

2.7 DISCHARGE NOZZLES

A. Equipment manufacturer's standard one-piece brass or aluminum alloy of type, size, discharge pattern, and capacity required for application.

2.8 CONTROL PANELS

A. Description: FM Approved or NRTL listed, including equipment and features required for testing, supervising, and operating fire-extinguishing system.

B. Power Requirements: 120/240-V ac; with electrical contacts for connection to system components and fire-alarm system, and transformer or rectifier as needed to produce power at voltage required for accessories and alarm devices.

C. Enclosure: NEMA ICS 6, Type 1, enameled-steel cabinet.

1. Mounting: Recessed flush with surface or Surface as required.

D. Supervised Circuits: Separate circuits for each independent hazard area.

1. Detection circuits equal to the required number of zones, or addressable devices assigned to the required number of zones.
2. Manual pull-station circuit.
3. Alarm circuit.
4. Release circuit.
5. Abort circuit.
6. EPO circuit.

E. Control-Panel Features:

1. Electrical contacts for shutting down fans, activating dampers, and operating system electrical devices.
2. Automatic switchover to standby power at loss of primary power.
3. Storage container, low-pressure indicator.
4. Service disconnect to interrupt system operation for maintenance with visual status indication on the annunciator panel.

F. Annunciator Panel: Graphic type showing protected, hazard-area plans, as well as locations of detectors and abort, EPO, and manual stations. Include lamps to indicate device-initiating alarm, electrical contacts for connection to control panel, and stainless-steel or aluminum enclosure.

G. Standby Power: Sealed batteries with capacity to operate system for 24 hours and alarm for minimum of 15 minutes. Include automatic battery charger that has a varying charging rate between trickle and high depending on battery voltage, and that is capable of maintaining batteries fully charged. Include manual voltage control, dc voltmeter, dc ammeter, electrical contacts for connection to control panel, automatic transfer switch, and suitable enclosure.

2.9 DETECTION DEVICES

A. General Requirements for Detection Devices:

1. Comply with NFPA 2001, NFPA 72, and UL 268.
2. 24-V dc, nominal.

B. Ionization Detectors: Dual-chamber type, having sampling and referencing chambers, with smoke-sensing element.

C. Photoelectric Detectors: LED light source and silicon photodiode receiving element.

D. Signals to the Central Fire Alarm Control Panel: Any type of local system trouble is reported to the central fire alarm control panel as a composite "trouble" signal. Alarms on each system zone are individually reported to the central fire alarm control panel as separately identified zones.

2.10 MANUAL STATIONS

A. General Description: Surface or Semirecessed FM Approved or NRTL listed, with clear plastic hinged cover, 120-V ac or low voltage compatible with controls. Include contacts for connection to control panel.

B. Manual Release: "MANUAL RELEASE" caption, and red finish. Unit can manually discharge extinguishing agent with operating device that remains engaged until unlocked.

C. Abort Switch: "ABORT" caption, momentary contact, with green finish.

D. EPO Switch: "EPO" caption, with yellow finish.

2.11 SWITCHES

A. Description: FM Approved or NRTL listed, where available, 120-V ac or low voltage compatible with controls. Include contacts for connection to control panel.

1. Low-Agent Pressure Switches: Pneumatic operation.
2. Power Transfer Switches: Key-operation selector, for transfer of release circuit signal from main supply to reserve supply.
3. Door Closers: Magnetic retaining and release device or electrical interlock to cause the door operator to drive the door closed.

2.12 ALARM DEVICES

A. Description: Listed and labeled by an NRTL or FM Approved, low voltage, and surface mounting. Comply with requirements in Section 283111 "Digital, Addressable Fire-Alarm System" or Section 283112 "Zoned (DC Loop) Fire-Alarm System" for alarm and monitoring devices.

B. Bells: Minimum 6-inch diameter.

C. Horns: 90 to 94 dBA.

D. Strobe Lights: Translucent lens, with "FIRE" or similar caption.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with hazard-area leakage requirements, installation tolerances, and other conditions affecting work performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 HFC 227ea agent PIPING APPLICATIONS

A. Flanged pipe and fittings and flanged joints may be used to connect to specialties and accessories and where required for maintenance.

B. NPS 2 and Smaller: Schedule 40, steel pipe; malleable-iron threaded fittings; and threaded joints.

3.3 CLEAN-AGENT PIPING INSTALLATION

A. Install clean-agent extinguishing piping and other components level and plumb, according to manufacturers' written instructions.

B. Install extinguishing-agent containers anchored to substrate.

C. Install pipe and fittings, valves, and discharge nozzles according to requirements listed in NFPA 2001, Section "Distribution."

1. Install valves designed to prevent entrapment of liquid, or install pressure relief devices in valved sections of piping systems.
2. Support piping using supports and methods according to NFPA 13.
3. Install control panels, detection system components, alarms, and accessories, complying with requirements of NFPA 2001, Section "Detection, Actuation, and Control Systems," as required for supervised system application.

3.4 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Where installing piping adjacent to equipment, allow space for service and maintenance.

C. Connect electrical devices to control panel and to building's fire-alarm system. Electrical power, wiring, and devices are specified in Section 283111 "Digital, Addressable Fire-Alarm System".

3.5 IDENTIFICATION

A. Identify system components and equipment. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

B. Identify piping, extinguishing-agent containers, other equipment, and panels according to NFPA 2001.

C. Install signs at entry doors for protected areas to warn occupants that they are entering a room protected with a clean-agent fire-extinguishing system.

D. Install signs at entry doors to advise persons outside the room the meaning of the horn(s), bell(s), and strobe light(s) outside the protected space.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

D. Tests and Inspections:

1. After installing clean-agent extinguishing piping system and after electrical circuitry has been energized, test for compliance with requirements.
2. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Sections "Inspection and Test Procedures" and "System Function Tests." Certify compliance with test parameters.
3. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
4. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation. Remove malfunctioning units, replace with new units, and retest.
5. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. Units will be considered defective if they do not pass tests and inspections.

F. Prepare test and inspection reports.

3.7 CLEANING

A. Each pipe section shall be cleaned internally after preparation and before assembly by means of swabbing, using a suitable nonflammable cleaner. Pipe network shall be free of particulate matter and oil residue before installing nozzles or discharge devices.

3.8 SYSTEM FILLING

A. Preparation:

1. Verify that piping system installation is completed and cleaned.
2. Check for complete enclosure integrity.
3. Check operation of ventilation and exhaust systems.

B. Filling Procedures:

1. Fill extinguishing-agent containers with extinguishing agent, and pressurize to indicated charging pressure.
2. Install filled extinguishing-agent containers.
3. Energize circuits.
4. Adjust operating controls.

3.9 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain clean-agent fire-extinguishing systems.

B. Refer Division 01 for administrative and procedural requirements for demonstration and training.

END OF SECTION 212200

SECTION 22 05 00 - COMMON RESULTS FOR PLUMBING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This section includes general requirements for plumbing systems including sanitary drain piping and potable water piping.

B. Related Requirements:
   1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
   2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 REFERENCES

A. General:

   1. The following documents form part of the Specifications to the extent stated. Where differences exist between codes and standards, the one affording the greatest protection shall apply.

   2. Unless otherwise noted, the referenced standard edition is the current one at the time of commencement of the Work.

1.4 DESCRIPTION

A. These Division 22 specifications define the statutory, administrative, procedural, and technical requirements of the mechanical and controls modifications, replacements, and/or upgrades products and services to be provided on this Subcontract.

B. Provide plumbing work as indicated on the Drawings and specified in Division 22 including:

   1. Prepare coordination drawings, shop drawings, submittals, as-built drawings, and operating and maintenance instructions.

   2. Determine items and quantities required.

   3. Provide complete, continuous, operational, and functioning systems.

   4. Fully coordinate with work of other Sections, including field verification of elevations, dimensions, clearance, and access.

5. Repair of all damage done to premises as a result of this installation and removal of debris left by those engaged in this installation.

6. Rigging, hoisting, transportation, and associated work necessary for placement of equipment in the final location shown.

7. Disassembly and re-assembly of equipment furnished under this Section, should this be required in order to move equipment into final location shown on the Drawings.

8. Labor, materials, tools, appliances and equipment that are required to furnish and install the complete installation for this section of the work including that which is reasonably inferred.

9. Cooperation with other crafts in putting the installation in place at a time when space required is accessible.

10. Temporary scaffolding necessary for performance of the work in this Division.

11. Cutting and core drilling required for work of Division 22, including locating of rebar or coordination of locating rebar with the General Contractor.

12. Pipe sleeves for all holes in walls, floors, and ceilings, and cutting of floor slabs and slabs on grade.

13. Waterproofing where necessary for installation under this Division.

14. Cooperation with and assistance to the Facilities Monitoring and Control System Contractor as required to provide a complete and functional plumbing system.

15. Counterflashing of roof penetrations for work of Division 22.

16. Sizes, and locations for installation of any curbs and pads for work of Division 22.

17. Temporary and permanent stands and supports for equipment requiring them including vibration isolation.

18. Temporary protection of existing installation.

19. Stenciling and equipment identification.

20. Firestopping of penetrations of ducts, piping, and conduits through walls, floors, and ceiling assemblies.

21. Temporary utilities as required to install work on Division 22 including lighting, water, gas, electricity, etc.

22. Fees, permits, inspections, taxes, and approach from agencies that have jurisdiction over installation of Division 22.

23. Participation in and coordination with the Commissioning process.

24. Warranty.

1.5 SUBMITTALS

A. Submit under provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's technical product specification sheets for each system component and device to be provided that includes data needed to prove compliance with this specification. Clearly indicate the exact model of each component to be provided.

C. Coordination Drawings:

1. Obtain drawings from the structural, electrical, sprinkler, plumbing, sheet metal, concrete, steel, and dry wall trades.

2. Hold regular coordination sessions with trades until coordination issues are resolved.

3. Prepare separate composite coordination drawings to a scale of 1/4 inch = 1 foot (1:25) or larger, showing work of Divisions to demonstrate coordination, clearance, access, etc. between ductwork, equipment, temperature controls, cable trays, conduits, light fixtures, piping, plumbing, structural elements, architectural elements, etc. These drawings are to be the basis for the detailed shop drawings and need not be submitted, but are to be available for review upon request.

a) Prepare floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.

b) Each trade is to adjust their shop drawings based on the outcome of coordination sessions. Indicate locations where space is limited for installation and access and where sequencing and coordination of installations are of importance to the efficient flow of the Work. Indicate scheduling, sequencing, movement, and positioning of large equipment into the building during construction. Indicate the proposed locations, of piping, ductwork, equipment, and materials. Include the following:

c) Clearances for installing and maintaining insulation.

d) Clearances for servicing and maintaining equipment, including specific ceiling tile or ceiling access panel access and space for equipment disassembly required for periodic maintenance.

e) Equipment connections and support details.

f) Fire-rated wall and floor penetrations.

g) Sizes and location of required concrete pads and bases.

h) Valve stem movement.

i) Sizes and locations of new and existing equipment support curbs on roof.

j) Sizes and locations of new openings, either sleeved, cut, or core-drilled, in new concrete construction unless specifically shown on the Structural Drawings.

1) Maintain one complete set of composite coordination drawings at the job site.

2) Periodically update drawings based on actual field conditions.

3) Submit final coordination drawings as part of record document requirements.

D. Submit manufacturer's operation and maintenance manuals in compliance with Section 01 78 23 – Operation and Maintenance Data. Include a list of spare parts that the manufacturer recommends the Owner purchase.

E. Lateral Force Anchorage: Submit lateral force anchorage calculations and details of anchorage of components to building including backing design. Seismic forces shall be in accordance with with value 1.5 used as the minimum CBC seismic importance factor, Ip. Calculations shall be sealed by a Structural Engineer registered in the state of Maryland.

F. Record Documents: Upon completion of the work covered by this Contract, as directed, furnish the Owner with as-built drawings as specified in 01 78 00 Closeout Submittals. Include changes installed under this Contract which are not in accordance with the Contract Drawings. Note that these as-built drawings are to be based on the Contract Drawings. In addition, submit final copies of the Shop Drawings and Coordination Drawings.

1.6 QUALITY ASSURANCE

A. Materials and Equipment: materials and equipment shall be new. Materials and equipment for which tests have been established by Underwriter's Laboratories, Inc. shall be approved by that body and shall bear its label of approval. The first names manufacturer and product is the basis of design. Other manufacturers and/or products are considered as substitutions.

B. In lieu of listing by an approved testing laboratory, consideration will be given to certified test reports of an adequately equipped, recognized independent test laboratory competent to perform such testing indicating conformance to requirements of the applicable Underwriter's Laboratories, Inc. standards.

C. Unless otherwise approved by the Project Manager, the materials to be furnished under this specification shall be the standard products of manufacturers regularly engaged in the production of such equipment equal to or superior to the material specified, and shall be the manufacturer's latest standard design that complies with the specification requirements.

D. Approval of Materials:

1. A complete list of materials and equipment proposed shall be submitted to the Project Manager for approval. The list shall include for each item: the manufacturer, the manufacturer's catalog number, type or class, the rating, capacity, size, etc.

2. Before installation of the equipment, the Subcontractor shall submit for approval detailed construction drawings for each item of fabricated equipment required for installation. Drawings shall be to scale and fully dimensioned and shall provide sufficient detail to clearly indicate the arrangement of equipment and its components.

3. Installation of approved substituted equipment is the Subcontractor's responsibility, and changes required to work included under other divisions for installations of approved substituted equipment must be made to the satisfaction of the Owner and without change in contract price. Approval by the Owner of substituted equipment and/or dimension drawings does not waive these requirements.

1.7 START-UP TRAINING

A. Assist owner in preparing a formal training program for operating staff prior to the scheduled start-up date. The program will consist of the design, start-up, and operation of the mechanical, plumbing, fire protection, and building automation systems. Coordinate the training program with

the production of the operation and maintenance manuals. Provide indexed binder and training materials to each participant.

B. Provide 16 hours (unless specified otherwise) of on-site training in the operation and maintenance for installed system and major piece of equipment. Systems include boilers and heating hot water system, chillers and chilled water system, plumbing, fire protection, air supply and exhaust systems, air conditioning units, balancing, and Facilities Monitoring and Control System. Trainers shall be experienced, manufacturer-approved personnel.

1. Schedule training for each system in advance with the Owner.

2. Include travel, per diem and incidental costs for personnel under contract to the Subcontractor. Operations and Maintenance data to be available for training sessions.

1.8 RULES AND REGULATIONS

A. See Division 01.

B. Provide work and materials in full accordance with the latest rules of the organizations listed in Division 1 and in other Sections of Division 22, and with prevailing rules and regulations pertaining to adequate protection and/or guarding of moving parts, or otherwise hazardous locations.

C. Whenever the Drawings and Specifications require something which will violate the regulations, the regulations shall govern. Review the Drawings and Specifications, and request from the Owner clarification or revision of portion of the work in violation of the rules or regulations prior to installing the work. Necessary installation alteration required for compliance shall be made at no additional cost to the Owner.

D. Whenever the Drawings and Specifications require larger sizes, or higher standards than are required by the regulations, the Drawings and Specifications shall govern.

E. Strictly conform to the requirements of the National Fire Protection Association, National Electrical Code, California Title 24 Codes, OSHA, Fire Marshal, and insurance underwriters' requirements. Expenses required shall be borne under this Contract.

1.9 PROTECTION OF EQUIPMENT

A. Protect, handle, and store products under provisions of 01 66 10 Storage of Materials.

B. Assume responsibility for damage to of the work or premises before substantial completion. Should new or existing equipment become damaged, restore it to its original condition and finish before final acceptance. Damage incurred to the owner property or to the work of other Divisions, caused by this Division, shall be replaced or repaired by, and at the expense of, the Subcontractor to the satisfaction of the University. Exposed materials shall be clean at the time of acceptance of the project.

1.10 SCHEDULING AND SEQUENCING

A. Cooperate with other trades in putting this installation in place at a time when space required is accessible, and in such a manner that other work in this space may be installed as shown on the Drawings. Schedule work and cooperate with the others to avoid delays, interferences, and unnecessary work, conforming to the construction schedule, making the installation when and where directed. Include labor and materials to install certain items furnished under this contract when required by the schedule. These items are part of this contract but may need to be installed

only after completion of work under another contract which this contractor may or may not be participating in. It is the responsibility of this contract to coordinate with others to insure that preparations are made and ready to accept the installation of these items. These items include, but are not limited to:

1. Air inlets and outlet
2. Temperature sensors.
3. Monitoring and control panels.
4. Sprinkler heads.

B. If a discrepancy is discovered between engineering and architectural Drawings, whether with respect to a significant variance between location, variation in quantity, or violation of code requirements, notify Architect for clarification and do not proceed with the work affected until clarification has been made.

1.10 TEMPORARY USE

A. Should it become necessary to use the new portion of the system and the new equipment to warm or air condition part of the building before the completion of this work, the Owner reserves the right to make use of same at its own risk and expense, but the temporary use of the equipment shall not constitute an acceptance of the plant or part thereof in way. The Owner will bear the cost of fuel and electrical current for such temporary use of the equipment. If temporary use of new systems or equipment is solely for the benefit of the contractor, contractor shall bear the cost of fuel and electrical current for such temporary use.

1.11 WARRANTY

A. Comply with Section 01 78 36 – Warranties.

B. Provide extended warranties where specifically required in subsequent sections of Division 22.

PART 2 - PRODUCTS

2.1 GENERAL

A. In addition to material and equipment specified, provide incidental materials to effect a complete installation. Such incidental materials include solders, tapes, caulkings, mastics, gaskets and similar items.

B. Materials and equipment shall be uniform throughout the installation. Equipment of the same type shall be of the same manufacturer. Materials and equipment shall be new.

2.2 MATERIALS AND SUBSTITUTIONS

A. Comply with requirements of 01 25 00 Substitution Procedures.

PART 3 - EXECUTION

3.1 EXAMINATION OF SITE

A. Examine the site and become familiar with conditions that may affect the work covered by this division of the Specifications.

B. Arrange to meet with the Owner at the job site before the work is started and discuss with them the various phases of the work and the procedure and preparation for testing and adjusting the systems.

C. The general arrangement and location of piping ductwork, apparatus, etc., is shown on the Drawings or herein specified. Minor changes may be necessary to accommodate other work, new or existing, that may conflict with this work. Install this work in harmony with these trades and fully coordinate work.

D. Visit the site of the work, take measurements, examine areas where work is to be performed and get such other information necessary for proper execution of the work. Ascertain and check conditions with the Drawings and Specifications, other trades, existing conditions and by what means the work is to be performed. No allowance shall subsequently be made for extra expense due to failure or neglect to make such examination and correlation. Where revisions or changes in the existing work are required to permit the installation of new work, they shall be made at no additional cost to the Owner. No allowance shall be subsequently made for error or omission.

3.2 ACCURACY OF DATA

A. The Drawings indicate the general arrangement and location of piping, ducts, and equipment. Should it be necessary to deviate from arrangement or location indicated in order to meet architectural conditions or site conditions, or due to interference with other work, make such deviations as offsets, rises and drops in piping and ducts that may be necessary, whether shown or not, without extra expense to the Owner. Extreme accuracy of the data given herein and on the Drawings is not guaranteed. The Drawings and Specifications are for the assistance and guidance of this Section and exact locations, distances, and elevations shall be governed by actual site conditions.

3.3 COORDINATION ITEMS

A. Coordinate mechanical work with that of other trades in order to:

1. Avoid interferences between general construction, mechanical, electrical, structural and other specialty trades.

2. Maintain clearances and advise other trades of clearance requirements for operation, repair, removal and testing of mechanical equipment.

B. Understanding of Work:

1. Study, examine, and compare of the contract documents, including drawings and specifications. The Subcontractor shall have a full understanding of how the work in this part is scheduled, phased, and installed with work of other trades.

2. Include in this installation piping, ductwork, devices, and equipment that are necessary for complete and operating systems as specified and as required.

3. Connect piping and ductwork from fixtures, outlets, and devices full size to the nearest suitable main or riser.

4. Certain installations may be presented as typical, and full details are not repeated for each case. Subcontractor shall provide complete installation as if full details apply to each and every case, and make adjustments to typical details to suit each specific installation as part of the basic work.

5. Installation of work presented on the diagrams are applicable to the plans, and work depicted on the plans are applicable to the diagrams.

6. If there is a discrepancy in the drawings or specifications, the contractor shall figure the work based on the most stringent requirements to complete the installation and obtain clarification from the Architect before installation.

C. Sequence, coordinate, and integrate the various elements of mechanical systems, materials, and equipment. Comply with the following requirements:

1. Coordinate mechanical systems, equipment, and materials installation with other building components.

2. Verify dimensions by field measurements.

3. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for mechanical installations.

4. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.

5. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing in the building.

6. Where mounting heights are not detailed or dimensioned, install systems, materials and equipment to provide the maximum headroom possible. Work shall be above ceilings or ceiling line.

7. Coordinate installation and connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.

8. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the Work are shown only in diagrammatic form. Coordinate with individual system requirements.

9. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components, where installed exposed in finished spaces.

10. Install mechanical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as is practical, connect equipment for ease of disconnecting, with minimum of interference with other installations. Extend grease fittings to an accessible location.

11. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.

12. Coordinate with the locations of electrical panels and avoid installing piping and ductwork over them. Electrical panels are purposely located and have priority for location. The contractor is responsible for required piping and ductwork offsets to insure that the panels are located as designed and for other conditions.

13. Perform system modification recommended by Test and Balance Agency after recommendations are accepted by the Owner

3.5 WORKMANSHIP AND SUPERVISION

A. Special Requirements Section 01 45 00 – Quality Control in addition to the following.

1. Measurements: Materials installed shall be to exact field measurements.

2. The installation depicted on the Drawings is designed to fit tightly into work under other Sections or Divisions. It is the essence of this Contract that work be completely coordinated with other Sections or Divisions, and that locations of pipes and ducts be exactly determined in the field and cleared with other Sections or Divisions before the installation of these items is begun. No extra compensation will be made for failure to observe this clause.

3. Adequate clearance for access to operable devices and automatic devices and for access to lubrication points shall be maintained in portions of the work including ductwork and piping installed on the roof. Tripping hazards shall be avoided.

4. Provide architectural access doors where shown and where required for access to equipment and operable devices.

5. Gauges, thermometers, and other indicating devices shall be installed so that they can be easily read from the floor.

3.6 MATERIAL DELIVERY AND STORAGE

A. Comply with Section 01 66 10 – Storage of Materials.

3.7 INSTALLATION

A. Manufacturer's Directions: Follow manufacturer's directions covering points not shown on the drawings or specified herein. Manufacturer's directions do not take precedence over drawings and Specifications. Where these are in conflict with the drawings and Specifications, notify the Project Manager for clarification before installing the work.

B. Carpentry, Cutting, Patching, and Core Drilling:

C. Provide carpentry, cutting, patching, and core drilling required for installation of material and equipment specified in this division.

1. No penetrations shall be sleeved, cut, or core drilled through concrete construction without a submittal indicating exact locations and sizes and specific written approval from the Owner or unless specifically shown on the Structural Drawings.

2. It is the Subcontractor's responsibility to accurately size and locate openings through the structure. The dimensions shown on the Structural Drawings are for general information only. Provide specific sizes, dimensions, requirements, etc.

D. Seismic Mounting:

1. Material and equipment, including floor mounted equipment, piping, and appurtenances shall consider seismic forces in mounting system structural calculations.

E. Waterproof Construction:

1. Maintain waterproof integrity of penetrations of materials intended to be waterproof. Provide flashings at exterior roof penetrations. Caulk penetrations of foundation walls and floors watertight. Provide membrane clamps at penetrations of waterproof membranes.

2. Provide waterproof NEMA 3R enclosures for equipment or devices mounted outside or otherwise exposed to the weather.

F. Sleeves, Stubs, and Slab Penetrations: Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment".

G. Painting of Mechanical Equipment and Hardware:

1. Comply with applicable Division 09 sections for paints and coatings.

2. Provide moisture resistant paint for exterior painting.

3. Colors shall be as shown on the drawings unless specified.

4. Comply with individual Sections for other equipment to be painted.

5. Repair damaged galvanizing, paint, or coatings. Use Z.R.C. (no known equal) cold galvanized compound for galvanized repairs.

H. Concrete Equipment Bases:

1. All equipment located on concrete floor inside the building or on grade outside the building, shall be mounted on a concrete base. The concrete base shall be four inches high and shall extend six inches beyond the edge of equipment base unless indicated otherwise on drawings.

2. Coordinate concrete bases: Concrete bases indicated on Architectural or Structural drawings are specified in other Divisions. Concrete bases not on Architectural or Structural drawings are requirements of this Division.

3.8 PIPING AND EQUIPMENT IDENTIFICATION

A. Comply with Section 22 05 53 – Identification for Plumbing Piping.

3.9 SHUTDOWN AND SCHEDULING

A. Comply with 01 32 19 Construction Coordination and Sequencing.

3.10 PROTECTION OF EQUIPMENT

A. Care shall be exercised during construction to avoid damage or disfigurement. Equipment shall be protected from dust and moisture prior to and during construction. The Subcontractor is cautioned that concrete finishing, painting, etc. in electrical rooms shall not proceed if unprotected equipment is installed.

B. Where required or directed, construct temporary protection for equipment and installations for protection from dust and debris caused by construction.

C. All protection shall be substantially constructed with the use of clean canvas, heavy plastic, visqueen and plywood as required, and made tight and dust proof as directed.

D. The Subcontractor shall repair by spray or brush painting, after properly preparing the surface, scratches or defects in the finish of the equipment. Only identical paint furnished by the equipment manufacturer shall be used for such purposes.

E. Failure of the Subcontractor to protect the equipment as outlined herein shall be grounds for rejection of the equipment and its installation.

3.11 INSPECTIONS

A. Comply with Section 01 45 01 – Inspection of Materials and Work.

3.12 CLEANING

A. Comply with Section 01 74 00 – Cleaning and Waste Management.

3.14 LUBRICATION

A. All lubrication points shall be accessible. Where this is impossible, provision shall be made for lubrication at an accessible location. Where oil is used, an oil level indicator and capped, vented filling connection shall be provided and firmly mounted in an accessible space and shall be connected to the bearing with pipe(s) as required. Where grease is used for lubricant, the pipe shall have a suitable lubricating fitting installed at the accessible end. Equipment shall be thoroughly lubricated before operation and at time work is accepted.

3.15 SEALANTS

A. See Section 07 92 00 – Joint Sealants.

B. Completely seal duct, pipe and conduit penetrations through rated and non-rated walls.

3.16 TESTS

A. Upon completion of the mechanical construction work, perform tests and provide test reports as specified in this and other sections.

1. All tests shall be made in the presence of a representative of the Project Manager. The application or interruption of mechanical utilities shall be programmed and directed by the Project Manager.

2. The Subcontractor shall submit to the Project Manager 3 copies of test results, certified in writing, witnessed, signed and dated, immediately upon completion of work. Unsatisfactory condition revealed by these test results, or unsatisfactory methods of tests and/or testing apparatus and instruments, shall be corrected by the Subcontractor to the satisfaction of the Project Manager.

3. The Project Manager reserves the right to require that the Subcontractor perform and repeat tests that are deemed necessary to complete or check the tests or the certified records of the Subcontractor during the course of the work. Correct unsatisfactory portion of its work that is revealed by the tests or that may be due to progressive deterioration during this period, unless the item in question was a direct specification.

3.17 COMMISSIONING

A. Perform start-up in accordance with 01 75 00 Starting and Adjusting.

B. Commissioning is included as a part of the total package of quality assurance and quality control for this project. Commissioning is to be integrated into the project as the process that oversees and verifies the functional performance of equipment, systems, and assemblies via observation and testing. Include coordination with and full participation in the commissioning process. Commissioning shall include but not be limited to field observations, factory and site tests, pre-start checks, start-up checks, functional test procedure review, functional testing, commissioning meetings, documentation, test interpretation, and deficiency correction. The details of these requirements are described in the above Sections and other referenced Sections and are hereby incorporated by reference into the work of this Division.

3.18 MAINTENANCE AND OPERATING INSTRUCTIONS AND TRAINING

A. Refer to 01 78 00 Closeout Submittals.

B. At time of occupancy, arrange for manufacturer's representatives to instruct operating and maintenance personnel in the use of equipment requiring operating and maintenance. Arrange for personnel to be instructed at one time. Costs for this service shall be included in the Subcontract.

C. Maintenance and operating instructions and training for Owner-furnished equipment will be provided by the equipment vendor. The Subcontractor shall be responsible for other equipment.

END OF SECTION 22 05 00

SECTION 22 05 13 - COMMON MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

B. Related Requirements:
1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.2 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:

1. Motor controllers.

2. Torque, speed, and horsepower requirements of the load.

3. Ratings and characteristics of supply circuit and required control sequence.

4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

A. Comply with NEMA MG 1 unless otherwise indicated.

B. Comply with IEEE 841 for severe-duty motors.

2.2 MOTOR CHARACTERISTICS

A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet above sea level.

B. Rating: Motor shall be rated for Class I, Division 1 operation (explosion proof). A Class I, Division 1 location is a location: (1) in which ignitable concentrations of flammable gases or vapors exist under normal operating conditions; or (2) in which ignitable concentrations of such gases or vapors may exist frequently because of repair or maintenance operations or because of leakage; or (3) in which breakdown or faulty operation of equipment or processes might release ignitable concentrations of flammable gases or vapors, and might also cause simultaneous failure of electric equipment.

C. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 POLYPHASE MOTORS

A. Description: NEMA MG 1, Design B, medium induction motor.

B. Efficiency: Energy efficient, as defined in NEMA MG 1.

C. Service Factor: 1.15.

D. Multispeed Motors: Variable torque.

1. For motors with 2:1 speed ratio, consequent pole, single winding.

2. For motors with other than 2:1 speed ratio, separate winding for each speed.

E. Multispeed Motors: Separate winding for each speed.

F. Rotor: Random-wound, squirrel cage.

G. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.

H. Temperature Rise: Match insulation rating.

I. Code Letter Designation:

1. Motors 15 HP and Larger: NEMA starting Code F or Code G.

2. Motors Smaller than 15 HP: Manufacturer's standard starting characteristic.

2.4 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

A. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.

B. Motors Used with Variable Frequency Controllers:

1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.

2. Energy- and Premium-Efficient Motors: Class B temperature rise; Class F insulation.

3. Inverter-Duty Motors: Class F temperature rise; Class H insulation.

4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.

C. Severe-Duty Motors: Comply with IEEE 841, with 1.15 minimum service factor.

2.5 SINGLE-PHASE MOTORS

A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:

1. Permanent-split capacitor.

2. Split phase.

3. Capacitor start, inductor run.

4. Capacitor start, capacitor run.

B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.

C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.

D. Motors 1/20 HP and Smaller: Shaded-pole type.

E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 22 05 13

SECTION 22 0517 – SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Sleeves.
2. Sleeve-seal systems.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.

C. Galvanized-Steel-Sheet Sleeves: 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint.

D. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

2.2 SLEEVE-SEAL SYSTEMS

A. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.

1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Stainless steel.

3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch (25-mm) annular clear space between piping and concrete slabs and walls.

1. Sleeves are not required for core-drilled holes.

C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.

1. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.
2. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches (50 mm) above finished floor level.

3. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.

D. Install sleeves for pipes passing through interior partitions.

1. Cut sleeves to length for mounting flush with both surfaces.
2. Install sleeves that are large enough to provide 1/4-inch (6.4-mm) annular clear space between sleeve and pipe or pipe insulation.
3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Division 07 Section "Joint Sealants."

E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Division 07 Section "Penetration Firestopping."

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.3 SLEEVE AND SLEEVE-SEAL SCHEDULE

A. Use sleeves and sleeve seals for the following piping-penetration applications:

1. Exterior Concrete Walls above Grade:

a. Piping Smaller Than NPS 6 (DN 150): Cast-iron wall sleeves or galvanized-steel-pipe sleeves.

2. Exterior Concrete Walls below Grade:

a. Piping Smaller Than NPS 6 (DN 150): Cast-iron wall sleeves with sleeve-seal system or galvanized-steel-pipe sleeves with sleeve-seal system.

1) Select sleeve size to allow for 1-inch (25-mm) annular clear space between piping and sleeve for installing sleeve-seal system.

3. Concrete Slabs-on-Grade:

a. Piping Smaller Than NPS 6 (DN 150): Cast-iron wall sleeves with sleeve-seal system or galvanized-steel-pipe sleeves with sleeve-seal system.

1) Select sleeve size to allow for 1-inch (25-mm) annular clear space between piping and sleeve for installing sleeve-seal system.

4. Concrete Slabs above Grade:

a. Piping Smaller Than NPS 6 (DN 150): Galvanized-steel-pipe sleeves.

5. Interior Partitions:

a. Piping Smaller Than NPS 6 (DN 150): Galvanized-steel-pipe sleeves.

END OF SECTION

SECTION 22 05 18 - ESCUTCHEONS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Escutcheons.

B. Related Requirements:
1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 ESCUTCHEONS

A. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.

C. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.

B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of insulated piping and with OD that completely covers opening.

1. Escutcheons for New Piping:

a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
b. Chrome-Plated Piping: One-piece, cast-brass type with polished, chrome-plated finish.
c. Insulated Piping: One-piece, stamped-steel type.
d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
e. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
f. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
g. Bare Piping in Equipment Rooms: One-piece, cast-brass type with polished, chrome-plated finish.

3.2 FIELD QUALITY CONTROL

A. Replace broken and damaged escutcheons and floor plates using new materials.

END OF SECTION 22 05 18

SECTION 22 05 19 - METERS AND GAGES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following meters and gages for mechanical systems:

1. Thermometers.
2. Gages.
3. Test plugs.

B. Related Sections include the following:

1. Mechanical equipment sections that specify meters and gages as part of factory fabricated equipment.
2. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
3. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 DEFINITIONS

A. CR: Chlorosulfonated polyethylene synthetic rubber.

B. EPDM: Ethylene-propylene-diene terpolymer rubber.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Schedule for thermometers, and gages indicating manufacturer's number, scale range, and location for each.

C. Product Certificates: For each type of thermometer and gage, signed by product manufacturer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 METAL-CASE, LIQUID-IN-GLASS THERMOMETERS

A. Manufacturers:

   1. Palmer - Wahl Instruments Inc.
   2. Trerice, H. O. Co.
   3. Weiss Instruments, Inc.
   4. Weksler Instruments Operating Unit; Dresser Industries; Instrument Div.

B. Case: Die-cast aluminum, 9 inches (229 mm) long.

C. Tube: Red or blue reading, organic-liquid filled, with magnifying lens.

D. Tube Background: Satin-faced, non reflective aluminum with permanently etched scale markings.

E. Window: Glass or plastic .

F. Connector: Adjustable type, 180 degrees in vertical plane, 360 degrees in horizontal plane, with locking device.

G. Stem: Copper-plated steel, aluminum, or brass for thermo well installation and of length to suit installation.

H. Accuracy: Plus or minus 1 percent of range or plus or minus 1 scale division to maximum of 1.5 percent of range.

2.3 THERMOWELLS

A. Manufacturers:

   1. AMETEK, Inc.; U.S. Gauge Div.
   2. Ashcroft Commercial Instrument Operations; Dresser Industries; Instrument Div.
   3. Ernst Gage Co.
   4. Marsh Bellofram.
   5. Miljoco Corp.
   6. NANMAC Corporation.
   7. Noshok, Inc.
   8. Palmer - Wahl Instruments Inc.
   9. REO TEMP Instrument Corporation.
   10. Tel-Tru Manufacturing Company.
   11. Trerice, H. O. Co.

12. Weiss Instruments, Inc.
13. Weksler Instruments Operating Unit; Dresser Industries; Instrument Div.
14. WIKA Instrument Corporation.
15. Winters Instruments.

B. Manufacturers: Same as manufacturer of thermometer being used.

C. Description: Pressure-tight, socket-type metal fitting made for insertion into piping and of type, diameter, and length required to hold thermometer.

2.4 PRESSURE GAGES

A. Manufacturers:

1. AMETEK, Inc.; U.S. Gauge Div.
2. Ashcroft Commercial Instrument Operations; Dresser Industries; Instrument Div.
3. Ernst Gage Co.
4. Eugene Ernst Products Co.
5. KOBOLD Instruments, Inc.
6. Marsh Bellofram.
7. Miljoco Corp.
8. Noshok, Inc.
9. Palmer - Wahl Instruments Inc.
10. REO TEMP Instrument Corporation.
11. Trerice, H. O. Co.
12. Weiss Instruments, Inc.
13. Weksler Instruments Operating Unit; Dresser Industries; Instrument Div.
14. WIKA Instrument Corporation.
15. Winters Instruments.

B. Direct-Mounting, Dial-Type Pressure Gages: Indicating-dial type complying with ASME B40.100.

1. Case: Dry type, drawn steel or cast aluminum, 4-1/2-inch (114-mm) diameter.
2. Pressure-Element Assembly: Bourdon tube, unless otherwise indicated.
3. Pressure Connection: Brass, NPS 1/4 (DN 8), bottom-outlet type unless back-outlet type is indicated.
4. Movement: Mechanical, with link to pressure element and connection to pointer.
5. Dial: Satin-faced, non-reflective aluminum with permanently etched scale markings.
6. Pointer: Red metal.
7. Window: Glass or plastic .
8. Ring: Metal.
9. Accuracy: Grade A, plus or minus 1 percent of middle half scale.
10. Vacuum-Pressure Range: 30-in. Hg of vacuum to 15 psig of pressure (100 kPa of vacuum to 103 kPa of pressure).
11. Range for Fluids under Pressure: Two times operating pressure.

C. Pressure-Gage Fittings:

1. Valves: NPS 1/4 (DN 8) brass or stainless-steel needle type.
2. Syphons: NPS 1/4 (DN 8) coil of brass tubing with threaded ends.
3. Snubbers: ASME B40.5, NPS 1/4 (DN 8) brass bushing with corrosion-resistant, porous-metal disc of material suitable for system fluid and working pressure.

2.5 TEST PLUGS

A. Manufacturers:

1. Flow Design, Inc.
2. MG Piping Products Co.
3. National Meter, Inc.
4. Peterson Equipment Co., Inc.
5. Sisco Manufacturing Co.
6. Trerice, H. O. Co.
7. Watts Industries, Inc.; Water Products Div.

B. Description: Corrosion-resistant brass or stainless-steel body with core inserts and gasketed and threaded cap, with extended stem for units to be installed in insulated piping.

C. Minimum Pressure and Temperature Rating: 500 psig at 200 deg F (3450 kPa at 93 deg C) .

D. Core Inserts: One or two self-sealing rubber valves.

1. Insert material for air, water, oil, or gas service at 20 to 200 deg F (minus 7 to plus 93 deg C) shall be CR.
2. Insert material for air or water service at minus 30 to plus 275 deg F (minus 35 to plus 136 deg C) shall be EPDM.

PART 3 - EXECUTION

3.1 THERMOMETER APPLICATIONS

A. Install liquid-in-glass thermometers in the following locations:
1. Inlet and outlet of domestic water mixing valve.

B. Provide the following temperature ranges for thermometers:

1. Domestic Hot Water: 30 to 180 deg F, with 2-degree scale divisions (Minus 1 to plus 82 deg C, with 1-degree scale divisions).
2. Domestic Cold Water: 0 to 100 deg F, with 2-degree scale divisions (Minus 18 to plus 38 deg C, with 1-degree scale divisions).

3.2 GAGE APPLICATIONS

A. Install dry-case-type pressure gages at suction and discharge of each pump.

3.3 INSTALLATIONS

A. Install direct-mounting thermometers and adjust vertical and tilted positions.

B. Install thermo-wells with socket extending one-third of diameter of pipe and in vertical position in piping tees where thermometers are indicated.

C. Install direct-mounting pressure gages in piping tees with pressure gage located on pipe at most readable position.

D. Install needle-valve and snubber fitting in piping for each pressure gage for fluids (except steam).

E. Install test plugs in tees in piping.

F. Install permanent indicators on walls or brackets in accessible and readable positions.

3.4 CONNECTIONS

A. Install meters and gages adjacent to machines and equipment to allow service and maintenance for meters, gages, machines, and equipment.

3.5 ADJUSTING

A. Adjust faces of meters and gages to proper angle for best visibility.

END OF SECTION 22 05 19

SECTION 22 05 23 - GENERAL-DUTY VALVES FOR PLUMBING PIPING.

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Bronze ball valves.

2. Bronze lift check valves.

3. Bronze gate valves.

4. Globe Style Control valves

5. Solenoid valves

B. Related Requirements:
1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 DEFINITIONS

A. RS: Rising stem.

1.4 SUBMITTALS

A. Product Data: For each type of valve indicated.

1.5 QUALITY ASSURANCE

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:

1. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.

2. ASME B31.1 for power piping valves.

3. ASME B31.9 for building services piping valves.

C. NSF Compliance: NSF 61 for valve materials for potable-water service.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.

2. Protect threads, flange faces, grooves, and weld ends.

3. Set angle, gate, and globe valves closed to prevent rattling.

4. Set ball and plug valves open to minimize exposure of functional surfaces.

5. Block check valves in either closed or open position.

B. Use the following precautions during storage:

1. Maintain valve end protection.

2. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Refer to valve schedule articles for applications of valves.

B. Valve Sizes: Same as upstream piping unless otherwise indicated.

C. Valves in Insulated Piping: With 2-inch stem extensions and the following features:

1. Gate Valves: With rising stem.

2. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.

2.2 BRONZE BALL VALVES

A. Two-Piece, Full-Port, Bronze Ball Valves with Stainless-Steel Trim:

1. Description:

a. Standard: MSS SP-110.

b. SWP Rating: 150 psig (1035 kPa).

c. CWP Rating: 600 psig (4140 kPa).

d. Body Design: Two piece.

e. Body Material: Bronze.

f. Ends: Threaded or solder joint.

g. Seats: PTFE or TFE.

h. Stem: Stainless steel.

i. Ball: Stainless steel, vented.

j. Port: Full.

2.3 BRONZE SWING CHECK VALVES

A. Class 125, Bronze Swing Check Valves with Bronze Disc:

1. Description:

a. Standard: MSS SP-80, Type 3.

b. CWP Rating: 200 psig (1380 kPa).

c. Body Design: Horizontal flow.

d. Body Material: ASTM B 62, bronze.

e. Ends: Threaded.

f. Disc: Bronze.

2.4 BRONZE GATE VALVES

A. Class 125, RS Bronze Gate Valves:

1. Description:

a. Standard: MSS SP-80, Type 2.

b. CWP Rating: 200 psig (1380 kPa).

c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.

d. Ends: Threaded or solder joint.

e. Stem: Bronze.

f. Disc: Solid wedge; bronze.

g. Packing: Asbestos free.

h. Handwheel: Malleable iron or bronze.

2.5 GLOBE-STYLE CONTROL VALVES

A. General Globe-Style Valve Requirements:

1. Globe-style control valve body dimensions shall comply with ISA 75.08.01.
2. Construct the valves to be serviceable from the top.
3. For cage guided valves, trim shall be field interchangeable for different valve flow characteristics, such as equal percentage, linear, and quick opening.
4. Reduced trim for one nominal size smaller shall be available for industrial valves NPS 1 and larger.
5. Replaceable seats and plugs.
6. Furnish each control valve with a corrosion-resistant nameplate indicating the following:

    a. Manufacturer's name, model number, and serial number.
    b. Body and trim size.
    c. Arrow indicating direction of flow.

B. Two-Way Globe Valves NPS 2 and Smaller:

1. Globe Style: Single port.
2. Body: Cast bronze or forged brass with ASME B16.5, Class 250 rating.
3. End Connections: Threaded.
4. Bonnet: Screwed.
5. Packing: PTFE V-ring.
6. Plug: Top guided.
7. Plug, Seat, and Stem: Brass.
8. Process Temperature Range: 35 to 248 deg F.
9. Ambient Operating Temperature: 35 to 150 deg F.
10. Leakage: FCI 70-2, Class IV.
11. Rangeability: 25 to 1.
12. Equal percentage flow characteristic.

C. Two-Way Globe Valves NPS 2-1/2 to NPS 6 (DN 65 to DN 150):

1. Globe Style: Single port.
2. Body: Cast iron complying with ASME B61.1, Class 125.
3. End Connections: Flanged, suitable for mating to ASME B16.5, Class 150 flanges.
4. Bonnet: Bolted.
5. Packing: PTFE cone-ring.
6. Plug: Top or bottom guided.
7. Plug, Seat, and Stem: Brass or stainless steel.
8. Process Temperature Rating: 35 to 281 deg F.
9. Leakage: 0.1 percent of maximum flow.
10. Rangeability: Varies with valve size between 6 and 10 to 1.
11. Modified linear flow characteristic.

2.6 ELECTRIC AND ELECTRONIC CONTROL VALVE ACTUATORS

A. Actuators for Control Valves: Capable of closing valve against system pump shutoff head.

B. Position indicator and graduated scale on each actuator.

C. Type: Motor operated, with or without gears, electric and electronic.

D. Voltage: Voltage selection delegated to professional designing control system 120-V ac

E. Deliver torque required for continuous uniform movement of controlled device from limit to limit when operated at rated voltage.

F. Function properly within a range of 85 to 120 percent of nameplate voltage.

G. Construction:

1. For Actuators Less Than 100 W: Fiber or reinforced nylon gears with steel shaft, copper alloy or nylon bearings, and pressed steel enclosures.
2. For Actuators from 100 to 400 W: Gears ground steel, oil immersed, shaft hardened steel running in bronze, copper alloy or ball bearings. Operator and gear trains shall be totally enclosed in dustproof cast-iron, cast-steel or cast-aluminum housing.
3. For Actuators Larger Than 400 W: Totally enclosed reversible induction motors with auxiliary hand crank and permanently lubricated bearings.

H. Field Adjustment:

1. Spring Return Actuators: Easily switchable from fail open to fail closed in the field without replacement.

I. Two-Position Actuators: Single direction, spring return or reversing type.

J. Position Feedback:

1. Equip two-position actuators with limits switches or other positive means of a position indication signal for remote monitoring of open and close position.

K. Fail-Safe:

1. Where indicated, provide actuator to fail to an end position.
2. Internal spring return mechanism to drive controlled device to an end position (open or close) on loss of power.

L. Integral Overload Protection:

1. Provide against overload throughout the entire operating range in both directions.
2. Electronic overload, digital rotation sensing circuitry, mechanical end switches, or magnetic clutches are acceptable methods of protection.

M. Valve Attachment:

1. Unless otherwise required for valve interface, provide an actuator designed to be directly coupled to valve shaft without the need for connecting linkages.
2. Attach actuator to valve drive shaft in a way that ensures maximum transfer of power and torque without slippage.
3. Bolt and set screw method of attachment is acceptable only if provided with at least two points of attachment.

N. Temperature and Humidity:

1. Temperature: Suitable for operating temperature range encountered by application with minimum operating temperature range of minus 20 to plus 120 deg F.

2. Humidity: Suitable for humidity range encountered by application; minimum operating range shall be from 5 to 95 percent relative humidity, non-condensing.

O. Enclosure:

1. Suitable for ambient conditions encountered by application.
2. NEMA 250, Type 2 for indoor and protected applications.
3. NEMA 250, Type 4 or Type 4X for outdoor and unprotected applications.
4. Provide actuator enclosure with heater and control where required by application.

P. Stroke Time:
1. Operate valve from fully open to fully closed within 15 seconds.
2. Move valve to failed position within 5 seconds.
3. Select operating speed to be compatible with equipment and system operation.

Q. Sound:

1. Spring Return: 62 dBA.
2. Non-Spring Return: 45 dBA.

2.7 SOLENOID VALVES

A. Description:

1. Action: Either normally open or normally closed in the event of electrical power failure as required by the application.
2. Size to close against the system pressure.
3. Manual override capable.
4. Heavy-duty assembly.
5. Body: Brass.
6. Seats and Discs: NBR or PTFE.
7. Solenoid Enclosure: NEMA 250, Type 4.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Install check valves for proper direction of flow and as follows:

1. Swing Check Valves: In horizontal position with hinge pin level.

3.3 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valve applications are not indicated, use the following:

1. Shutoff Service: Ball or gate valves.

2. Pump-Discharge Check Valves:

a. NPS 2 and Smaller: Bronze swing check valves with bronze disc.

B. Select valves, except wafer types, with the following end connections:

1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.

2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in valve schedules below.

3.5 DOMESTIC, HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe NPS 2 and Smaller:

1. Bronze Valves: May be provided with solder-joint ends instead of threaded ends.

2. Ball Valves: Two piece, full port, bronze with stainless-steel] trim.

3. Bronze Swing Check Valves: Class 125, bronze disc.

B. Pipe NPS 2-1/2 and Larger:

1. Bronze Gate Valves: Class 125, RS.

3.6 ELECTRIC POWER

A. Furnish and install electrical power to products requiring electrical connections.

B. Furnish and install circuit breakers. Comply with requirements in Section 262816 "Enclosed Switches and Circuit Breakers."

C. Furnish and install power wiring. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

D. Furnish and install raceways. Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems."

3.7 CONTROL VALVES

A. Install flanges or unions to allow drop-in and -out valve installation.

B. Valve Orientation:

1. Where possible, install globe and ball valves installed in horizontal piping with stems upright and not more than 15 degrees off of vertical, not inverted.
2. Install valves in a position to allow full stem movement.
3. Where possible, install butterfly valves that are installed in horizontal piping with stems in horizontal position and with low point of disc opening with direction of flow.

C. Clearance:

1. Locate valves for easy access and provide separate support of valves that cannot be handled by service personnel without hoisting mechanism.
2. Install valves with at least 12 inches of clear space around valve and between valves and adjacent surfaces.

D. Threaded Valves:

1. Note internal length of threads in valve ends, and proximity of valve internal seat or wall, to determine how far pipe should be threaded into valve.
2. Align threads at point of assembly.
3. Apply thread compound to external pipe threads, except where dry seal threading is specified.
4. Assemble joint, wrench tight. Apply wrench on valve end as pipe is being threaded.

E. Flanged Valves:

1. Align flange surfaces parallel.
2. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly with a torque wrench.

F. Connections

1. Connect electrical devices and components to electrical grounding system. Comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

G. Identification

1. Identify system components, wiring, cabling, and terminals. Each piece of wire, cable, and tubing shall have the same designation at each end for operators to determine continuity at points of connection. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

2. Install engraved phenolic nameplate with valve identification on valve and on face of ceiling directly below valves concealed above ceilings.

H. Cleaning

1. Remove grease, mastic, adhesives, dust, dirt, stains, fingerprints, labels, and other foreign materials from exposed interior and exterior surfaces.

2. Wash and shine glazing.

3. Polish glossy surfaces to a clean shine.

I. Checkout Procedures

1. Control Valve Checkout:

a. Check installed products before continuity tests, leak tests, and calibration.

b. Check valves for proper location and accessibility.

c. Check valves for proper installation for direction of flow, elevation, orientation, insertion depth, or other applicable considerations that will impact performance.

d. Verify that control valves are installed correctly for flow direction.

e. Verify that valve body attachment is properly secured and sealed.

f. Verify that valve actuator and linkage attachment are secure.

g. Verify that actuator wiring is complete, enclosed, and connected to correct power source.

h. Verify that valve ball, disc, and plug travel are unobstructed.

i. After piping systems have been tested and put into service, but before insulating and balancing, inspect each valve for leaks. Adjust or replace packing to stop leaks. Replace the valve if leaks persist.

J. Adjustment, Calibration and Testing

1. Stroke and adjust control valves following manufacturer's recommended procedure, from 100 percent open to 100 percent closed back to 100 percent open.

2. Stroke control valves with pilot positioners. Adjust valve and positioner following manufacturer's recommended procedure, so valve is 100 percent closed, 50 percent closed, and 100 percent open at proper air pressures.

3. Check and document open and close cycle times for applications with a cycle time of less than 30 seconds.

4. For control valves equipped with positive position indication, check feedback signal at multiple positions to confirm proper position indication.

END OF SECTION 22 05 23

SECTION 22 05 29 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following hangers and supports for plumbing system piping and equipment:

1. Steel pipe hangers and supports.
2. Trapeze pipe hangers.
3. Thermal-hanger shield inserts.
4. Fastener systems.
5. Equipment supports.

B. Related Sections include the following:

1. Division 05 Section "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment support.
2. Division 22 Section "Expansion Fittings and Loops for Plumbing Piping" for pipe guides and anchors.
3. Division 22 Section "Vibration and Seismic Controls for Plumbing Piping and Equipment" for vibration isolation devices.
4. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
5. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 DEFINATIONS

A. MSS: Manufacturers Standardization Society for The Valve and Fittings Industry Inc.

B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.4 PERFORMANCE REQUIREMENTS

A. Design supports for multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.

B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.5 SUBMITTALS

A. Product Data: For the following:

1. Steel pipe hangers and supports.
2. Thermal-hanger shield inserts.

PART 2 - PRODUCTS

2.1 MANUFACTURES

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 STEEL PIPE HANGERS AND SUPPORTS

A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.

B. Manufacturers:
   1. B-Line Systems, Inc.; a division of Cooper Industries.
   2. Carpenter & Paterson, Inc.
   3. PHD Manufacturing, Inc.

C. Nonmetallic Coatings: Plastic coating, jacket, or liner.

D. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

2.3 TRAPEZE PIPE HANGER

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural-steel shapes with MSS SP-58 hanger rods, nuts, saddles, and U-bolts.

2.4 THERMAL-HANGER SHIELD INSERTS

A. Description: 100-psig- (690-kPa-) minimum, compressive-strength insulation insert encased in sheet metal shield.

B. Manufacturers

   1. Carpenter & Paterson, Inc.
   2. PHS Industries, Inc.
   3. Pipe Shields, Inc.
   4. Rilco Manufacturing Company, Inc.

C. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with vapor barrier.

D. Insulation-Insert Material for Hot Piping: ASTM C 552, Type II cellular glass.

E. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

F. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

G. Insert Length: Extend 2 inches (50 mm) beyond sheet metal shield for piping operating below ambient air temperature.

2.5 FASTENER SYSTEMS

A. Mechanical-Expansion Anchors: Insert-wedge-type zinc-coated steel, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Manufacturers:

A. B-Line Systems, Inc.; a division of Cooper Industries.
B. Hilti, Inc.
C. Powers Fasteners.

2.6 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural-steel shapes.

2.7 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

A. Specific hanger and support requirements are specified in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized, metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use padded hangers for piping that is subject to scratching.

F. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of non-insulated or insulated stationary pipes, NPS 1/2 to NPS 30 (DN 15 to DN 750).
2. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes, NPS 1/2 to NPS 24 (DN 15 to DN 600), if little or no insulation is required.
3. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8 (DN 15 to DN 200).
4. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8 (DN 15 to DN 200).
5. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 2 (DN 15 to DN 50).
6. U-Bolts (MSS Type 24): For support of heavy pipes, NPS 1/2 to NPS 30 (DN 15 to DN 750).

G. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20 (DN 20 to DN 500).

H. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Clevises (MSS Type 14): For 120 to 450 deg F (49 to 232 deg C) piping installations.
2. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
3. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F (49 to 232 deg C) piping installations.

I. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. C-Clamps (MSS Type 23): For structural shapes.
6. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
7. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.

8. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.

J. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.

3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

K. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.

L. Use mechanical-expansion anchors instead of building attachments where required in concrete construction.

3.2 HANGER AND SUPPORT INSTALLATION

A. Steel Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Trapeze Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.

C. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

D. Fastener System Installation:
1. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

E. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

F. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

G. Install hangers and supports to allow controlled thermal movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

H. Install lateral bracing with pipe hangers and supports to prevent swaying.

I. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 (DN 65) and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

J. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

K. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9 (for building services piping) are not exceeded.

L. Insulated Piping: Comply with the following:

1. Attach clamps and spacers to piping.
   A. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
   B. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
   C. Do not exceed pipe stress limits according to ASME B31.9 for building
   D. services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

   A. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN 100) and larger if pipe is installed on rollers.

3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

   A. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN 100) and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:

   A. NPS 1/4 to NPS 3-1/2 (DN 8 to DN 90): 12 inches (305 mm) long and 0.048 inch (1.22 mm) thick.
5. Insert Material: Length at least as long as protective shield.

6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.3 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make smooth bearing surface.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.4 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:

   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.

4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

3.5 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches (40 mm).

3.6 PAINTING

A. Touch Up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).

END OF SECTION 22 05 29

SECTION 22 05 53 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This section describes the identification of valves, piping, and equipment components of the mechanical systems to indicate their function and system served.

B. Related Requirements:
   1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
   2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 REFERENCES

A. ANSI: American National Standards Institute

   1. ANSI A13.1: Scheme for the Identification of Piping Systems

B. OSPSC: Oregon State Plumbing Specialty Code

1.4 SUBMITTALS

A. Product Data: Submit product data for products specified herein.

B. Valve Tag Directory: Submit for approval prior to fabrication of valve tags.

C. Equipment Nameplate Directory: Submit for approval prior to fabrication of labels.

D. Include copy of valve tag and equipment nameplate directories in each set of operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 VALVE IDENTIFICATION

A. Valve Tags:

   1. General: Identify valves with metal tags. Legends shall be stamped or embossed. Tags shall indicate the function of the valve and its normal operating position; for example:

_____ (PROJECT)

56 HW	(NUMBER AND CONTENT OF PIPE)
ISOLATION	(VALVE FUNCTION)
NO	(NORMAL OPERATION POSITION)

2. Size: Valve tags 2-inch diameter with 1/4-inch-high letters.

3. Material: Use 0.050 or 0.064-inch brass tags.

4. Automatic Valves and Regulating Valves: Use 1/16-inch-thick laminated 3-ply plastic, center ply white, outer ply red, “lamicoid,” or equal. Form letters by exposing center ply.

5. Existing Buildings and Systems: Contact the Port for coordination with existing building tagging system and supplementary information required for any specific system before valve tagging begins.

B. Valve Tag Directory: Include tag number, location, exposed or concealed, service, valve size, valve manufacturer, valve model number, tag material, and normal operating position of valve.

2.2 PIPING MARKERS

A. Acceptable Manufacturers: Marking Systems, Inc. (MSI), Seton, W. H. Brady, or equal.

B. Label pipes with all-vinyl, self-sticking labels or letters. For pipe covering sizes up to and including 3/4-inch outside diameter, select labels with 1/2-inch letters. For sizes from 3/4- to 2-inch outside diameter, 3/4-inch letters; above 2 inches outside diameter, 2-inch letters. The pipe markers shall be identified and color coded as follows with black directional arrows.

SERVICE	PIPE MARKER	BACKGROUND COLOR
Flushng Water Cold	“NONPOTABLE COLD WATER DANGER-UNSAFE WATER”	Yellow
Flushing Water Hot	“NONPOTABLE HOT WATER DANGER-UNSAFE WATER”	Yellow
Cold Water	“DOMESTIC COLD WATER”*	Green
Tempered Water	“TEMPERED WATER”*	Yellow
Hot Water	“DOMESTIC HOT WATER SUPPLY” *	Yellow
	“DOMESTIC HOT WATER RETURN” *	Yellow
Natural Gas	“NATURAL GAS”	Yellow
Sanitary Waste	“SANITARY WASTE”	Green
Storm Drain	“STORM DRAIN”	Green
Overflow Drain	“OVERFLOW DRAIN”	Green
Vent	“VENT”	Green
Local Vent	“LOCAL VENT”	Green
Gas Vent	“GAS VENT”	Yellow
Grease Waste	“GREASE WASTE”	Green
Liquefied Grease Waste	“LIQUEFIED GREASE WASTE”	Green

* Directional arrow applied adjacent to pipe marker indicating direction of flow.

2.3 EQUIPMENT IDENTIFICATION

A. Nameplates:

1. Tag all pumps, air supply units, fans, converters, and miscellaneous items of mechanical equipment with engraved nameplates. Nameplates shall be 1/16-inch-thick, 3 x 5 laminated 3-ply plastic, center ply white, outer ply black. Form letters by exposing center ply.

2. Identify unit with code number as shown on drawings and area served.

B. Equipment Nameplate Directory: List pumps, air handlers, terminal units, and other equipment nameplates. Include Port- and Contractor-furnished equipment. List nameplate designation, manufacturer's model number, location of equipment, area served or function, disconnect location, and normal position of HOA switch.

PART 3 - EXECUTION

3.1 VALVE IDENTIFICATION

A. Valve Tags:

1. Attach to valve with a brass chain.

2. Number valves per direction of the Port.

B. Valve Tag Directory: Post final copy in operation and maintenance manual.

C. Concealed Valves: Affix color coded "dot" to walls or ceilings wherever valves are concealed. Colors shall be as follows:

1. Domestic CW Green

2. Domestic HW Yellow

3. Plumbing Cleanouts Black

3.2 PIPING MARKERS

A. Unless recommendations of ANSI A13.1 are more stringent, apply labels or letters after completion of pipe cleaning, insulation, painting, or other similar work, as follows:

1. Every 20 feet along continuous exposed lines.

2. Every 10 feet along continuous concealed lines.

3. Adjacent to each valve and stubout for future.

4. Where pipe passes through a wall, into and out of concealed spaces.

5. On each riser.

6. On each leg of a "T."

7. Locate conspicuously where visible.

B. Further, apply labels or letters to lower quarters of the pipe on horizontal runs where view is not obstructed or on the upper quarters when pipe is normally viewed from above. Apply arrow labels indicating direction of flow.

C. Spray a protective coating of clear epoxy over markers and arrows in corrosive atmosphere areas.

D. Comply with OSPSC regarding identification of non-potable piping systems.

3.3 EQUIPMENT IDENTIFICATION

A. Nameplates: Attach to prominent area of equipment, either with sheet metal screws, brass chain, or contact cement as applicable.

B. Nameplate Directory: Post final copy in operation and maintenance manual.

END OF SECTION 22 05 53

SECTION 22 07 19 - PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This section describes insulation for plumbing piping and equipment.

B. Related Requirements:
1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 REFERENCES

A. IBC: International Building Code

1. IBC Chapter 13: Energy Efficiency

B. UL: Underwriters Laboratories

1. UL 723: Standard for Test for Surface Burning Characteristics of Building Materials

1.4 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Flame and Smoke Ratings: Installed composite flame spread not to exceed 25 and smoke developed not to exceed 50 as tested by UL 723.

2. Energy Codes: IBC Chapter 13 shall govern where requirements for thickness exceeds thickness specified.

B. Protection: Protect against dirt, water, chemical or mechanical damage before, during, and after installation. Repair or replace damaged insulation at no additional cost to the contract.

C. Source Quality Control:

1. Service: Use insulation specifically manufactured for service specified.

2. Labeling: Insulation labeled or stamped with brand name and number.

3. Insulation and accessories shall not provide any nutritional or bodily use to fungi, bacteria, insects, rats, mice or other vermin, shall not react corrosively with equipment, piping or ductwork and shall be asbestos free.

1.5 SUBMITTALS

A. Product Data: Submit product data for each type of insulation, including density, conductivity, thickness, jacket, vapor barrier and flame spread and smoke developed indexes.

B. Shop Drawings: Submit shop drawings detailing installation of insulation for the following:

1. Removable covers for pump casings, accesses, etc.

2. Expansion joints.

3. Acoustical insulation including construction and installation of stainless steel jacket.

PART 2 - PRODUCTS

2.1 GENERAL

A. All insulation shall be of one manufacturer.

2.2 PIPE INSULATION

A. Fiberglass: Split sectional or snap-on type with 3.5 pcf density 0.23 per inch maximum thermal conductivity (K-factor) at 75ºF mean temperature, 500ºF minimum service rating and white, vapor barrier jacket with pressure sensitive closure system. CertainTeed 500ºF snap-on, or equal.

B. Calcium Silicate: Sectional with 14 pcf nominal density, 0.42 per inch maximum K-factor at 200ºF mean temperature and 1200ºF minimum service rating. Pabco, or equal.

C. Elastomeric: Expanded closed cell, 0.27 per inch maximum K-factor at 75ºF mean temperature and 220ºF maximum service rating with fitting covers. Armstrong Armaflex II, or equal.

D. Acoustical: 2-inch thick 8 pcf density mineral wool.

2.3 ACCESSORIES

A. Adhesives:

1. Fiberglass: Johns Manville Zeston, Z-Glu, or equal.

2. Calcium Silicate: Benjamin Foster 30-36, or equal.

3. Elastomeric: Armstrong 520, or equal.

B. Weld Pins: Duro-Dyne, with NC-1 nylon stop clips, or equal.

C. Cements:

1. Insulating: Ryder, or equal.

2. Heat Transfer: Johns Manville Zeston Z-20, or equal.

D. Wire Mesh: 1-inch mesh with 20-gauge annealed steel wire.

E. Pipe Fitting Covers: One-piece PVC insulated pipe fitting covers. Johns Manville Zeston, Ceel-Co, or equal.

F. Grooved Coupling Insulation: One-piece PVC insulated fitting cover. Johns Manville Zeston, Ceel-Co, or equal.

G. Insulation Protection Saddles: 12-inch long, 16-gauge steel. All piping with insulation shall be Anvil Fig. 167, galvanized, or equal.

H. Mastic: Chicago Mastic, or equal:

1. Vapor Barrier: 17-475.

2. Outdoor Mastic: 16-110 white.

I. Metal Pipe Jacket: 0.016-inch thick aluminum jacket with form-fitting covers, aluminum snap straps and sealant.

J. Cloth Facing: Presized fiberglass cloth.

K. Tapes: Pressure sensitive, weather resistant and for temperatures up to 150ºF. Zeston Z-tape, or equal.

L. Paint: Ultraviolet resistant latex paint with special adherence capabilities to the PVC fitting covers, elastomeric, aluminum facing, Kraft paper, tapes, and adhesives. See Section 09 96 00 for additional requirements.

PART 3 - EXECUTION

3.1 GENERAL

A. Applicators: Applicators shall be employed by a firm that specializes in insulation work.

B. Preparation: Surfaces of piping and equipment shall be clean, free of oil or dirt, and dry before insulation is applied.

C. Stamps: ASME stamps, UL labels, and similar stamps and labels shall not be covered.

D. Any insulation that becomes damaged, water soaked, or stained shall be replaced at no additional cost to the Port.

3.2 PIPE AND EQUIPMENT INSULATION APPLIED LOCATIONS

A. Insulate the following piping systems with glass fiber insulation, all-purpose jacket in thickness listed.

1. Domestic cold water, non-potable cold water, 1-inch thick.

2. Domestic hot water and tempered water, above ground, 1-inch thick for piping 2 inches and smaller, 1 1/2-inch thick for 2 1/2 inches and larger with vapor barrier.

3. Interior storm water and overflow drains, 1/2-inch thick on vertical and horizontal runs to main stack. Main stack not insulated.

4. Trap priming lines and traps in unheated space, 1-inch over heat tape.

5. Air separators, heat exchangers, and storage tanks, 3 1/2-inch thick.

B. Insulate the following piping systems with glass fiber insulation, all-purpose jacket in thickness listed and cover with metal pipe jacket:

1. Domestic cold water and non-potable cold water exposed to weather, 1-inch thick over heat trace cable.

2. Flushing water hot exposed to weather, 1-inch thick over heat trace cable.

C. Insulate piping in calcium silicate where indicated. Use same thickness as listed above for glass fiber insulation.

D. Insulate the following piping systems with elastomeric insulation in thickness listed:

1. Domestic hot and cold water, above grade, industrial cold water, 1 1/4-inch piping and smaller may use elastomeric, 1/2-inch.

2. Condensation drains and other drains discharging cold water, 1/2-inch.

E. The following piping is not insulated:

1. Waste and vent (except where heat traced).

2. Domestic cold water exposed supplies.

3. Priming lines (except where heat traced).

F. Insulation shall include all fittings, unions, flanges, mechanical couplings, valve bodies, valve bonnets, and piping through sleeves (except valve bonnets). Unions and flanges need not be insulated on the following systems:

1. Domestic hot water, inside building.

G. Valves and irregular fittings shall be insulated with section of pipe insulation and insulating cement, securely fastened, and finished with 6 oz. canvas and Foster 30-36, or equal, lagging adhesive. The Contractor shall have the option on all flanges, valves, and strainers not requiring a vapor barrier to insulate with removable replaceable pads fabricated of 1-inch layer of Pittsburgh Corning Temp Mat, or equal, sandwiched between inner and outer layer of 8 ounce glass cloth, held together with stainless staples with sufficient stainless lacing hooks to hold pad firmly to flange or valve with minimum 3-inch overlap onto adjacent pipe insulation using 18-gauge stainless steel lacing wire.

H. Expansion Joints and Flexible Connectors: Pipe insulation or block of same material and thickness as adjacent piping.

3.3 PIPING INSTALLATION

A. General:

1. Joints: Coat both sides of complete joining area with applicable adhesive.

a. Longitudinal Joints: Make joints on top or back of pipe to minimize visibility. Except for foam plastic, seal with closure system or 3-inch-wide tape.

b. Butt Joints: Butt tightly together and, except for foam plastic, seal with 3-inch-wide tape or butt straps.

c. Multiple Layered Insulation: Joints shall be staggered.

2. Access: Strainer and other items requiring service or maintenance with easily removable and replaceable section of insulation to provide access.

3. Voids: Fill all voids, chipped corners, and other openings with insulating cement or material compatible with insulating material. In insulation with vapor barrier, coat with vapor barrier mastic.

4. Heat Tracing: Where piping is shown or specified to be heat traced, bed heat tape into heat transfer cement with insulation over heat tape and cement. FG or FP not allowed.

5. Seal joints, seams, and fittings of metal watertight jackets at exterior locations.

B. Fiberglass Insulation: Exterior insulation encased in metal jacket.

C. Calcium Silicate Insulation:

1. Secure with 18-gauge wire embedded into insulation.

2. On systems with vapor barrier, coat complete with vapor barrier mastic.

3. Cover with cloth facing secured with applicable adhesive.

4. Exterior insulation encased in metal jacket.

D. Elastomeric Insulation:

1. Slit full length and snap around pipe.

2. Make cuts perpendicular to insulating surface leaving no cut section exposed.

3. Do not stretch insulation to cover joints or fittings.

4. Seal joints with adhesive. Sealing joints with tape will not be allowed.

5. Exterior insulation shall be painted with two coats of specified paint in accordance with the manufacturer's instructions or encase in metal jacket.

E. Fittings: Insulation specified with continuous vapor barrier, the vapor barrier must not be violated.

1. On Elastomeric and Acoustical Insulation: Fittings covered with covers made up of mitered sections of insulation or with formed pipe fitting covers.

2. In Other Insulation: Fittings covered with insulation to the same level of the adjoining insulation or fill with insulating cement. Finish with pipe fitting covers or cloth facing and tape.

F. Unions, Flanges, Mechanical Joints, Valves, Etc:

1. General:

a. As specified for fittings.

b. Minimum thickness same as specified for piping.

2. Unions: Build up insulation at least 1/2 inch beyond adjoining insulation.

3. Flanges: With square corners. Where flanges are not insulated, terminate adjacent insulation so flange bolts can be removed.

4. Flanged Valves: Insulation with square corners.

G. Vapor Barrier Insulation:

1. Piping which requires vapor barrier protection shall have a continuous vapor barrier, which shall not be pierced or broken. The following piping systems require vapor barrier protection:

a. Domestic cold water.

b. Non-potable cold water.

2. Insulation for pipe requiring vapor barrier protection 1 1/4-inch or smaller, insulation continuous through pipe hanger. Provide shield or rigid insulation at hanger.

3. For pipe 1 1/2-inch and larger, 18-inch section of calcium silicate, same thickness as pipe insulation, with continuous vapor barrier jacket, at each hanger.

4. For piping 1 1/2-inch and larger, vapor barrier shall be protected with pipe shield specified in Section 22 05 29, Hangers and Supports for Plumbing Piping and Equipment.

H. Non-Vapor Barriered Insulation:

1. Piping not requiring a vapor barrier shall be supported as specified above except at piping requiring roller hangers. Provide saddle as specified in Section 22 05 29, Hangers and Supports for Plumbing Piping and Equipment.

2. On piping 1 1/2-inch and smaller, insulation may pass through hanger. Provide shield or rigid insulation at hanger.

3. Tack weld saddles on black steel pipe to pipe. Fill void between saddle and pipe with insulation.

3.4 EQUIPMENT INSTALLATION

A. General: Install true and smooth. Insulation over curved surfaces shall conform to curves of surface.

1. Access: Access, etc., that requires service, inspection, or maintenance shall be provided with covers or sections that are easily removable and replaceable. Reinforce openings in adjacent insulation with metal beading. In vapor barriered insulation, coat joints with vapor barrier mastic.

2. Voids, Depressions, and Cavities: All voids, chipped corners, and other openings shall be filled with insulating cement or material compatible with insulating material.

3. Vapor Barriered Insulation: Where insulation is specified to have a vapor barrier, the barrier shall not be pierced or broken.

    a. Tears, etc., shall be coated with vapor barrier mastic and patched with insulation facing or tape.

    b. Staples shall be brush coated with vapor barrier coating.

    c. Cover all raw edges coated with vapor barrier mastic, and seal cover to equipment surface.

4. Non-Vapor Barriered Insulation:

    a. Tears, etc. shall be patched with insulation facing or tape.

    b. Cover all raw edges and bevel neatly to the equipment surface.

5. Multi-layered Insulation: Joints shall be staggered.

B. Expansion Joints: Covered with larger size pipe insulation to allow full movement and be removable, ends turned back to pipe, coat with vapor barrier mastic on joints in vapor barriered system and finished with cloth facing cemented to insulation with adhesive.

3.5 FIELD QUALITY CONTROL

A. Field Test: All systems shall be tested and approved prior to installation of insulation.

B. Existing Insulation:

1. Repair existing insulation damaged during construction.

2. Make neat connections where new and existing insulation meet.

3. Where existing piping or equipment is removed, cover existing surfaces neatly to match existing.

END OF SECTION 22 07 19

SECTION 22 11 16 - DOMESTIC WATER PIPING.

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Under-building slab and aboveground domestic water pipes, tubes, fittings, and specialties inside the building.

2. Remote reading water meters

B. Related Requirements:
1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design this project element, including comprehensive engineering analysis by a qualified design professional, to meet or exceed the program requirements, performance requirements, code compliance, applicable ASTM quality standard, and design criteria as outlined and / or referenced within this RFP package.

1.4 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Compliance: ASME B31.9

PART 2 - PRODUCTS

2.1 PIPING SYSTEM WORKING PRESSURE

A. Water Distribution Systems, Below Ground: 150 psig.

B. Water Distribution Systems, Above Ground: 125 psig.

2.2 COPPER TUBE AND FITTINGS

A. Hard Copper Tube: ASTM B88, Types K and L water tube, drawn temper.

B. Soft Copper Tube: ASTM B88, Types K and L water tube, annealed temper.

2.3 DUCTILE-IRON PIPE

A. AWWA C151, Classes 50 and 51, mechanical joint and push–on joint, with AWWA C104 cement–mortar lining.

2.4 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free, unless otherwise indicated; full-face or ring type unless otherwise indicated.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

D. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

2.5 VALVES

A. Gate, globe, ball, butterfly and check valves suitable for service.

B. At a minimum, service isolation valves shall be provided at the service entrance to each building, at the base of each riser and as otherwise required to logically isolate a portion of the system for service or repairs.

2.6 TRANSITION FITTINGS

A. General Requirements:

1. Suitable for working pressure, pipe, tube and service.

2.7 DIELECTRIC FITTINGS

A. General Requirements: Provide brass nipple and coupling for dielectric protection on all piping.

2.8 REMOTE READING WATER METERS

A. Water Meters: Basis of design Norgas Metering Technologies Inc., model TM or approved equal.

1. Casing: Cast Iron, Epoxy Coatng

2. Turbine: Plastic

3. Maximum Temperature: 104 deg. F

4. Water flow measurement: Cubic meters per hour

5. Accuracy: Above Transition +/- 2%; Below transition +/- 5%.

6. Pulse Output: Low or High as required.

B. Remote Pulse Counter: Basis of design EKM Metering Inc., model Omnimeter Pulse v.4 or approved equal.

1. Casing: Plastic

2. Display: Digital

3. Pulse input ports: Three

4. Power required: Yes

PART 3 - EXECUTION

3.1 WATER METER INSTALLATION

A. Install remote reading gas meters in accordance with manufacturer's written instructions. Provide required wiring, power, and other associated accessories to complete the system installation.

3.2 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner to engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports in compliance with CO-7 DB section 16.

END OF SECTION 22 11 16

SECTION 22 11 19 - DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following domestic water piping specialties:

1. Backflow preventers.
2. Water pressure-reducing valves.
3. Balancing valves.
4. Temperature Actuated, water mixing valves
5. Strainers.
6. Outlet Boxes
7. Wall hydrants.
8. Drain valves.
9. Water hammer arresters.
10. Trap-seal primer valves.

B. Related Requirements:
1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig (860 kPa), unless otherwise indicated.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. NSF Compliance:

1. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic domestic water piping components.

2. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9."

PART 2 - PRODUCTS

2.1 BACKFLOW PREVENTERS

A. Reduced-Pressure-Principle Backflow Preventers:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Ames Co.

b. Watts Industries, Inc.; Water Products Div.

c. Zurn Plumbing Products Group; Wilkins Div.

2. Standard: ASSE 1013.

3. Operation: Continuous-pressure applications.

4. Pressure Loss: 12 psig (83 kPa) maximum, through middle 1/3 of flow range.

5. Body: Bronze for NPS 2 (DN 50) and smaller; cast iron with interior lining complying with AWWA C550 or that is FDA approve for NPS 2-1/2 (DN 65) and larger.

6. End Connections: Threaded for NPS 2 (DN 50) and smaller; flanged for NPS 2-1/2 (DN 65) and larger.

7. Configuration: Designed for horizontal, straight through flow.

8. Accessories:

a. Valves: Ball type with threaded ends on inlet and outlet of NPS 2 (DN 50) and smaller; outside screw and yoke gate-type with flanged ends on inlet and outlet of NPS 2-1/2 (DN 65) and larger.

b. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.

B. Double-Check Backflow-Prevention Assemblies:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Ames Co.

    b. Watts Industries, Inc.; Water Products Div.

    c. Zurn Plumbing Products Group; Wilkins Div.

2. Standard: ASSE 1015.

3. Operation: Continuous-pressure applications, unless otherwise indicated.

4. Pressure Loss: 5 psig (35 kPa) maximum, through middle 1/3 of flow range.

5. Body: Bronze for NPS 2 (DN 50) and smaller; cast iron with interior lining complying with AWWA C550 or that is FDA approved for NPS 2-1/2 (DN 65) and larger.

6. End Connections: Threaded for NPS 2 (DN 50) and smaller; flanged for NPS 2-1/2 (DN 65) and larger.

7. Configuration: Designed for horizontal, straight through flow.

8. Accessories:

    a. Valves: Ball type with threaded ends on inlet and outlet ofNPS 2 (DN 50) and smaller; outside screw and yoke gate-type with flanged ends on inlet and outlet of NPS 2-1/2 (DN 65) and larger.

2.2 WATER PRESSURE-REDUCING VALVES

A. Water Regulators:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Cash Acme.

    b. Watts Industries, Inc.; Water Products Div.

    c. Zurn Plumbing Products Group; Wilkins Div.

2. Standard: ASSE 1003.

3. Pressure Rating: Initial working pressure of 150 psig (1035 kPa).

4. Body: Bronze for NPS 2 (DN 50) and smaller; cast iron with interior lining complying with AWWA C550 or that is FDA approved for NPS 2-1/2 and NPS 3 (DN 65 and DN 80).

5. End Connections: Threaded for NPS 2 (DN 50) and smaller; flanged for NPS 2-1/2 and NPS 3 (DN 65 and DN 80).

2.3 BALANCING VALVES

A. Copper-Alloy Calibrated Balancing Valves:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Armstrong International, Inc.

   b. ITT Industries; Bell & Gossett Div.

   c. Taco, Inc.

   d. Watts Industries, Inc.; Water Products Div.

2. Type: Ball valve with two readout ports and memory setting indicator.

3. Body: Brass or bronze,

4. Size: Same as connected piping, but not larger than NPS 2 (DN 50).

2.4 TEMPERATURE-ACTUATED, WATER MIXING VALVES

A. Primary, Thermostatic, Water Mixing Valves:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Lawler Manufacturing Company.
   b. Leonard Valve Company.
   c. Powers.
   d. Or approved equal.
2. Standard: ASSE 1017.
3. Pressure Rating: 125 psig minimum unless otherwise indicated.
4. Type: Cabinet-type, thermostatically controlled, water mixing valve.
5. Material: Bronze body with corrosion-resistant interior components.
6. Connections: Union inlets and outlet.
7. Accessories: Manual temperature control, check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
8. Tempered-Water Setting: As indicated on drawings.
9. Tempered-Water Design Flow Rate: As indicated on drawings.
10. Selected Valve Flow Rate at 45-psig Pressure Drop: As indicated on drawings.
11. Valve Finish: Rough bronze.
12. Piping Finish: Copper.
13. Cabinet: Factory fabricated, stainless steel, for surface mounting and with hinged, stainless-steel door.

B. Individual-Fixture, Water Tempering Valves:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Lawler Manufacturing Company.

b. Leonard Valve Company.
c. Powers.
d. Or approved equal.

2. Standard: ASSE 1016, thermostatically controlled, water tempering valve.
3. Pressure Rating: 125 psig minimum unless otherwise indicated.
4. Body: Bronze body with corrosion-resistant interior components.
5. Temperature Control: Adjustable.
6. Inlets and Outlet: Threaded.
7. Finish: Rough or chrome-plated bronze.
8. Tempered-Water Setting: As indicated on drawings.
9. Tempered-Water Design Flow Rate: As indicated on drawings.

2.5 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers:

1. Pressure Rating: 125 psig (860 kPa) minimum, unless otherwise indicated.

2. Body: Bronze for NPS 2 (DN 50) and smaller; cast iron with interior lining complying with AWWA C550 or FDA-approved, epoxy coating and for NPS 2-1/2 (DN 65) and larger.

3. End Connections: Threaded for NPS 2 (DN 50) and smaller;flanged for NPS 2-1/2 (DN 65) and larger.

4. Screen: Stainless steel with round perforations, unless otherwise indicated.

5. Perforation Size:

a. StrainersNPS 2 (DN 50) and Smaller: 0.020 inch (0.51 mm).

6. Drain: Factory-installed, hose-end drain valve.

B. Clothes Washer Outlet Boxes:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
a. Acorn Engineering, Co..
b. IPS Corporation.
c. Watts Industries, Inc.; Water Products Div.
d. Or approved equal.
2. Mounting: Recessed.
3. Material and Finish: Enameled-steel or epoxy-painted-steel box and faceplate.
4. Faucet: Combination valved fitting or separate hot- and cold-water valved fittings complying with ASME A112.18.1. Include garden-hose thread complying with ASME B1.20.7 on outlets.
5. Supply Shutoff Fittings: NPS 1/2 gate, globe, or ball valves and NPS 1/2 copper, water tubing.
6. Drain: NPS 2 standpipe and P-trap for direct waste connection to drainage piping.
7. Inlet Hoses: Two 60-inch- long, rubber household clothes washer inlet hoses with female, garden-hose-thread couplings. Include rubber washers.
8. Drain Hose: One 48-inch- long, rubber household clothes washer drain hose with hooked end.

2.6 WALL HYDRANTS

A. Nonfreeze Wall Hydrants:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Josam Company.

   b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.

   c. Watts Drainage Products Inc.

   d. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.21.3M for concealed-outlet, self-draining wall hydrants.

3. Pressure Rating: 125 psig (860 kPa).

4. Operation: Loose key.

5. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.

6. Inlet: NPS 3/4 or NPS 1 (DN 20 or DN 25).

7. Outlet: Concealed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.

8. Box: Deep, flush mounting with cover.

9. Box and Cover Finish: Polished nickel bronze.

10. Outlet: Exposed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.

11. Nozzle and Wall-Plate Finish: Polished nickel bronze.

12. Operating Keys(s): Two with each wall hydrant.

2.7 DRAIN VALVES

A. Ball-Valve-Type, Hose-End Drain Valves:

1. Standard: MSS SP-110 for standard-port, two-piece ball valves.

2. Pressure Rating: 400-psig (2760-kPa) minimum CWP.

3. Size: NPS 3/4 (DN 20).

4. Body: Copper alloy.

5. Ball: Chrome-plated brass.

6. Seats and Seals: Replaceable.

7. Handle: Vinyl-covered steel.

8. Inlet: Threaded or solder joint.

9. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

2.8 WATER HAMMER ARRESTERS

A. Water Hammer Arresters:

1. Standard: ASSE 1010 or PDI-WH 201.

2. Type: Metal bellows.

3. Size: ASSE 1010, Sizes AA and A through F or PDI-WH 201, Sizes A through F.

2.9 TRAP-SEAL PRIMER VALVES

A. Supply-Type, Trap-Seal Primer Valves:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. MIFAB, Inc.

b. PPP Inc.

c. Sioux Chief Manufacturing Company, Inc.

d. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.

2. Watts Industries, Inc.; Water Products Div.

3. Standard: ASSE 1018.

4. Pressure Rating: 125 psig (860 kPa) minimum.

5. Body: Bronze.

6. Inlet and Outlet Connections: NPS 1/2 (DN 15) threaded, union, or solder joint.

7. Gravity Drain Outlet Connection: NPS 1/2 (DN 15) threaded or solder joint.

8. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

9. Distribution Unit: Provide where required.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Refer to Section 22 05 00 – Common Results for Plumbing for piping joining materials, joint construction, and basic installation requirements.

B. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.

1. Locate backflow preventers in same room as connected equipment or system.

2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe to floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are not acceptable for this application.

3. Do not install bypass piping around backflow preventers.

C. Install water regulators with inlet and outlet shutoff valves. Install pressure gages on inlet and outlet.

D. Install balancing valves in locations where they can easily be adjusted.

E. Install temperature-actuated water mixing valves with check stops or shutoff valves on inlets and with shutoff valve on outlet.

1. Install thermometers and water regulators if specified.

2. Install cabinet-type units recessed in or surface mounted on wall as specified.

F. Install Y-pattern strainers for water on supply side of each water pressure-reducing valve, and pump.

G. Install water hammer arresters in water piping according to PDI-WH 201.

H. Install supply-type, trap-seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping and specialties.

3.3 LABELING AND IDENTIFYING

A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:

1. Reduced-pressure-principle backflow preventers.

2. Double-check backflow-prevention assemblies.

3. Manifold, thermostatic, water-mixing-valve assemblies.

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and prepare test reports:

1. Test each reduced-pressure-principle backflow preventer and double-check backflow-prevention assembly according to authorities having jurisdiction and the device's reference standard.

B. Remove and replace malfunctioning domestic water piping specialties and retest as specified above.

3.5 ADJUSTING

A. Set field-adjustable pressure set points of water pressure-reducing valves.

B. Set field-adjustable flow set points of balancing valves.

C. Set field-adjustable temperature set points of temperature-actuated water mixing valves.

END OF SECTION 22 11 19

SECTION 22 11 23 - DOMESTIC WATER PUMPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following all-bronze and bronze-fitted centrifugal pumps for domestic hot-water circulation:

1. In-line Circulators.

B. Related Requirements:
1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 SUBMITTALS

A. Product Data: For each type and size of domestic water pump specified. Include certified performance curves with operating points plotted on curves; and rated capacities of selected models, furnished specialties, and accessories.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Operation and Maintenance Data: For domestic water pumps to include in emergency, operation, and maintenance manuals.

1.4 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, and dimensional requirements of domestic water pumps and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. UL Compliance: Comply with UL 778 for motor-operated water pumps.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Retain shipping flange protective covers and protective coatings during storage.

B. Protect bearings and couplings against damage.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 CLOSE COUPLED, IN-LINE CIRCULATORS

A. Manufacturers:

   1. Armstrong Pumps Inc.
   2. Bell & Gossett Domestic Pump; ITT Industries.
   3. Grundfos Pumps Corp.
   4. Taco, Inc.

B. Description: Factory-assembled and -tested, single-stage, close-coupled, in-line, centrifugal pumps as defined in HI 5.1-5.6.

   1. Pump and Motor Assembly: Hermetically sealed, replaceable-cartridge-type unit with motor and impeller on common shaft and designed for installation with pump and motor shaft mounted horizontally.
   2. Casing: Cast iron, with threaded companion-flange connections.
   3. Impeller: Corrosion-resistant material.
   4. Seal: Mechanical, carbon on Silicon carbide.
   5. Shaft and sleeve: Stainless steel
   6. Motor: Single speed OPD, unless otherwise indicated. Comply with requirements in Division 15 Section "Motors."
   7. Motor bearings: Permanently lubricated, ball bearings.

C. Capacities and Characteristics: As indicated on drawings.

D. Spare parts: Manufacturer’s recommended quantity, but not less than 10% of all replacement parts, with a minimum quantity of one each.

2.3 CONTROLS

A. Thermostats: Electric; adjustable for control of hot-water circulation pump.

   1. Manufacturers:

      a. Honeywell International, Inc.

b. Square D.
c. White-Rodgers Div.; Emerson Electric Co.

2. Type: Water-immersion sensor, for installation in hot-water circulation piping.
3. Range: 65 to 200 deg F (18 to 93 deg C).
4. Operation of Pump: On or off.
5. Transformer: Provide if required.
6. Power Requirement: 24 V, ac.
7. Settings: Start pump at 110 deg F (41 deg C) and stop pump at 120 deg F (49 deg C).

2.4 FLEXIBLE CONNECTORS

A. Manufacturers:

1. Anamet, Inc.
2. Flex-Hose Co., Inc.
3. Flexicraft Industries.
4. Flex-Pression, Ltd.
5. Flex-Weld, Inc.
6. Hyspan Precision Products, Inc.
7. Mercer Rubber.
8. Metraflex, Inc.
9. Proco Products, Inc.
10. Tozen America Corporation.
11. Unaflex Inc.

B. Description: Corrugated, bronze inner tubing covered with bronze wire braid. Include copper-tube ends or bronze flanged ends, braze-welded to tubing. Include 125-psig (860-kPa) minimum working-pressure rating and ends matching pump connections.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of domestic-water-piping system to verify actual locations of connections before pump installation.

3.2 PUMP INSTALLATION

A. Comply with HI 1.4.

B. Install pumps with access for periodic maintenance including removal of motors, impellers, couplings, and accessories.

C. Independently support pumps and piping so weight of piping is not supported by pumps and weight of pumps is not supported by piping.

D. Install close-coupled, horizontally mounted, in-line centrifugal pumps with motor and pump shafts horizontal.

E. Install continuous-thread hanger rods and elastomeric hangers of sufficient size to support pump weight. Vibration isolation devices are specified in Division 22 Section " Vibration and Seismic Controls for Plumbing piping and equipment".

F. Fabricate brackets or supports as required. Hanger and support materials are specified in Division 22 Section "Hangers and Supports for Plumbing piping and equipment."

3.3 CONTROL INSTALLATION

A. Install immersion-type thermostats in hot-water return piping.

3.4 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to pumps to allow service and maintenance.

C. Connect domestic water piping to pumps. Install suction and discharge piping equal to or greater than size of pump nozzles. Refer to Division 22 Section "Domestic Water Piping."

1. Install flexible connectors adjacent to pumps in suction and discharge piping of the pumps.

2. Install shutoff valve and strainer on suction side of pumps, and check valve and throttling valve on discharge side of pumps. Install valves same size as connected piping. Refer to Division 22 Section "Valves" for general-duty valves for domestic water piping and Division 22 Section "Domestic Water Piping Specialties" for strainers.
3. Install pressure gages at suction and discharge of pumps. Install at integral pressure-gage tappings where provided or install pressure-gage connectors in suction and discharge piping around pumps. Refer to Division 22 Section "Meters and Gages for Plumbing Piping" for pressure gages and gage connectors.

D. Ground equipment according to Division 26 Section.

E. Connect wiring according to Division 26 Section.

F. Connect thermostats to pumps that they control.

G. Interlock pump with water heater burner and time delay relay.

3.5 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. Check piping connections for tightness.
3. Clean strainers on suction piping.
4. Set thermostats for automatic starting and stopping operation of pumps.
5. Perform the following startup checks for each pump before starting:

a. Verify bearing lubrication.
b. Verify that pump is free to rotate by hand and that pump for handling hot liquid is free to rotate with pump hot and cold. If pump is bound or drags, do not operate until cause of trouble is determined and corrected.
c. Verify that pump is rotating in the correct direction.

6. Prime pump by opening suction valves and closing drains, and prepare pump for operation.
7. Start motor.
8. Open discharge valve slowly.
9. Adjust temperature settings on thermostats.
10. Adjust timer settings.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain controls and pumps.

B. Refer Division 01 for administrative and procedural requirements for demonstration and training.

END OF SECTION 221123

SECTION 22 13 16 - SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following for soil, waste, and vent piping inside the building:

1. Pipe, tube, and fittings.
2. Special pipe fittings.
3. Encasement for underground metal piping.

B. Related Requirements:
1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure, unless otherwise indicated:

1. Soil, Waste, and Vent Piping: 10-foot head of water (30 kPa).
2. Sanitary Sewer, Force-Main Piping: 50 psig (345 kPa).

1.4 SUBMITTALS

A. Product Data: For pipe, tube, fittings, and couplings.

B. Field quality-control inspection and test reports.

1.5 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping; "NSF-drain" for plastic drain piping; "NSF-tubular" for plastic continuous waste piping; and "NSF-sewer" for plastic sewer piping.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

2.3 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 74, Service class.

B. Gaskets: ASTM C 564, rubber.

2.4 HUBLESS CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 888 or CISPI 301.

B. Shielded Couplings: ASTM C 1277 assembly of metal shield or housing, corrosion-resistant fasteners, and rubber sleeve with integral, center pipe stop.

1. Heavy-Duty, Shielded, Stainless-Steel Couplings: With stainless-steel shield, stainless-steel bands and tightening devices, and ASTM C 564, rubber sleeve.

a. Manufacturers:

1) Clamp-All Corp.

2) Ideal Div.; Stant Corp.

3) Tyler Pipe; Soil Pipe Div.

PART 3 - EXECUTION

3.1 EXCAVATION

A. Refer to 31 23 00 Excavation and Fill for excavating, trenching, and backfilling requirements.

3.2 PIPING APPLICATIONS

A. Flanges and unions may be used on aboveground pressure piping, unless otherwise indicated.

B. Aboveground, soil and waste piping shall be the following:

1. Hubless cast-iron soil pipe and fittings heavy-duty shielded, stainless-steel couplings; and hubless-coupling joints.

2. Dissimilar Pipe-Material Couplings: Shielded, non-pressure pipe couplings for joining dissimilar pipe materials with small difference in OD.

C. Aboveground, vent piping shall be the following:

1. Hub less cast-iron soil pipe and fittings; heavy-duty shielded, couplings; and hubless-coupling joints.

D. Underground, soil, waste, and vent piping shall be the following:

1. Service class, cast-iron soil piping; gaskets; and gasketed joints.

3.3 PIPING INSTALLATION

A. Basic piping installation requirements are specified in Section 22 05 00 – Common Results for Plumbing.

B. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers.

C. Install cleanout fitting with closure plug inside the building in sanitary force-main piping.

D. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Sleeves and mechanical sleeve seals are specified in Section 22 05 00 – Common Results for Plumbing.

E. Install wall-penetration fitting at each service pipe penetration through foundation wall. Make installation watertight.

F. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

1. Install encasement on underground piping according to ASTM A 674 or AWWA C105.

G. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

H. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

I. Install soil and waste drainage and vent piping at the following minimum slopes, unless otherwise indicated:

1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 (DN 80) and smaller; 1 percent downward in direction of flow for piping NPS 4 (DN 100) and larger.

2. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.

3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

J. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.

K. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

3.4 JOINT CONSTRUCTION

A. Basic piping joint construction requirements are specified in Section 22 05 00 – Common Results for Plumbing.

B. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.

C. Join hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.

3.5 VALVE INSTALLATION

A. General valve installation requirements are specified in Section 22 05 23 – General-Duty Valves for Plumbing Piping.

3.6 HANGER AND SUPPORT INSTALLATION

A. Pipe hangers and supports are specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment." Install the following:

1. Vertical Piping: MSS Type 8 or Type 42, clamps.

2. Install individual, straight, horizontal piping runs according to the following:

a. 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.

b. Longer Than 100 Feet (30 m): MSS Type 43, adjustable roller hangers.

c. Longer Than 100 Feet (30 m), if Indicated: MSS Type 49, spring cushion rolls.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet (30 m) or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.

4. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Install supports according to Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch (10-mm) minimum rods.

E. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 60 inches (1500 mm) with 3/8-inch (10-mm) rod.

2. NPS 3 (DN 80): 60 inches (1500 mm) with 1/2-inch (13-mm) rod.

3. NPS 4 and NPS 5 (DN 100 and DN 125): 60 inches (1500 mm) with 5/8-inch (16-mm) rod.

4. NPS 6 (DN 150): 60 inches (1500 mm) with 3/4-inch (19-mm) rod.

F. Install supports for vertical cast-iron soil piping every 15 feet (4.5 m).

G. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/4 (DN 32): 72 inches (1800 mm) with 3/8-inch (10-mm) rod.

2. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 96 inches (2400 mm) with 3/8-inch (10-mm) rod.

H. Install supports for vertical copper tubing every 10 feet (3 m).

I. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.7 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

C. Connect drainage and vent piping to the following:

1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.

2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.

3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.

4. Equipment: Connect drainage piping as indicated. Provide shutoff valve, if indicated, and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 (DN 65) and larger.

D. Connect force-main piping to the following:

5. Sump Pump in elevator pit: To pump discharge.

3.8 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.

2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Re-inspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for re-inspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.

2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.

3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water (30 kPa). From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.

4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg (250 Pa). Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.

5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.

6. Prepare reports for tests and required corrective action.

3.9 CLEANING

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

END OF SECTION 22 13 16

SECTION 22 13 19 - SANITARY WASTE PIPING SPECIALTIES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following sanitary drainage piping specialties:
   1. Cleanouts.
   2. Floor drains.

B. Related Requirements:
   1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
   2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 CLEANOUTS

A. Exposed Metal Cleanouts:

   1. Standard: ASME A112.36.2M for cast iron for cleanout test tee.

   2. Size: Same as connected drainage piping

   3. Body Material: Hubless, cast-iron soil pipe test tee as required to match connected piping.

   4. Closure: Countersunk or raised-head, brass plug.

   5. Closure Plug Size: Same as or not more than one size smaller than cleanout size.

B. Metal Floor Cleanouts:

   1. Standard: ASME A112.36.2M for adjustable housing cleanout.

   2. Size: Same as connected branch.

3. Type: Adjustable housing.
4. Body or Ferrule: Cast iron.
5. Outlet Connection: Spigot.
6. Closure: Brass plug with tapered threads.
7. Adjustable Housing Material: Cast iron with set-screws or other device.
8. Frame and Cover Material and Finish: Nickel-bronze, copper alloy.
9. Frame and Cover Shape: Round.
10. Top Loading Classification: Heavy Duty.
11. Riser: ASTM A 74, Service class, cast-iron drainage pipe fitting and riser to cleanout.

C. Cast-Iron Wall Cleanouts:

1. Standard: ASME A112.36.2M. Include wall access.
2. Size: Same as connected drainage piping.
3. Body: Hubless, cast-iron soil pipe test tee as required to match connected piping.
4. Closure: Countersunk or raised-head, brass plug.
5. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
6. Wall Access: Round, flat, chrome-plated brass or stainless-steel cover plate with screw.

2.2 FLOOR DRAINS

A. Cast-Iron Floor Drains FD-1:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Josam Company; Josam Div.
   b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc., model 2110.
   c. Watts Drainage Products Inc.
   d. Zurn Plumbing Products Group; Light Commercial Operation.
   e. Zurn Plumbing Products Group; Specification Drainage Operation.
2. Standard: ASME A112.6.3.
3. Body Material: Duco cast iron.
4. Seepage Flange: Required.

5. Anchor Flange: Required.
6. Clamping Device: Required.
7. Outlet: Bottom.
8. Backwater Valve: Not required.
9. Coating on Interior and Exposed Exterior Surfaces: Not required.
10. Sediment Bucket: Not required.
11. Top or Strainer Material: Vandal Proof Cast Iron Bar grate.
12. Top of Body and Strainer Finish: None.
13. Top Shape: Round.
14. Dimensions of Top or Strainer: 8 inches
15. Top Loading Classification: Medium Duty.
16. Anti-Flood Rim: Not Required.
17. Inlet Fitting: Gray iron, with threaded inlet and threaded or spigot outlet.
18. Trap: Not required.
19. Trap primer connection: Required.

B. Prison Cell Floor Drains FD-2:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. Josam Company; Josam Div.
    b. MIFAB model F1160
    c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    d. Watts Drainage Products Inc.
    e. Zurn Plumbing Products Group; Light Commercial Operation.
    f. Zurn Plumbing Products Group; Specification Drainage Operation.
2. Standard: ASME A112.6.
3. Body Material: Cast iron.
4. Weepholes: Required.
5. Anchor Flange: Required.

6. Outlet: No hub side outlet.
7. Coating on Interior and Exposed Exterior Surfaces: Not required.
8. Sediment Bucket: Not required.
9. Top or Strainer Material: Nickel bronze with tamper proof security srcews.
10. Top of Body and Strainer Finish: Nickel bronze.
11. Top Shape: Round
12. Dimensions of Top or Strainer: 4 inches
13. Top Loading Classification: Medium Duty.
14. Funnel: Not required.
15. Trap: Integral deep seal trap with clean out plug.
16. Trap primer connection: Required.

C. Penal Use Shower Drains FD-3:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Josam Company; Josam Div.
   b. MIFAB.
   c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc., model 2016
   d. Watts Drainage Products Inc.
   e. Zurn Plumbing Products Group; Light Commercial Operation.
   f. Zurn Plumbing Products Group; Specification Drainage Operation.
2. Standard: ASME A112.6.
3. Body Material: Duco Coated Steel Body.
4. Weepholes: Required.
5. Anchor Flange: Required.
6. Outlet: No hub side outlet.
7. Coating on Interior and Exposed Exterior Surfaces: Manufacturer's Standard.
8. Sediment Bucket: Not required.
9. Top or Strainer Material: Nickel bronze with tamper proof security screws.

10. Top of Body and Strainer Finish: Nickel bronze.
11. Top Shape: Round
12. Dimensions of Top or Strainer: 4 inches
13. Top Loading Classification: Medium Duty.
14. Funnel: Not required.
15. Trap: Integral trap.
16. Trap primer connection: Required.

D. Cast-Iron Floor Drains FD-4:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. Josam Company; Josam Div.
    b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc., model 3650.
    c. Watts Drainage Products Inc.
    d. Zurn Plumbing Products Group; Light Commercial Operation.
    e. Zurn Plumbing Products Group; Specification Drainage Operation.
2. Standard: ASME A112.6.3.
3. Body Material: Duco cast iron.
4. Seepage Flange: Required.
5. Anchor Flange: Required.
6. Clamping Device: Required.
7. Outlet: Bottom.
8. Backwater Valve: Not required.
9. Coating on Interior and Exposed Exterior Surfaces: Not required.
10. Sediment Bucket: Not required.
11. Top or Strainer Material: Vandal Proof Cast Iron Bar grate.
12. Top of Body and Strainer Finish: None.
13. Top Shape: Round.
14. Dimensions of Top or Strainer: 8 inches

15. Top Loading Classification: Medium Duty.

16. Funnel assembly: Required.

17. Inlet Fitting: Gray iron, with threaded inlet and threaded or spigot outlet.

18. Trap: Not required.

19. Trap primer connection: Required.

E. Cast-Iron Floor Sinks FS-1:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Josam Company; Josam Div.

    b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc., model 3101.

    c. Watts Drainage Products Inc.

    d. Zurn Plumbing Products Group; Light Commercial Operation.

    e. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.6.3.

3. Body Material: Duco cast iron.

4. Seepage Flange: Required.

5. Anchor Flange: Required.

6. Clamping Device: Required.

7. Outlet: Bottom.

8. Backwater Valve: Not required.

9. Coating on Interior and Exposed Exterior Surfaces: Acid resistant.

10. Sediment Bucket: Required.

11. Top or Strainer Material: None.

12. Top of Body and Strainer Finish: None.

13. Top Shape: Square.

14. Dimensions of Top: 8 inches square

15. Top Loading Classification: Medium Duty.

16. Inlet Fitting: Gray iron, with threaded inlet and threaded or spigot outlet.

17. Trap: Not required.

18. Trap primer connection: Required.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:

1. Size same as drainage piping up to NPS 4 (DN 100). Use NPS 4 (DN 100) for larger drainage piping unless larger cleanout is indicated.

2. Locate at each change in direction of piping greater than 45 degrees.

3. Locate at minimum intervals of 50 feet (15 m) for piping NPS 4 (DN 100) and smaller and 100 feet (30 m) for larger piping.

4. Locate at base of each vertical soil and waste stack.

B. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

C. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

D. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.

1. Position floor drains for easy access and maintenance.

2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:

a. Radius, 30 Inches (750 mm) or Less: Equivalent to 1 percent slope, but not less than 1/4-inch (6.35-mm) total depression.

b. Radius, 30 to 60 Inches (750 to 1500 mm): Equivalent to 1 percent slope.

c. Radius, 60 Inches (1500 mm) or Larger: Equivalent to 1 percent slope, but not greater than 1-inch (25-mm) total depression.

3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.

4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

E. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.

1. Exception: Fitting may be omitted if trap has trap-seal primer connection.

2. Size: Same as floor drain inlet.

F. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

G. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipe fittings.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

3.3 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 22 13 19

SECTION 22 14 13 - FACILITY STORM DRAINAGE PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following storm drainage piping inside the building:

1. Pipe, tube, and fittings.
2. Special pipe fittings.
3. Encasement for underground metal piping.

B. Related Sections include the following:

1. Division 22 Section "Storm Drainage Piping Specialties."

C. Related Requirements:

1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene plastic.

B. LLDPE: Linear, low-density polyethylene plastic.

C. PE: Polyethylene plastic.

D. PVC: Polyvinyl chloride plastic.

E. TPE: Thermoplastic elastomer.

1.4 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working-pressure, unless otherwise indicated:

1. Storm Drainage Piping: 10-foot head of water (30 kPa).

1.5 SUBMITTALS

A. Product Data: For pipe, tube, fittings, and couplings.

B. LEED Submittal:

1. Product Data for Credit EQ 4.1: For solvent cements and adhesive primers, including printed statement of VOC content.

C. Field quality-control inspection and test reports.

1.6 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

2.3 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 74, Service class.

B. Gaskets: ASTM C 564, rubber.

C. Calking Materials: ASTM B 29, pure lead and oakum or hemp fiber.

2.4 HUBLESS CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 888 or CISPI 301.

B. Shielded Couplings: ASTM C 1277 assembly of metal shield or housing, corrosion-resistant fasteners, and rubber sleeve with integral, center pipe stop.

1. Heavy-Duty, Shielded, Stainless-Steel Couplings: With stainless-steel shield, stainless-steel bands and tightening devices, and ASTM C 564, rubber sleeve.

a. Manufacturers:

1) ANACO.
2) Clamp-All Corp.
3) Ideal Div.; Stant Corp.
4) Mission Rubber Co.
5) Tyler Pipe; Soil Pipe Div.

2.5 SPECIAL PIPE FITTINGS

A. Flexible, Non-pressure Pipe Couplings: Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition pattern. Include shear ring, ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.

1. Manufacturers:

a. Dallas Specialty & Mfg. Co.
b. Fernco, Inc.
c. Logan Clay Products Company (The).
d. Mission Rubber Co.
e. NDS, Inc.
f. Plastic Oddities, Inc.

2. Sleeve Materials:

a. For Cast-Iron Soil Pipes: ASTM C 564, rubber.
b. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

B. Shielded Non-pressure Pipe Couplings: ASTM C 1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

1. Manufacturers:

a. Cascade Waterworks Mfg. Co.
b. Mission Rubber Co.

C. Rigid, Unshielded, Non-pressure Pipe Couplings: ASTM C 1461, sleeve-type reducing- or transition-type mechanical coupling molded from ASTM C 1440, TPE material with corrosion-resistant-metal tension band and tightening mechanism on each end.

1. Manufacturers:

a. ANACO.

D. Pressure Pipe Couplings: AWWA C219 metal, sleeve-type same size as, with pressure rating at least equal to, and ends compatible with, pipes to be joined.

1. Manufacturers:

a. Cascade Waterworks Mfg. Co.
b. Dresser, Inc.; DMD Div.
c. EBAA Iron Sales, Inc.
d. Ford Meter Box Company, Inc. (The); Pipe Products Div.
e. JCM Industries, Inc.

f. Romac Industries, Inc.
g. Smith-Blair, Inc.
h. Viking Johnson.

2. Center-Sleeve Material: Manufacturer's standard.
3. Gasket Material: Natural or synthetic rubber.
4. Metal Component Finish: Corrosion-resistant coating or material.

E. Wall-Penetration Fittings: Compound, ductile-iron coupling fitting with sleeve and flexing sections for up to 20-degree deflection, gaskets, and restrained-joint ends complying with AWWA C110 or AWWA C153. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.

1. Manufacturers:

a. SIGMA Corp.

2.6 ENCASEMENT FOR UNDERGROUND METAL PIPING

A. Description: ASTM A 674 or AWWA C105, high-density, cross-laminated PE film of 0.004-inch (0.10-mm) minimum thickness.

B. Form: Sheet.

C. Color: Black.

PART 3 - EXECUTION

3.1 EXCAVATION

A. Refer to Division 31 Section "Earthwork" for excavating, trenching, and backfilling.

3.2 PIPING APPLICATIONS

A. Flanges and unions may be used on aboveground pressure piping, unless otherwise indicated.

B. Aboveground storm drainage piping shall be the following:
1. Hubless cast-iron soil pipe and fittings; standard, shielded, stainless-steel couplings; and coupled joints.
2. Dissimilar Pipe-Material Couplings: Rigid, unshielded, non-pressure pipe couplings for joining dissimilar pipe materials with small difference in OD.

C. Underground storm drainage piping the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Dissimilar Pipe-Material Couplings: Rigid, unshielded, non-pressure pipe couplings for joining dissimilar pipe materials with small difference in OD.

3.3 PIPING INSTALLATION

A. Storm sewer and drainage piping outside the building are specified in Division 33.

B. Install cleanouts at grade and extend to where building storm drains connect to building storm sewers.

C. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight.

D. Install wall-penetration fitting system at each service pipe penetration through foundation wall. Make installation watertight.

E. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

1. Install encasement on underground piping according to ASTM A 674 or AWWA C105.

F. Make changes in direction for storm drainage piping using appropriate branches, bends, and long-sweep bends. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

G. Lay buried building storm drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

H. Install storm drainage piping at the following minimum slopes, unless otherwise indicated:

1. Building Storm Drain: 1 percent downward in direction of flow for piping NPS 3 (DN 80) and smaller; 1 percent downward in direction of flow for piping NPS 4 (DN 100) and larger.
2. Horizontal Storm-Drainage Piping: 2 percent downward in direction of flow.

I. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.

J. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

K. Provide insulation to all horizontal runs of above ground storm drain piping.

3.4 JOINT CONSTRUCTION

A. Hub-and-Spigot, Cast-Iron Soil Piping Gasketed Joints: Join according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.

B. Hubless Cast-Iron Soil Piping Coupled Joints: Join according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.

C. Grooved Joints: Cut groove ends of pipe and assemble grooved ends of pipes, grooved-end fittings, and grooved-end-piping couplings according to AWWA C606.

3.5 VALVE INSTALLATION

A. Shutoff Valves: Install shutoff valve on each sump pump discharge.

1. Install gate or full-port ball valve for piping NPS 2 (DN 50) and smaller.
2. Install gate valve for piping NPS 2-1/2 (DN 65) and larger.

B. Check Valves: Install swing check valve, between pump and shutoff valve, on each sump pump discharge.

3.6 HANGER AND SUPPORT INSTALLATION

A. Pipe hangers and supports are specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment." Install the following:

1. Vertical Piping: MSS Type 8 or Type 42, clamps.
2. Individual, Straight, Horizontal Piping Runs: According to the following:

   a. 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet (30 m) or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Install supports according to Division 15 Section "Hangers and Supports."

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch (10-mm) minimum rods.

E. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:
1. NPS 4 and NPS 5 (DN 100 and DN 125): 60 inches (1500 mm) with 5/8-inch (16-mm) rod.
2. NPS 6 (DN 150): 60 inches (1500 mm) with 3/4-inch (19-mm) rod.
3. NPS 8 to NPS 12 (DN 200 to DN 300): 60 inches (1500 mm) with 7/8-inch (22-mm) rod.
4. Spacing for 10-foot (3-m) lengths may be increased to 10 feet (3 m). Spacing for fittings is limited to 60 inches (1500 mm).

F. Install supports for vertical cast-iron soil piping every 15 feet (4.5 m).

G. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.7 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect interior storm drainage piping to exterior storm drainage piping. Use transition fitting to join dissimilar piping materials.

C. Connect storm drainage piping to roof drains and storm drainage specialties.

3.8 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Re-inspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for re-inspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test storm drainage piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced storm drainage piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Test Procedure: Test storm drainage piping on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water (30 kPa). From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
4. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
5. Prepare reports for tests and required corrective action.

3.9 CLEANING

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

END OF SECTION 22 14 13

SECTION 22 14 23 – STORM DRAINAGE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Roof drains.
2. Area Drains.
3. Cleanouts.
4. Miscellaneous Storm Drainage Piping Specialties.

B. Related Requirements:
1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 METAL ROOF DRAINS

A. Cast-Iron, Medium-Sump, General-Purpose Roof Drains, RD:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Josam Company.
b. MIFAB, Inc.
c. Smith, Jay R. Mfg. Co.

d. Watts Water Technologies, Inc.
e. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.6.4, for general-purpose roof drains.
3. Body Material: Cast iron.
4. Dimension of Body: 8- to 12-inch (203- to 305-mm) diameter.
5. Combination Flashing Ring and Gravel Stop: Required.
6. Flow-Control Weirs: Not required.
7. Outlet: Bottom.
8. Extension Collars: Not required.
9. Underdeck Clamp: Required.
10. Expansion Joint: Not required.
11. Sump Receiver Plate: Required.
12. Dome Material: Cast iron.
13. Wire Mesh: Not required.
14. Perforated Gravel Guard: Not required.
15. Vandal-Proof Dome: Not required.

B. Cast-Iron, Medium-Sump, General-Purpose Roof Drains, OD:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Josam Company.
b. MIFAB, Inc.
c. Smith, Jay R. Mfg. Co.
d. Watts Water Technologies, Inc.
e. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.6.4, for general-purpose roof drains.
3. Body Material: Cast iron.
4. Dimension of Body: 8- to 12-inch (203- to 305-mm) diameter.
5. Combination Flashing Ring and Gravel Stop: Required.
6. Flow-Control Weirs: Not required.
7. Outlet: Bottom.
8. Extension Collars: Not required.
9. Underdeck Clamp: Required.
10. Expansion Joint: Not required.
11. Sump Receiver Plate: Required.
12. Dome Material: Cast iron.
13. Wire Mesh: Not required.
14. Perforated Gravel Guard: Not required.
15. Vandal-Proof Dome: Not required.
16. Water Dam: 2 inches (51 mm) high.

C. Cast-Iron Area Drain AD-1:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Josam Company; Josam Div.
b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
c. Watts Drainage Products Inc., model FD 460
d. Zurn Plumbing Products Group; Light Commercial Operation.
e. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.6.3.
3. Body Material: Cast iron.
4. Seepage Flange: Required.
5. Anchor Flange: Required.
6. Clamping Device: Required.
7. Outlet: Bottom.
8. Backwater Valve: Not required.
9. Coating on Interior and Exposed Exterior Surfaces: Epoxy Coated.
10. Sediment Bucket: Required.
11. Top or Strainer Material: Ductile Iron Tractor Grate with vandal proof screws.
12. Top of Body and Strainer Finish: None.
13. Top Shape: Square.
14. Dimensions of Top: 12 inches square
15. Top Loading Classification: Medium Duty.
16. Inlet Fitting: Gray iron, with threaded or spigot outlet.
17. Trap: Not required.

2.2 CLEANOUTS

A. Floor Cleanouts:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Josam Company.
    b. Smith, Jay R. Mfg. Co.
    c. Watts Water Technologies, Inc.
    d. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.36.2M, for threaded, adjustable housing cleanouts.
3. Size: Same as connected branch.
4. Type: Threaded, adjustable housing.
5. Body or Ferrule Material: Cast iron.
6. Clamping Device: Required.
7. Outlet Connection: Spigot.
8. Closure: Brass plug with tapered threads.
9. Adjustable Housing Material: Cast iron with threads.
10. Frame and Cover Material and Finish: Nickel-bronze, copper alloy.
11. Frame and Cover Shape: Round.
12. Top-Loading Classification: Medium Duty.
13. Riser: ASTM A 74, Service class, cast-iron drainage pipe fitting and riser to cleanout.

B. Wall Cleanouts:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Josam Company.
    b. Smith, Jay R. Mfg. Co.
    c. Watts Water Technologies, Inc.
    d. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.36.2M, for cleanouts. Include wall access.
3. Size: Same as connected drainage piping.
4. Body Material: Hubless, cast-iron soil-pipe test tee as required to match connected piping.
5. Closure: Countersunk or raised-head, drilled-and-threaded brass plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
7. Wall Access: Round, nickel-bronze, copper-alloy, or stainless-stee wall-installation frame and cover.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install roof drains at low points of roof areas according to roof membrane manufacturer's written installation instructions. Roofing materials are specified in Division 07 Sections.

1. Install flashing collar or flange of roof drain to prevent leakage between drain and adjoining roofing. Maintain integrity of waterproof membranes where penetrated.
2. Install expansion joints, if indicated, in roof drain outlets.
3. Position roof drains for easy access and maintenance.

B. Install cleanouts in aboveground piping and building drain piping according to the following instructions unless otherwise indicated:

1. Use cleanouts the same size as drainage piping up to NPS 4 (DN 100). Use NPS 4 (DN 100) for larger drainage piping unless larger cleanout is indicated.
2. Locate cleanouts at each change in direction of piping greater than 45 degrees.
3. Locate cleanouts at minimum intervals of 50 feet (15 m) for piping NPS 4 (DN 100) and smaller and 100 feet (30 m) for larger piping.
4. Locate cleanouts at base of each vertical soil and waste stack.

C. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

D. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

E. Install test tees in vertical conductors and near floor.

F. Install wall cleanouts in vertical conductors. Install access door in wall if indicated.

3.2 CONNECTIONS

A. Comply with requirements for piping specified in Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

3.3 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 22 14 23

SECTION 22 14 29 – SUMP PUMPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the sump pumps and accessories, inside the building, for elevator pit and sump pits for plumbing sanitary drainage:
   1. Submersible sump pumps.
   2. Sump pump pits.

B. Related Requirements:
   1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
   2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 SUBMITTALS

A. Product Data: For each type and size of sump pump specified. Include certified performance curves with operating points plotted on curves, and rated capacities of selected models, furnished specialties, and accessories.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Operation and Maintenance Data: For each sump pump to include in emergency, operation, and maintenance manuals.

1.4 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, and dimensional requirements of sump pumps and are based on the specific system indicated. Refer to Division 01 Section "Product Requirements."

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Retain shipping flange protective covers and protective coatings during storage.

B. Protect bearings and couplings against damage.

C. Comply with pump manufacturer's written rigging instructions for handling.

1.6 COORDINATION

A. Coordinate size and location of concrete pits. Concrete, reinforcement, and formwork requirements are specified in Division 03.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 ELEVATOR PIT SUBMERSIBLE SUMP PUMPS

A. Manufacturers:
1. Goulds Pumps; ITT Industries.
2. Stancor, Inc.
3. Weil Pump Company, Inc.

B. Description: Factory-assembled and -tested, simplex, single-stage, centrifugal, end-suction, submersible, direct-connected sump pumps with oil sensor, complying with UL 778 and HI 1.1-1.2 and HI 1.3 for submersible sump pumps.

C. Casing and Impeller: Cast-iron casing with metal inlet strainer and brass, bronze, or cast-iron impeller.

D. Pump and Motor Shaft: Stainless steel with factory-sealed, grease-lubricated ball bearings and double-mechanical seals.

E. Motor: Hermetically sealed, capacitor-start type, stainless steel housing with built-in overload protection; three-conductor waterproof power cable of length required, and with grounding plug and cable-sealing assembly for connection at pump. Comply with requirements in Division 22 Section "Common Motor Requirements for Plumbing Equipment."

1. Moisture-Sensing Probe: Internal moisture sensor with moisture alarm.

2. Oil sensor Probe: Stainless steel oil sensing probe mounted on the pump.

F. Pump Discharge Piping: Factory or field fabricated, copper tube.

G. Pit Cover: Cast iron or steel with bituminous coating and strong enough to support controls. See Part 2 "Sump Pump Pits" Article for other requirements.

H. Control Panel: The main control shall be approved to UL 508 standards and housed in a gasketed NEMA 4X enclosure with a see-through window for observation of operating functions. The control shall be equipped with an 8-pin twist lock receptacle, dual solid state Oil-Minder relays with variable sensitivity settings, an over current relay, self cleaning stainless steel sensor probe, high decibel warning horn with alarm silencing switch, dual floats, clearly marked terminal board and remote monitoring contact. A NEMA 4X junction box with 8-pin twist-lock electrical receptacle and 25' (additional lengths available in 25' increments) of mating 8 conductor cable shall be provided. All cables between the pump and junction box shall be 16' long and the cable and plug from the control unit shall be 8' long. The control unit, junction box, pump, floats and sensor probe shall be factory assembled as a complete, ready to use system. The system shall allow for the main control to be located outside of the elevator hoistway to be monitored for all functions without having to enter the elevator shaft. The control panel shall be capable to send remote alarm at Central control room.

I. Float Switches: Mechanical Float Switches, one for Normal On-Off operation and one for High Water Alarm, with 16' Cables.

J. Capacity and Characteristics: As indicated on drawings.

2.3 SUBMERSIBLE SUMP PUMPS

A. Submersible, Fixed-Position, Single-Seal Sump Pumps:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Barnes; Crane Pumps & Systems.
    b. Bell & Gossett Domestic Pump; ITT Corporation.
    c. Goulds Pumps; ITT Corporation.
    d. Grundfos Pumps Corp.
    e. Stancor, Inc.
    f. Weil Pump Company, Inc.
    g. Weinman Division; Crane Pumps & Systems.
    h. Zoeller Company.
    i. Liberty Pumps.

2. Description: Factory-assembled and -tested sump-pump unit.
3. Pump Type: Submersible, end-suction, single-stage, close-coupled, overhung-impeller, centrifugal sump pump as defined in HI 1.1-1.2 and HI 1.3.
4. Pump Casing: Cast iron, with strainer inlet, legs that elevate pump to permit flow into impeller, and vertical discharge for piping connection.
5. Impeller: Statically and dynamically balanced, ASTM A 48/A 48M, Class No. 25 A cast iron design for clear wastewater handling, and keyed and secured to shaft.
6. Pump and Motor Shaft: Stainless steel , with factory-sealed, grease-lubricated ball bearings.
7. Seal: Mechanical.
8. Motor: Hermetically sealed, capacitor-start type; with built-in overload protection; lifting eye or lug; and three-conductor, waterproof power cable of length required and with grounding plug and cable-sealing assembly for connection at pump.

    a. Motor Housing Fluid: Air.

9. Controls:

    a. Enclosure: NEMA 250, Type 1 wall-mounted.
    b. Switch Type: Mechanical-float type, in NEMA 250, Type 6 enclosures with mounting rod and electric cables.
    c. High-Water Alarm: Rod-mounted, NEMA 250, Type 6 enclosure with mechanical-float, switch matching control and electric bell; 120-V ac, with transformer and contacts for remote alarm bell.

10. Control-Interface Features:

    a. Remote Alarm Contacts: For remote alarm interface.
    b. Building Automation System Interface: Auxiliary contacts in pump controls for interface to building automation system and capable of providing the following:

        1) On-off status of pump.
        2) Alarm status.

2.4 SUMP PUMP PITS

A. Pipe Connections: Construct of watertight, cast-in-place, reinforced concrete with sidewall openings for pipe connections. Cast-in-place concrete, formwork, and reinforcement are specified in Division 03 Section "Cast-in-Place Concrete."

1. Pipe Connections: Sleeved openings large enough for mechanical sleeve seals for drainage piping. Sleeves and mechanical sleeve seals are specified in Division 22 Section "Common Work Results for Plumbing," and drainage piping is specified in Division 22 Section "Facility Storm Drainage Piping."

B. Curb Frame and Cover:

1. Curb Frame Material: Galvanized steel or steel with bituminous coating.

    a. Pattern: Angle-cross-section shape with flat top surface.

2.5 BUILDING AUTOMATION SYSTEM INTERFACE

A. Provide auxiliary contacts in pump controllers capable of interfacing with building automation system. Include the following:

1. On-off status of each pump.
2. Alarm status.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of plumbing piping to verify actual locations of storm drainage piping connections before sump pump installation.

B. Cast-in-place concrete materials and placement requirements are specified in Division 03.

3.2 SUMP PUMP INSTALLATION

A. Install sump pumps according to applicable requirements in HI 1.4.

B. Install pumps and arrange to provide access for maintenance including removal of motors, impellers, couplings, and accessories.

C. Set submersible sump pumps on pit floor. Make direct connections to storm drainage piping.

D. Construct sump pump pits and connect to drainage piping. Set pit curb frame recessed in and anchored to concrete. Fasten pit cover to pit curb flange. Install cover so top surface is flush with finished floor.

E. Support piping so weight of piping is not supported by pumps.

3.3 CONNECTIONS

A. Piping installation requirements are specified in Division 22 Section "Facility Storm Drainage Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to sump pumps to allow service and maintenance.

C. Connect storm drainage piping to pumps. Install discharge piping equal to or greater than size of pump discharge piping. Refer to Division 22 Section "Facility Storm Drainage Piping."

1. Install flexible connectors adjacent to pumps in discharge piping.
2. Install check and shutoff valves on discharge piping from each pump. Install unions on pumps having threaded pipe connections. Install valves same size as connected piping. Refer to Division 22 Section "General-Duty Valves for Plumbing Piping" for general-duty valves for drainage piping.

D. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

E. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

F. Provide required wiring, equipment and accessories, including 120 V alarm bell to activate remote alarm at control room.

3.4 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. Verify bearing lubrication.
3. Disconnect couplings and check motors for proper direction of rotation.

4. Verify that each pump is free to rotate by hand. If pump is bound or drags, do not operate until cause of trouble is determined and corrected.
5. Verify that pump controls are correct for required application.

B. Start pumps without exceeding safe motor power:

1. Start motors.
2. Open discharge valves slowly.
3. Check general mechanical operation of pumps and motors.

C. Test and adjust controls and safeties.

D. Remove and replace damaged and malfunctioning components.

1. Pump Controls: Set pump controls for automatic start, stop, and alarm operation as required for system application.
2. Set field-adjustable switches and circuit-breaker trip ranges as indicated, or if not indicated, for normal operation.

E. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project outside normal occupancy hours for this purpose.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain controls and pumps.

B. Refer Division 01 for administrative and procedural requirements for demonstration and training.

END OF SECTION 22 14 29

SECTION 22 14 29.16 – IN LINE ELECTRIC GRINDER

PART 1 -GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.1 SUMMARY

A. Section Includes:

1. In-line Grinder and Controllers.

B. Related Requirements:
1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.2 QUALITY ASSURANCE

A. Referenced Standards:
3. American Iron and Steel Institute (AISI):
4. American National Standard Institute (ANSI).
5. ASTM International (ASTM):
6. Society of Automotive Engineers (SAE) 660
7. National Electrical Manufacturer's Association (NEMA):
8. National Electrical Code (NEC).
9. Underwriters Laboratories, Inc.(UL).
10. International Electrotechnical Commission (IEC)

B. Manufacturer

a. Supplier shall have a minimum 30 years experience as a manufacturer of municipal waste water equipment and a minimum 5,000 prior installations of similar equipment.

b. Supplier shall conduct factory testing and verification of equipment prior to shipment.

1.3 SYSTEM DESCRIPTION

A. Provide single source coordination responsibility through the manufacturer for the entire system including, but not limited to, the following:

1. In-Line Grinder.

2. Control panels.

1.4 SUBMITTALS

A. Shop Drawings:

1. See Section 01 33 00 – Submittal Procedures.

2. Product technical data including:

a. Submittals shall include equipment descriptions, functional descriptions, dimensional and assembly drawings, catalog data, and job specific drawings.

b. Manufacturer's installation instructions.

B. Operation and Maintenance Manuals:

1. See Section 01 33 00 – Submittal Procedures.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaging

1. Containers or skids shall be constructed for normal shipping, handling, and storage.

2. Containers shall provide adequate protection for the equipment in a dry indoor environment between +40 deg F and +100 deg F.

1.6 WARRANTY

A. Minimum 5 year warranty on equipment and labor.

PART 2 -PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
1. JWC Environmental.
2. Frankmiller Inc.
3. Vogalsang USA.
4. Or equal.

B. Manufacturers requesting to be selected as an approved equal shall submit certified documentation including installation lists with phone numbers, equipment drawings, flow performance curves, electrical schematics and cut sheets, O&M draft showing compliance with these specifications.

2.2 EQUIPMENT

A. Grinder: Grinder shall reduce or shred influent solids for protection of downstream equipment. Grinder shall be two shafted design consisting of individual cutters and spacers. Grinder shall have a main body housing with pipe flanges, top cover, bottom cover and upper end housing. Grinder shall have a motor/ gear reducer combination to drive the cutter shafts.

B. Components

1. Cutters and Spacers:
   a. Cutting stack shall be a nominal height of 8 inches.
   b. Cutter shall be an individual disk constructed of AISI 8620 alloy steel.
   c. Cutters shall be heat treated.
   d. Cutters shall have cam shaped teeth. Tooth height shall not be greater than ½-inch above the root diameter of the cutter. OD shall be 4.71-inches.
   e. Spacers shall be an individual disk constructed of AISI 8620 alloy steel.
   f. Spacers shall have a smooth outside diameter with no tooth profiles

2. Shafts: Alloy steel, ANSI, Series 400.

3. Seal Cartridges: Tungsten carbide with nickel binder.

4. O-rings: Buna-N or Nitrile rubber or neoprene.

5. Radial and axial loads shall be borne by sealed, oversized, deep-groove ball bearings.

6. Main Body Housing: Ductile Iron, ASTM A 536-84 with inlet and outlet flanges.
   a. Speed Reducer: Internal planetary mechanism with trochoidal curved tooth profile, grease lubricated, vertically mounted with a 29:1 single reduction.

7. Motor: TEFC, three phase with a minimum service factor of 1.15, minimum efficiency at full load 86.6%, and minimum power factor of 78% at full load.

C. Performance Requirements: As indicated on contract drawings.

D. Spare parts: Manufacturer's recommended quantity, but not less than 10% of all replacement parts, with a minimum quantity of one each.

2.3 CONTROLLER

A. General:

1. Controller shall provide control of the grinder and be designed to control one motor at 460 volts, 3 phase, 60 Hz. The controller shall have indicator lights, switches and other control devices.

B. Components

1. Enclosures
   a. Enclosure shall be fiberglass reinforced polyester NEMA 4X .
   b. Enclosure shall house the control devices, motor starter, and PLC.

2. Grinder ON-OFF/RESET-REMOTE three-position, NEMA 4X selector switch
   a. In the OFF/RESET position, the grinder shall not run.
   b. In the ON position, the grinder shall run continuously.
   c. In the REMOTE position, the grinder shall start and stop as controlled by an external device.

d. Selector switch shall be the only method for resetting the controller after failure.

3. Pilot Lights
   a. Lights shall be LED type, rated NEMA 4X.
   b. Lights shall indicate POWER ON, RUN, and FAIL.

4. Programmable Logic Controller (PLC)
   a. PLC shall have a minimum of 16K of memory.

5. Motor Starter
   a. Starter shall be a full-voltage reversing type with 120 volt operating coil.
   b. Overload relay shall be adjustable and sized to full load amperes (FLA) of the motor.

6. Control Transformer
   a. Control transformer shall be minimum 130 VA.
   b. Control transformer primary and secondary shall be fused for over current protection.

C. Performance:

1. When a grinder jam obstruction occurs, the controller shall stop the grinder and reverse the rotation to clear the obstruction. If the obstruction is cleared, the controller shall return the grinder to normal operation. If three (3) reverses occur within a 30 second interval, the controller shall stop the grinder motor and activate the grinder FAIL indicator and relay.

2. When a power failure occurs while the grinder is operating, the grinder will resume operation once power is restored.

3. When a power failure occurs while the grinder is in a FAIL condition, once power is restored the fail indicator shall reactivate and remain until reset.

4. Reset of the grinder shall be accomplished from the controller only.

PART 3 -EXECUTION

3.1 INSTALLATION

A. Install equipment at location as shown on Drawings, and in accordance with manufacturer's written instructions, OSHA, local, state and federal Codes and regulations.

3.2 FIELD QUALITY CONTROL

A. Provide services of equipment manufacturer's field service representatives to:

1. Inspect equipment covered by these Specifications.

2. Supervise pre-start adjustments and installation checks.

3. Conduct initial startup of equipment and perform operational checks.

3.3 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain grinder with controls.

B. Refer Division 01 for administrative and procedural requirements for demonstration and training.

END OF SECTION 22 14 29.16

SECTION 22 3400 – FUEL-FIRED DOMESTIC WATER HEATERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following fuel-fired water heaters:
   1. Commercial, power-burner, storage, gas water heaters.
   2. Compression tanks.
   3. Water heater accessories.

1.3 SUBMITTALS

A. Product Data: For each type and size of water heater indicated. Include rated capacities, operating characteristics, furnished specialties, and accessories.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Product Certificates: For each type of commercial water heater, signed by product manufacturer.

D. Source quality-control test reports.

E. Field quality-control test reports.

F. Operation and Maintenance Data: For water heaters to include in emergency, operation, and maintenance manuals.

G. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain same type of water heaters through one source from a single manufacturer.

B. Product Options: Drawings indicate size, profiles, and dimensional requirements of water heaters and are based on the specific system indicated. Refer to Division 01 Section "Product Requirements."

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. ASHRAE/IESNA 90.1-2004Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004.

E. ASME Compliance:

1. Where ASME-code construction is indicated, fabricate and label commercial water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
2. Where ASME-code construction is indicated, fabricate and label commercial, finned-tube water heaters to comply with ASME Boiler and Pressure Vessel Code: Section IV.

F. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9" for all components that will be in contact with potable water.

1.5 COORDINATION

A. Coordinate size and location of concrete bases with Architectural and Structural Drawings.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of fuel-fired water heaters that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including storage tank and supports.
b. Faulty operation of controls.
c. Deterioration of metals, metal finishes, and other materials beyond normal use.

2. Warranty Period(s): From date of Substantial Completion:

a. Commercial, Gas Water Heaters:

1) Storage Tank: Ten years.
2) Controls and Other Components: Five years.

b. Compression Tanks: One year.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 COMMERCIAL, GAS WATER HEATERS

A. Commercial, Power-Burner, Storage, Gas Water Heaters: Comply with ANSI Z21.10.3/CSA 4.3.

1. Manufacturers:
   a. Bradford White Corporation.
   b. PVI Industries, LLC.
   c. Smith, A. O. Water Products Company.

2. Storage-Tank Construction: ASME-code steel with 150-psig (1035-kPa) working-pressure rating.

   a. Tappings: Factory fabricated of materials compatible with tank. Attach tappings to tank before testing.

      1) NPS 2 (DN 50) and Smaller: Threaded ends according to ASME B1.20.1.
      2) NPS 2-1/2 (DN 65) and Larger: Flanged ends according to ASME B16.5 for steel and stainless-steel flanges, and according to ASME B16.24 for copper and copper-alloy flanges.

   b. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.
   c. Lining: Nickel shield complying with NSF 61 barrier materials for potable-water tank linings, including extending lining into and through tank fittings and outlets.

3. Factory-Installed, Storage-Tank Appurtenances:

   a. Anode Rod: Replaceable magnesium.
   b. Dip Tube: Provide unless cold-water inlet is near bottom of tank.
   c. Drain Valve: Corrosion-resistant metal complying with ASSE 1005.
   d. Insulation: Comply with ASHRAE/IESNA 90.1. Surround entire storage tank except connections and controls.
   e. Jacket: Steel with enameled finish.
   f. Combination Temperature and Pressure Relief Valves: ANSI Z21.22/CSA 4.4. Include one or more relief valves with total relieving capacity at least as great as heat input, and include pressure setting less than water heater working-pressure rating. Select one relief valve with sensing element that extends into storage tank.

4. Burner: Comply with UL 795 for power-burner water heaters and for natural-gas fuel.

   a. Manufacturers:
      1) Gordon-Piatt Group; John Zink Company, LLC.
      2) Power Flame, Inc.
      3) Webster Engineering Co., L.L.C.

   b. Automatic Ignition: ANSI Z21.20, electric, automatic, gas-ignition system.

5. Temperature Control: Adjustable thermostat.
6. Safety Controls: Automatic, high-temperature-limit and low-water cutoff devices or systems.
7. Special Requirements: NSF 5 construction.
8. Draft Hood: Draft diverter; complying with ANSI Z21.12.

9. Building Automation System Interface: Normally closed dry contacts for enabling and disabling water heater.
10. Capacity and Characteristics: As Indicated on drawings.

B. Spare parts: Manufacturer's recommended quantity, but not less than 10% of all replacement parts, with a minimum quantity of one each.

2.3 COMPRESSION TANKS

A. Description: Steel, pressure-rated tank constructed with welded joints and factory-installed, butyl-rubber diaphragm. Include air precharged to minimum system-operating pressure at tank.

1. Manufacturers:

   a. AMTROL Inc.
   b. Smith, A. O.; Aqua-Air Div.
   c. Taco, Inc.

2. Construction:

   a. Tappings: Factory-fabricated steel, welded to tank before testing and labeling. Include ASME B1.20.1 pipe thread.
   b. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.
   c. Air-Charging Valve: Factory installed.

3. Capacity and Characteristics: As indicated on drawings.

2.4 WATER HEATER ACCESSORIES

A. Gas Shutoff Valves: ANSI Z21.15/CGA 9.1, manually operated. Furnish for installation in piping.

B. Gas Pressure Regulators: ANSI Z21.18, appliance type. Include pressure rating, capacity, and pressure differential required between gas supply and water heater.

C. Gas Automatic Valves: ANSI Z21.21, appliance, electrically operated, on-off automatic valve.

D. Combination Temperature and Pressure Relief Valves: Include relieving capacity at least as great as heat input, and include pressure setting less than water heater working-pressure rating. Select each relief valve with sensing element that extends into storage tank.

1. Gas Water Heaters: ANSI Z21.22/CSA 4.4.

E. Piping-Type Heat Traps: Field-fabricated piping arrangement according to ASHRAE/IESNA 90.1-2004 or ASHRAE 90.2-2004.

F. Electrical one point connection with complete controls, thermal overload protection and control transformer.

2.5 SOURCE QUALITY CONTROL

A. Test and inspect water heater storage tanks, specified to be ASME-code construction, according to ASME Boiler and Pressure Vessel Code.

B. Hydrostatically test commercial water heater storage tanks before shipment to minimum of one and one-half times pressure rating.

C. Prepare test reports.

PART 3 - EXECUTION

3.1 WATER HEATER INSTALLATION

A. Install commercial water heaters on concrete bases.
   1. Concrete base construction requirements are specified in Division 22 Section "Common Work Results for Plumbing."

B. Install water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.

C. Install gas water heaters according to NFPA 54.

D. Install gas shutoff valves on gas supplies to gas water heaters without shutoff valves.

E. Install gas pressure regulators on gas supplies to gas water heaters without gas pressure regulators if gas pressure regulators are required to reduce gas pressure at burner.

F. Install automatic gas valves on gas supplies to gas water heaters, if required for operation of safety control.

G. Install combination temperature and pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend commercial-water-heater, relief-valve outlet, with drain piping same as domestic water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.

H. Install water heater drain piping as indirect waste to spill by positive air gap into open drains or over floor drains. Install hose-end drain valves at low points in water piping for water heaters that do not have tank drains. Refer to Division 22 Section "Domestic Water Piping Specialties" for hose-end drain valves.

I. Install thermometer on outlet piping of water heaters. Refer to Division 22 Section "Meters and Gages for Plumbing Piping" for thermometers.

J. Install pressure gage(s) on inlet and outlet piping of commercial, fuel-fired water heater piping. Refer to Division 22 Section "Meters and Gages for Plumbing Piping" for pressure gages.

K. Install piping-type heat traps on inlet and outlet piping of water heater storage tanks without integral or fitting-type heat traps.

L. Fill water heaters with water.

M. Charge compression tanks with air.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to water heaters to allow service and maintenance. Arrange piping for easy removal of water heaters.

C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports:

1. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, confirm proper operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Remove and replace water heaters that do not pass tests and inspections and retest as specified above.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain commercial water heaters. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION

SECTION 22 42 13.13 – COMMERCIAL WATER CLOSETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Water closets.
2. Flushometer valves.
3. Toilet seats.

B. Related Requirements:
1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for water closets.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: Include diagrams for power, signal, and control wiring.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For flushometer valves to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 WALL-MOUNTED, WATER CLOSETS

A. Water Closets P-1A: ADA compliant, Wall mounted, top spud.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. American Standard Companies, Inc.
    b. Crane Plumbing model.
    c. Sloan Valve Company.
    d. TOTO USA, INC., model CT708EG

2. Bowl:

    a. Standards: ASME A112.19.2/CSA B45.1 and ASME A112.19.5.
    b. Material: Vitreous china.
    c. Type: Siphon jet.
    d. Style: Flushometer valve.
    e. Height: ADA.
    f. Rim Contour: Elongated.
    g. Water Consumption: 1.28 gal. per flush.
    h. Spud Size and Location: NPS 1-1/2 (DN 40); top.
    i. Color: White.

3. Bowl-to-Drain Connecting Fitting: ASTM A 1045 or ASME A112.4.3.
4. Flushometer Valve: Sensor operated with override push button, Included with fixture.
5. Toilet Seat: included with fixture.
6. Support : Heavy duty, commercial.

    a. Standard: ASME A112.6.1M.
    b. Description: Waste-fitting assembly as required to match drainage piping material and arrangement with faceplates, couplings gaskets, and feet; bolts and hardware matching fixture. Include additional extension coupling, faceplate, and feet for installation in wide pipe space.

2.2 TOILET SEATS

A. Toilet Seats:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. American Standard America.
    b. Bemis Manufacturing Company.
    c. Church Seats.
    d. Olsonite Seat Co.
    e. Sperzel of Lexington.
    f. TOTO USA, INC.
    g. Zurn Industries, LLC; Commercial Brass and Fixtures.

2. Standard: IAPMO/ANSI Z124.5.
3. Material: Plastic.
4. Type: Commercial (Heavy duty).
5. Shape: Elongated rim, open front.
6. Hinge: Check.
7. Hinge Material: Noncorroding metal.

8. Seat Cover: Not required.
9. Color: White.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before water-closet installation.

B. Examine walls and floors for suitable conditions where water closets will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Water-Closet Installation:

1. Install level and plumb according to roughing-in drawings.
2. Install accessible, wall-mounted water closets at mounting height for handicapped/elderly, according to ICC/ANSI A117.1.

B. Support Installation:
1. Use carrier supports with waste-fitting assembly and seal.
2. Install wall-mounted, back-outlet water-closet supports with waste-fitting assembly and waste-fitting seals; and affix to building substrate.

C. Flushometer-Valve Installation:

1. Install flushometer-valve, water-supply fitting on each supply to each water closet.
2. Attach supply piping to supports or substrate within pipe spaces behind fixtures.
3. Install actuators in locations that are easy for people with disabilities to reach.
4. Install fresh batteries in battery-powered, electronic-sensor mechanisms.

D. Install toilet seats on water closets.

E. Joint Sealing:

1. Seal joints between water closets and walls and floors using sanitary-type, one-part, mildew-resistant silicone sealant.
2. Match sealant color to water-closet color.
3. Comply with sealant requirements specified in Division 07 Section "Security Joint Sealants."

3.3 CONNECTIONS

A. Connect water closets with water supplies and soil, waste, and vent piping. Use size fittings required to match water closets.

B. Comply with water piping requirements specified in Division 22 Section "Domestic Water Piping."

C. Comply with soil and waste piping requirements specified in Division 22 Section "Sanitary Waste and Vent Piping."

D. Where installing piping adjacent to water closets, allow space for service and maintenance.

3.4 ADJUSTING

A. Operate and adjust water closets and controls. Replace damaged and malfunctioning water closets, fittings, and controls.

B. Adjust water pressure at flushometer valves to produce proper flow.

C. Install fresh batteries in battery-powered, electronic-sensor mechanisms.

3.5 CLEANING AND PROTECTION

A. Clean water closets and fittings with manufacturers' recommended cleaning methods and materials.

B. Install protective covering for installed water closets and fittings.

C. Do not allow use of water closets for temporary facilities unless approved in writing by Owner.

END OF SECTION 221413.13

SECTION 22 42 16.13 - COMMERCIAL LAVATORIES

Part 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Lavatories.

2. Faucets.

B. Related Requirements:
1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for lavatories.

2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: Include diagrams for power, signal, and control wiring of automatic faucets.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Counter cutout templates for mounting of counter-mounted lavatories.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For lavatories and faucets to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 LAVATORY

A. Lavatory: Ledge back, vitreous china, wall mounted.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. American Standard America.

    b. Briggs Plumbing Products, Inc.

    c. Crane Plumbing, L.L.C.

    d. Mansfield Plumbing Products LLC.

    e. Or equal

2. Fixture:

    a. Standard: ASME A112.19.2/CSA B45.2.

    b. Type: For wall hanging.

    c. Nominal Size: 19 inches by 17 inches

    d. Faucet-Hole Punching: Three holes, 8-inch centers.

    e. Faucet-Hole Location: Top.

    f. Color: Bone.

    g. Mounting Material: concealed arms.

3. Faucet: Manual-type, commercial, solid-brass valve.

4. Support: ASME A112.6.1M, Type II, concealed-arm lavatory carrier with escutcheons.

2.2 LAMINAR-FLOW, FAUCET-SPOUT OUTLETS

A. NSF Standard: Comply with NSF/ANSI 61 Annex G, "Drinking Water System Components - Health Effects," for faucet-spout-outlet materials that will be in contact with potable water.

B. Description: Chrome-plated-brass, faucet-spout outlet that produces non-aerating, laminar stream. Include external or internal thread that mates with faucet outlet for attachment to faucets where indicated and flow-rate range that includes flow of faucet.

2.3 SUPPLY FITTINGS

A. NSF Standard: Comply with NSF/ANSI 61 Annex G, "Drinking Water System Components - Health Effects," for supply-fitting materials that will be in contact with potable water.

B. Standard: ASME A112.18.1/CSA B125.1.

C. Supply Piping: Chrome-plated-brass pipe or chrome-plated copper tube matching water-supply piping size. Include chrome-plated-brass or stainless-steel wall flange.

D. Supply Stops: Chrome-plated-brass, one-quarter-turn, ball-type or compression valve with inlet connection matching supply piping.

E. Operation: Wheel handle.

F. Risers:

1. NPS 1/2.

2. Chrome-plated, rigid-copper-pipe riser.

2.4 WASTE FITTINGS

A. Standard: ASME A112.18.2/CSA B125.2.

B. Drain: Grid type with NPS 1-1/2 offset and straight tailpiece.

C. Trap:

1. Size: NPS 1-1/2.

2. Material: Chrome-plated, two-piece, cast-brass trap and swivel elbow with 0.032-inch-thick brass tube to wall; and chrome-plated, brass or steel wall flange.

3. Material: Stainless-steel, two-piece trap and swivel elbow with 0.012-inch- thick stainless-steel tube to wall; and stainless-steel wall flange.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before lavatory installation.

B. Examine counters and walls for suitable conditions where lavatories will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install lavatories level and plumb according to roughing-in drawings.

B. Install supports, affixed to building substrate, for wall-mounted lavatories.

C. Install accessible wall-mounted lavatories at handicapped/elderly mounting height for people with disabilities or the elderly, according to ICC/ANSI A117.1.

D. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 22 05 18 "Escutcheons for Plumbing Piping."

E. Seal joints between lavatories, counters, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 07 92 00 – Joint Sealants.

F. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible lavatories. Comply with requirements in Section 22 07 19 – Plumbing Piping Insulation.

3.3 CONNECTIONS

A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

B. Comply with water piping requirements specified in Section 22 11 16 – Domestic Water Piping.

C. Comply with soil and waste piping requirements specified in Section 22 13 16 – Sanitary Waste and Vent Piping.

3.4 ADJUSTING

A. Operate and adjust lavatories and controls. Replace damaged and malfunctioning lavatories, fittings, and controls.

B. Adjust water pressure at faucets to produce proper flow.

C. Install fresh batteries in battery-powered, electronic-sensor mechanisms.

3.5 CLEANING AND PROTECTION

A. After completing installation of lavatories, inspect and repair damaged finishes.

B. Clean lavatories, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.

C. Provide protective covering for installed lavatories and fittings.

D. Do not allow use of lavatories for temporary facilities unless approved in writing by Owner.

END OF SECTION 22 42 16.13

SECTION 22 42 16.16 - COMMERCIAL SINKS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Service sinks.
2. Clinic Sinks
3. Hand wash Sinks
4. Kitchen sinks
5. Laminar-flow, faucet-spout outlets.
6. Supply fittings.
7. Waste fittings.

B. Related Requirements:
1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for sinks.
2. Include rated capacities, operating characteristics, and furnished specialties and accessories.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Counter cutout templates for mounting of counter-mounted lavatories.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For sinks to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

PART 2 - PRODUCTS

2.1 SERVICE SINKS

A. Service Sinks: Enameled, cast iron, floor mounted.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. American Standard America.

b. Commercial Enameling Co.

c. Kohler Co.

d. Or equal

2. Fixture:

a. Standard: ASME A112.19.1/CSA B45.2.

b. Style: With front apron and raised back.

c. Nominal Size: 28 by 28 inches.

d. Color: White.

e. Drain: Grid with NPS 2 outlet.

f. Rim Guard: Coated wire.

2.2 CLINIC SINKS

A. Clinic Sinks P-2G: Wall mounted.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

e. American Standard America.

f. Kohler Co.

g. Zurn Industries LLC.

h. Or equal

2. Fixture: Back-outlet, vitreous-china, blowout-type, flushing-rim, service sink.

    a. Standard: ASME A112.19.2/CSA B45.1.
    b. Nominal Size: 25 by 20 inches.
    c. Outlet Size: NPS 3.
    d. Color: White.
    e. Rim Guard: Stainless steel, on front.

3. Flushometer Valve: Sloan Royal 117 or approved equal included with fixture.
4. Faucet: Self Closing, double pedal valve, screwdriver stops, wall mounted included with fixture.
5. Support: ASME A112.61M, Type IV sink carrier.

2.3 HANDWASH SINKS

A. Handwash Sink P-2F: Stainless steel, wall mounted.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. AERO Manufacturing C, model HSEF.

    b. Commercial Enameling Co.

    c. Kohler Co.

    d. Or equal

2. Fixture:

    a. Standards: ASME A112.19.3/CSA B45.4 and NSF/ANSI 2.
    b. Type: Basin with radius corners, back for faucet, and support brackets.
    c. Nominal Size: 17 by 16 by 5 inches.

3. Faucet: Standard manufacturer’s faucet supplied with sink.
4. Supply Fittings: Comply with requirements in "Supply Fittings" Article.
5. Waste Fittings: Comply with requirements in "Waste Fittings" Article.
6. Support: ASME A112.6.1M, Type II, sink carrier.

2.4 KITCHEN SINKS

A. Kitchen Sinks P-2C: Sink basin provided under architectural work.

1. Faucet: SF-1.
2. Supply Fittings: Comply with requirements in "Supply Fittings" Article.
3. Waste Fittings: Comply with requirements in "Waste Fittings" Article, except include continuous waste for multibowl sinks.

    a. Disposer: Not required.
    b. Dishwasher Air-Gap Fitting: Not required.
    c. Hot-Water Dispenser: Not required.

B. Kitchen Sinks P-2D: Sink basin provided under architectural work .

1. Faucet: SF-2.
2. Supply Fittings: Comply with requirements in "Supply Fittings" Article.
3. Waste Fittings: Comply with requirements in "Waste Fittings" Article, except include continuous waste for multibowl sinks.

    a. Disposer: Not required.
    b. Dishwasher Air-Gap Fitting: Not required.
    c. Hot-Water Dispenser: Not required.

C. Kitchen Sinks P-2E: Sink basin provided under architectural work .

1. Faucet: SF-3.
2. Supply Fittings: Comply with requirements in "Supply Fittings" Article.
3. Waste Fittings: Comply with requirements in "Waste Fittings" Article, except include continuous waste for multibowl sinks.

    a. Disposer: Not required.
    b. Dishwasher Air-Gap Fitting: Not required.
    c. Hot-Water Dispenser: Not required.

D. Kitchen Sinks P-2G: One bowl, counter mounted, stainless steel.

1. Stainless-Steel Kitchen Sinks:

2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    e. Elkay Manufacturing Co.

    f. Julien Inc..

    g. Just Manufacturing Co.

    h. Or equal

3. Fixture:
    a. Standard: ASME A112.19.3/CSA B45.4 for stainless-steel kitchen sinks.
    b. Overall Dimensions: 37 inch by 19 ½ inch.
    c. Metal Thickness: 0.038 inch.
    d. Bowl:

        1) Dimensions: 36 inch by 18 inch.
        2) Drain: 3-1/2-inch grid.

            a) Location: Near back of bowl.

4. Faucet: SF-1.
5. Supply Fittings: Comply with requirements in "Supply Fittings" Article.
6. Waste Fittings: Comply with requirements in "Waste Fittings" Article.

    a. Disposer: Not required.
    b. Dishwasher Air-Gap Fitting: Not required.
    c. Hot-Water Dispenser: Not required.

2.5 SINK FAUCETS

A. NSF Standard: Comply with NSF/ANSI 61 Annex G, "Drinking Water System Components - Health Effects," for faucet-spout materials that will be in contact with potable water.

A. Sink Faucets: SF-1 Manual type, two-wrist blade handle with mixing valve.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Elkay Manufacturing Co., model LK 800 AT 10
   b. Chicago faucets

   c. Just Manufacturing Co.

   d. Or equal

2. Commercial, Solid-Brass Faucets.
3. Standard: ASME A112.18.1/CSA B125.1.
4. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and sink receptor.
5. Body Type: Widespread.
6. Body Material: Commercial, solid brass.
7. Finish: Polished chrome plate.
8. Maximum Flow Rate: 2.2 gpm.
9. Handle(s): Wrist blade, 4 inches.
10. Mounting Type: Deck, concealed.
11. Spout Type: Swing, shaped tube.
12. Vacuum Breaker: Not required for hose outlet.
13. Spout Outlet: Aerator.

B. Sink Faucets: SF-2 Manual type, two-wrist blade handle with mixing valve.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   e. Elkay Manufacturing Co., model LK800 GN
   f. Chicago faucets

   g. Just Manufacturing Co.

   h. Or equal

2. Commercial, Solid-Brass Faucets.
3. Standard: ASME A112.18.1/CSA B125.1.
4. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and sink receptor.
5. Body Type: Widespread.
6. Body Material: Commercial, solid brass.
7. Finish: Polished chrome plate.
8. Maximum Flow Rate: 2.2 gpm.
9. Handle(s): Wrist blade, 6 inches.

10. Mounting Type: Deck, concealed.
11. Spout Type: Swivel gooseneck.
12. Vacuum Breaker: Not required for hose outlet.
13. Spout Outlet: Aerator.

C. Sink Faucets SF-3: Manual-operation mixing valve.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   i. Elkay Manufacturing Co.
   j. Chicago faucets, model 625-LPABRCF for foot pedal

   k. Just Manufacturing Co.

   l. Or equal
2. Standard: ASME A112.18.1/CSA B125.1.
3. Configuration: Hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and sink receptor.
4. Body Type: Single hole.
5. Body Material: Solid brass.
6. Finish: Chrome plated.
7. Maximum Flow Rate: 2.2 gpm.
8. Control: Foot pedal.
9. Mounting Type: Deck, exposed.
10. Spout Type: Swivel, gooseneck.
11. Vacuum Breaker: Not required for hose outlet.
12. Spout Outlet: Aerator.

D. Sink Faucets: SF-4 Manual type, two- -handle utility faucet.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   m. American Standard America.
   n. Fiat products, model 830 A-A

   o. Or equal

2. Commercial, Solid-Brass Faucets.
3. Standard: ASME A112.18.1/CSA B125.1.
4. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and sink receptor.
5. Body Type: Widespread.
6. Body Material: Commercial, solid brass.
7. Finish: Polished chrome plate.
8. Maximum Flow Rate: 2.2 gpm.
9. Handle(s): Cross, four arm.
10. Mounting Type: Back/wall, exposed.
11. Spout Type: Rigid, solid brass, with adjustable wall brace and pail hook.
12. Vacuum Breaker: Required for hose outlet.
13. Spout Outlet: Hose thread according to ASME B1.20.7.

2.6 SUPPLY FITTINGS

A. NSF Standard: Comply with NSF/ANSI 61 Annex G, "Drinking Water System Components - Health Effects," for supply-fitting materials that will be in contact with potable water.

B. Standard: ASME A112.18.1/CSA B125.1.

C. Supply Piping: Chrome-plated brass pipe or chrome-plated copper tube matching water-supply piping size. Include chrome-plated brass or stainless-steel wall flange.

D. Supply Stops: Chrome-plated brass, one-quarter-turn, ball-type or compression valve with inlet connection matching supply piping.

E. Operation: Wheel handle.

F. Risers:

1. NPS 1/2.

2. Chrome-plated, rigid-copper pipe.

2.7 WASTE FITTINGS

A. Standard: ASME A112.18.2/CSA B125.2.

B. Drain: Grid type with NPS 1-1/2 offset and straight tailpiece.

C. Trap:

1. Size: NPS 1-1/2.

2. Material: Chrome-plated, two-piece, cast-brass trap and swivel elbow with 0.032-inch-thick brass tube to wall; and chrome-plated brass or steel wall flange.

3. Material: Stainless-steel, two-piece trap and swivel elbow with 0.012-inch thick stainless-steel tube to wall; and stainless-steel wall flange.

2.8 GROUT

A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before sink installation.

B. Examine walls, floors, and counters for suitable conditions where sinks will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install sinks level and plumb according to roughing-in drawings.

B. Install supports, affixed to building substrate, for wall-hung sinks.

C. Install accessible wall-mounted sinks at handicapped/elderly mounting height according to ICC/ANSI A117.1.

D. Set floor-mounted sinks in leveling bed of cement grout.

E. Install water-supply piping with stop on each supply to each sink faucet.

1. Exception: Use ball or gate valves if supply stops are not specified with sink. Comply with valve requirements specified in Section 22 05 23 General Duty valves for Plumbing Piping.

2. Install stops in locations where they can be easily reached for operation.

F. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 22 05 18 "Escutcheons for Plumbing Piping."

G. Seal joints between sinks and counters, floors, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 07 92 00 – Joint Sealants.

H. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible sinks. Comply with requirements in Section 22 07 19 – Plumbing Piping Insulation.

3.3 CONNECTIONS

A. Connect sinks with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

B. Comply with water piping requirements specified in Section 22 11 16 – Domestic Water Piping.

C. Comply with soil and waste piping requirements specified in Section 22 13 16 – Sanitary Waste and Vent Piping.

3.4 ADJUSTING

A. Operate and adjust sinks and controls. Replace damaged and malfunctioning sinks, fittings, and controls.

B. Adjust water pressure at faucets to produce proper flow.

3.5 CLEANING AND PROTECTION

A. After completing installation of sinks, inspect and repair damaged finishes.

B. Clean sinks, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.

C. Provide protective covering for installed sinks and fittings.

D. Do not allow use of sinks for temporary facilities unless approved in writing by Owner.

END OF SECTION 22 42 16.16

SECTION 22 42 23 – COMMERCIAL SHOWER FAUCET

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Shower faucets.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for showers.
2. Include rated capacities, operating characteristics, and furnished specialties and accessories.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For shower faucets to include in maintenance manuals.

PART 2 - PRODUCTS

A. Individual Faucets Servicing Showers P-7:
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Crane Plumbing, L.L.C,/Fiat Products.
b. Florestone Products Co.
c. Kohler Co.
2. General: A**ccessible** shower enclosure with faucet and receptor.
3. Standard: ANSI Z124.1.2.
4. Type: One-piece unit.
5. Style: Handicapped/wheelchair.
6. Faucet: Shower Faucets SF-1.
7. Nominal Size and Shape: 36 by 36 inches square.

8. Color: White.
9. Bathing Surface: Slip resistant according to ASTM F 462.

10. Outlet: Drain with NPS 2.
11. Shower Rod and Curtain: Required.
12. Grab Bar: ASTM F 446, mounted on support area back wall.

2.2 SHOWER FAUCETS

A. NSF Standard: Comply with NSF 61, "Drinking Water System Components - Health Effects," for shower materials that will be in contact with potable water.

B. Shower Faucets SF-1

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. American Standard Companies, Inc. model 1662.601.
    b. Bradley Corporation.
    c. Chicago Faucets.
    d. Delta Faucet Company.
    e. Eljer.
    f. Elkay Manufacturing Co.
    g. Kohler Co.

2. Description: Single-handle pressure-balance valve, ADA compliant, complete package including supply hose and shower head mounting bar. Include hot- and cold-water indicators; check stops; and arm, and flange. Coordinate faucet inlets with supplies and outlet with diverter valve.

    a. Body Material: Solid brass.
    b. Finish: Polished chrome plate.
    c. Diverter Valve: Not required.
    d. Mounting: Concealed.
    e. Operation: Noncompression, manual.
    f. Antiscald Device: Not required.
    g. Check Stops: Check-valve type, integral with or attached to body; on hot- and cold-water supply connections.
    h. Supply Connections: NPS 1/2.

3. Supply Connections: NPS 1/2.
4. Shower Heads:
    a. Basis-of-Design Product: Subject to compliance with requirements, provide Bricor Inc; B110CH-HH or a comparable product.
    b. Description: Shower head.
        1) Finish: Polished chrome plate.
        2) Maximum Flow Rate: 1.1 gpm , unless otherwise indicated.
        3) Shower Head Type: Hand held.
        4) Spray Pattern: Adjustable.

C. Shower Drains: Included.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of water-supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before shower installation.

B. Examine walls and floors for suitable conditions where showers will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Assemble shower components according to manufacturers' written instructions.

B. Install showers level and plumb according to roughing-in drawings.

C. Install water-supply piping with stop on each supply to each shower faucet.

1. Exception: Use ball, gate, or globe valves if supply stops are not specified with shower. Comply with valve requirements specified in Division 22 Section "General-Duty Valves for Plumbing Piping."
2. Install stops in locations where they can be easily reached for operation.

D. Install shower flow-control fittings with specified maximum flow rates in shower arms.

E. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheons requirements specified in Division 22 Section "Escutcheons for Plumbing Piping."

F. Seal joints between showers and floors and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Division 07 Section "Joint Sealants."

3.3 CONNECTIONS

A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

B. Comply with water piping requirements specified in Division 22 Section "Domestic Water Piping."

C. Comply with traps and soil and waste piping requirements specified in Division 22 Section "Sanitary Waste and Vent Piping."

3.4 ADJUSTING

A. Operate and adjust showers and controls. Replace damaged and malfunctioning showers, fittings, and controls.

B. Adjust water pressure at faucets to produce proper flow.

3.5 CLEANING AND PROTECTION

A. After completing installation of showers, inspect and repair damaged finishes.

B. Clean showers, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.

C. Provide protective covering for installed fixtures and fittings.

D. Do not allow use of showers for temporary facilities unless approved in writing by Owner.

END OF SECTION

SECTION 22 46 00 - SECURITY PLUMBING FIXTURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Combination units.
2. Water closets.
3. Lavatories.
4. Drinking fountains.
5. Showers.
6. Service sinks.

B. Related Requirements:

1. Section 224213.13 "Commercial Water Closets."
2. Section 224216.13 "Commercial Lavatories."
3. Section 224216.16 "Commercial Sinks."
4. Section 224223 "Commercial Showers."
5. Section 224713 "Drinking Fountains" for standard drinking fountains.
6. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
7. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners

1.3 DEFINITIONS

A. Accessible Service Space: Service area in secure space behind wall-mounted fixtures.

B. Back-Access Fixture: Security plumbing fixture designed to mount on wall sleeve built into wall or on wall, so installation and removal of fixture, piping, and other components are accessible only from service space behind wall.

C. Front-Access Fixture: Security plumbing fixture designed to mount on wall with installation and removal from fixture side of wall, and with piping and other components accessible only from access panel in fixture.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for security plumbing fixtures.
2. Include rated capacities, operating characteristics, and furnished specialties and accessories.

B. LEED Submittals:

1. Product Data for Prerequisite WE : Documentation indicating flow and water consumption requirements.

C. Shop Drawings: Diagram power, signal, and control wiring.

D. Field quality-control test reports.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For security plumbing fixtures and components to include in maintenance manuals.

PART 2 - PRODUCTS

2.1 COMBINATION UNITS

A. Combination Units P1-C, P1-D and P1-G: Back access, on floor, cabinet, with water closet and lavatory.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Acorn Engineering Company.
b. Bradley Corporation.
c. Metcraft Industries Inc.
d. Willoughby Industries, Inc.,1546

2. Material: 0.078-inch- minimum-thick stainless steel; corrosion-resistant metal for internal piping and bracing.
3. Finish: ASTM A 480/A 480M, No. 4 polished finish on exposed surfaces.
4. Cabinet: Five-sided apron with two angled sides, with backsplash.

a. Water-Closet Bowl Location: Centered on front of apron.
b. Toilet-Paper Holder: Recessed; stainless steel located above water closet and centered in front of apron.

5. Accessories:
a. Bubbler: On backsplash.

6. Mounting: Bolts through wall sleeve into accessible service space.
7. Water Closet:

a. Standard: IAPMO PS 61.
b. Bowl:

1) Type: Elongated, with back inlet, integral trap, and blowout design with back outlet and contoured seat.

2) Seat Surface: ASTM A 480/A 480M, No. 7 polished finish.
3) Outlet Connection: NPS 4 horizontal with cleanout and slip joint.
4) Flushing Device: Concealed air-control, pneumatically operated flushometer valve with stainless-steel access panel, push-button mechanism, and 1.28-gal./flush consumption.

8. Lavatory:

a. Standard: ASME A 112.19.3/CSA B45.4.
b. Location: In top of cabinet.
c. Receptor: Multisided bowl with integral soap depression.
d. Hot- and Cold-Water and Bubbler Supply Valves: Mechanical-metering type with push-button actuation and individual check stops complying with ASME A112.18.1/CSA B125.1.
e. Drain: Integral punched grid with NPS 1-1/4 minimum waste and trap complying with ASME A112.18.2/CSA B125.2.

9. Wall Sleeve: Galvanized-steel frame of dimensions required to match fixture. Include steel bars or other design to prevent escape if fixture is removed.

B. Combination Units P1-E: Back access, on floor, cabinet, with water closet and lavatory.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Acorn Engineering Company.
b. Bradley Corporation.
c. Metcraft Industries Inc.
d. Willoughby Industries, Inc.,1545

2. Material: 0.078-inch- minimum-thick stainless steel; corrosion-resistant metal for internal piping and bracing.
3. Finish: ASTM A 480/A 480M, No. 4 polished finish on exposed surfaces.
4. Cabinet: Two-sided apron with one angled sides, with backsplash.

a. Water-Closet Bowl Location: On angled left side or right side of apron, as indicated on drawings.
b. Toilet-Paper Holder: Recessed; stainless steel located above water closet and centered in front of apron.

5. Accessories:
a. Bubbler: On backsplash.
b. ADA compliant grab-bar welded to fixture.

6. Mounting: Bolts through wall sleeve into accessible service space.
7. Water Closet:

a. Standard: IAPMO PS 61.
b. Bowl:

1) Type: Elongated, with back inlet, integral trap, and blowout design with back outlet and contoured seat.
2) Seat Surface: ASTM A 480/A 480M, No. 7 polished finish.
3) Outlet Connection: NPS 4 horizontal with cleanout and slip joint.
4) Flushing Device: Concealed air-control, pneumatically operated flushometer valve with stainless-steel access panel, push-button mechanism, and 1.28-gal./flush consumption.

8. Lavatory:

a. Standard: ASME A 112.19.3/CSA B45.4.

b. Location: On angled left or right side
c. Receptor: Rectangular bowl.
d. Hot- and Cold-Water and Bubbler Supply Valves: Mechanical-metering type with push-button actuation and individual check stops complying with ASME A112.18.1/CSA B125.1.
e. Drain: Integral punched grid with NPS 1-1/4 minimum waste and trap complying with ASME A112.18.2/CSA B125.2.

9. Wall Sleeve: Galvanized-steel frame of dimensions required to match fixture. Include steel bars or other design to prevent escape if fixture is removed.

C. Combination Units P1-F: Back access, on floor, cabinet, with water closet and lavatory.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Acorn Engineering Company.
b. Bradley Corporation.
c. Metcraft Industries Inc.
d. Willoughby Industries, Inc., model 3696
2. Material: 0.078-inch- minimum-thick stainless steel; corrosion-resistant metal for internal piping and bracing.
3. Finish: ASTM A 480/A 480M, No. 4 polished finish on exposed surfaces.
4. Cabinet: Rectangular apron with backsplash and integral soap depression.

a. Water-Closet Bowl Location: Centered on front of apron.
b. Toilet-Paper Holder: Recessed; stainless steel located on right side of apron.

5. Accessories:
a. Bubbler: On backsplash.

6. Mounting: Bolts through wall sleeve into accessible service space.
7. Water Closet:

a. Standard: IAPMO PS 61.
b. Bowl:

1) Type: Elongated, with back inlet, integral trap, and blowout design with back outlet and contoured seat.
2) Seat Surface: ASTM A 480/A 480M, No. 7 polished finish.
3) Outlet Connection: NPS 4 horizontal with cleanout and slip joint.
4) Flushing Device: Concealed air-control, pneumatically operated flushometer valve with stainless-steel access panel, push-button mechanism, and 1.28-gal./flush consumption.

8. Lavatory:

a. Standard: ASME A 112.19.3/CSA B45.4.

b. Location: On top of cabinet.
c. Receptor: Oval bowl.
d. Hot- and Cold-Water and Bubbler Supply Valves: Mechanical-metering type with push-button actuation and individual check stops complying with ASME A112.18.1/CSA B125.1.

e. Drain: Integral punched grid with NPS 1-1/4 minimum waste and trap complying with ASME A112.18.2/CSA B125.2.

9. Wall Sleeve: Galvanized-steel frame of dimensions required to match fixture. Include steel bars or other design to prevent escape if fixture is removed.

2.2 STAINLESS-STEEL WATER CLOSETS

A. Water Closets P-1B: Front access, on floor, back outlet, extended bowl.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Acorn Engineering Company, model 1675, or approved equal.
b. Bradley Corporation.
c. Metcraft Industries Inc.
d. Willoughby Industries Inc.model ETWS-1490-HET-FM-HC,
e. Standard: IAPMO PS 61.

2. Material: 0.078-inch- (2.0-mm-) minimum-thick stainless steel; corrosion-resistant metal for internal piping and bracing.
3. Finish: ASTM A 480/A 480M, No. 4 polished finish on exposed surfaces.
4. Bowl:

a. Type: Elongated, with back inlet, integral trap, and siphon-jet design with back outlet, contoured seat, and access panel.
b. Length to Wall: Minimum of 25 inches.
c. Back-Outlet Connection: NPS 4 (DN 100), horizontal with cleanout and slip joint.
d. Seat Surface: ASTM A 480/A 480M, No. 7 polished finish.

5. Mounting: Bolts from fixture-mounted flanges into wall.
6. Flushometer Valve: Standard, 1.28 gal. per flush, included with fixture.
7. Toilet Seat: Not required.
8. Wall Sleeve: Galvanized-steel frame of dimensions required to match fixture. Include steel bars or other design to prevent escape if fixture is removed.

2.3 STAINLESS-STEEL LAVATORIES

A. Lavatories P-2A: Front access.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Acorn Engineering Company, model 1652FALRB or approved equal.
b. Bradley Corporation.
c. Metcraft Industries Inc.
d. Willoughby Industries, Inc.

2. Fixture:

a. Standard: IAPMO PS 61.
b. Material: 0.078-inchminimum-thick stainless steel; corrosion-resistant metal for internal piping and bracing.
c. Finish: ASTM A 480/A 480M, No. 4 polished finish on exposed surfaces.
d. Receptor: Rectangular bowl with integral soap depression, backsplash, and access panel.

e. Hot- and Cold-Water and Bubbler Supply Valves: Mechanical-metering type with push-button actuation, individual check stops, and deck-mounted filler spouts complying with ASME A112.18.1/CSA B125.1.
f. Drain: Integral punched grid with NPS 1-1/4 minimum horizontal waste and trap complying with ASME A112.18.2/CSA B125.2.

3. Accessories:
   a. Bubbler Location: On deck.

4. Mounting: Bolts from fixture-mounted flanges into wall.

B. Lavatories P-2B: Front access.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Acorn Engineering Company, model 1652FALRB or approved equal.
   b. Bradley Corporation.
   c. Metcraft Industries Inc.
   d. Willoughby Industries, Inc.
2. Fixture:

   a. Standard: IAPMO PS 61.
   b. Material: 0.078-inchminimum-thick stainless steel; corrosion-resistant metal for internal piping and bracing.
   c. Finish: ASTM A 480/A 480M, No. 4 polished finish on exposed surfaces.
   d. Receptor: Oval bowl with integral soap depression, backsplash, and access panel.
   e. Hot- and Cold-Water and Bubbler Supply Valves: Mechanical-metering type with push-button actuation, individual check stops.
   f. Drain: Integral punched grid with NPS 1-1/4 minimum horizontal waste and trap complying with ASME A112.18.2/CSA B125.2.

3. Accessories:
   a. Bubbler Location: On backsplash.

4. Mounting: Bolts from fixture-mounted flanges into wall.

2.4 DRINKING FOUNTAINS

A. Drinking Fountains : Back access.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Acorn Engineering Company, model 1652FALRB or approved equal.
   b. Bradley Corporation.
   c. Metcraft Industries Inc.
   d. Willoughby Industries, Inc.
2. Fixture:

   a. Standard: ASME A112.19.3/CSA B45.4.
   b. Material: 0.078-inch- minimum-thick stainless steel; corrosion-resistant metal for internal piping and bracing.
   c. Finish: ASTM A 480/A 480M, No. 4 polished finish on exposed surfaces.
   d. Receptor: Bowl with backsplash.
   e. Bubbler Supply Valve: Push-button actuation.

f. Bubbler: Hemispherical, vandal and suicide resistant.
g. Drain: Integral punched grid with NPS 1-1/4 tailpiece.

3. Waste Fittings: NPS 1-1/4 minimum waste and trap complying with ASME A112.18.2/CSA B125.2.
4. Mounting: Bolts through wall into accessible service space.
5. Wall Sleeve: Galvanized-steel frame of dimensions required to match fixture.

2.5 SHOWERS

A. Showers P-5: Back access, recessed.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Acorn Engineering Company.
b. Bradley Corporation.
c. Metcraft Industries Inc.
d. Willoughby Industries, Inc., model WRS-BF-FA-2HD

2. Fixture:

a. Standard: ASME A112.19.3/CSA B45.4.
b. Material: 0.078-inch- minimum-thick stainless steel; corrosion-resistant metal for internal piping and bracing.
c. Finish: ASTM A 480/A 480M, No. 4 polished finish on exposed surfaces.
d. Type and Configuration: Wall, with showerhead and soap dish.
e. Tempered-Water Supply Valves: Mechanical-metering type with individual check stops complying with ASME A112.18.1/CSA B125.1.
f. Shower: Two Vandal-resistant, fixed-type heads.
g. Soap Dish: Recessed, stainless steel.

3. Mounting: Bolts through wall sleeve into accessible service space.
4. Wall Sleeve: Galvanized-steel frame of dimensions required to match fixture.

2.6 SERVICE SINKS

A. Service Sinks P-4B: Back access, on floor.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Acorn Engineering Company, model 1630.
b. Bradley Corporation.
c. Metcraft Industries Inc.
d. Willoughby Industries, Inc.

2. Fixture:

a. Standard: ASME A112.19.3/CSA B45.4.
b. Material: 0.078-inch- minimum-thick stainless steel; corrosion-resistant metal for internal piping and bracing.
c. Finish: ASTM A 480/A 480M, No. 4 polished finish on exposed surfaces.
d. Receptor: Squarer bowl with high backsplash.
e. Nominal Size: 24 by 24 inches.
f. Faucet: Two handle, 8 inch centerset wall mounted utility faucet with pail hook, wall brace and threaded spout supplied with service sink.

g. Drain: Grid with NPS 2 outlet.

3. Waste Fittings: NPS 2 elbow waste complying with ASME A112.18.2/CSA B125.2.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before fixture installation.

B. Examine walls and floors for suitable conditions where fixtures will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install security plumbing fixtures level and plumb according to roughing-in drawings.

B. Install back-access, stainless-steel fixtures as follows:

1. Install wall sleeve in wall if indicated.
2. Install fixture on wall sleeve or wall, as indicated, with access from accessible service space.
3. Extend supply piping from service space to fixture.
4. Install soil and waste piping from fixture and extend into service space.
5. Install fixture trap in service space instead of below fixture drain.

C. Install fixture outlets with gasket seals.

D. Install fixtures designated "accessible" according to ICC A117.1 for heights, dimensions, and clearances.

E. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible fixtures. Comply with requirements in Section 220719 "Plumbing Piping Insulation."

F. Seal joints between fixtures, floors, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 7 "SecurityJoint Sealants."

G. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."

3.3 CONNECTIONS

A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

B. Comply with requirements for water piping specified in Section 221116 "Domestic Water Piping."

C. Comply with requirements for soil and waste drainage piping specified in Section 221316 "Sanitary Waste and Vent Piping."

3.4 ADJUSTING

A. Operate and adjust flushometer valves and flow-control valves on fixtures.

3.5 CLEANING AND PROTECTION

A. After installing fixtures, inspect and repair damaged finishes.

B. Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.

C. Provide protective covering for installed fixtures and fittings.

D. Do not allow use of fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 224600

SECTION 22 47 13 - DRINKING FOUNTAINS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following water coolers and related components:

1. Pressure water coolers.

B. Related Requirements:
1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 DEFINITIONS

A. Accessible Water Cooler: Fixture that can be approached and used by people with disabilities.

B. Fitting: Device that controls flow of water into or out of fixture.

C. Fixture: Drinking fountain or water cooler unless one is specifically indicated.

D. Water Cooler: Electrically powered fixture for generating and delivering cooled drinking water.

1.4 SUBMITTALS

A. Product Data: For each fixture indicated. Include rated capacities, furnished specialties, and accessories.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Operation and Maintenance Data: For fixtures to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities"; Public Law 90-480, "Architectural Barriers Act"; and Public Law 101-336, "Americans with Disabilities Act"; for fixtures for people with disabilities.

C. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.

D. ASHRAE Standard: Comply with ASHRAE 34, "Designation and Safety Classification of Refrigerants," for water coolers. Provide HFC 134a (tetrafluoroethane) refrigerant, unless otherwise indicated.

PART 2 - PRODUCTS

2.1 PRESSURE WATER COOLERS

A. Pressure Water Coolers: Wall mounted, wheelchair accessible.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Elkay Manufacturing Co. model EHWM217C or comparable product by one of the following:
a. Elkay model VRCTL 8SC.
b. Halsey Taylor.
c. Haws Corporation.
d. Or approved equal.

2. Cabinet: Bi-level with two attached cabinets, vinyl-covered steel with stainless-steel top.

3. Bubbler: One, with adjustable stream regulator, located on each cabinet deck.

4. Control: Push buttons.

5. Drain: Grid with NPS 1-1/4 tailpiece.

6. Supply: NPS 3/8 with shutoff valve.

7. Waste Fitting: ASME A112.18.2/CSA B125.2, NPS 1-1/4 brass P-trap.

8. Cooling System: Electric, with hermetically sealed compressor, cooling coil, air-cooled condensing unit, corrosion-resistant tubing, refrigerant, corrosion-resistant-metal storage tank, and adjustable thermostat.

a. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for water and waste piping systems to verify actual locations of piping connections before fixture installation. Verify that sizes and locations of piping and types of supports match those indicated.

B. Examine walls and floors for suitable conditions where fixtures are to be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

A. Use mounting frames for recessed water coolers, unless otherwise indicated.

B. Use chrome-plated brass or copper tube, fittings, and valves in locations exposed to view. Plain copper tube, fittings, and valves may be used in concealed locations.

3.3 INSTALLATION

A. Install off-floor supports affixed to building substrate and attach wall-mounting fixtures, unless otherwise indicated.

B. Install mounting frames affixed to building construction and attach recessed water coolers to mounting frames, unless otherwise indicated.

C. Install fixtures level and plumb. For ADA fixtures, install at height required by authorities having jurisdiction.

D. Install water-supply piping with shutoff valve on supply to each fixture to be connected to water distribution piping. Use ball, gate, or globe valve. Install valves in locations where they can be easily reached for operation. Valves are specified in Section 22 05 23 – General-Duty Valves for Plumbing Piping.

E. Install trap and waste piping on drain outlet of each fixture to be connected to sanitary drainage system.

F. Install pipe escutcheons at wall penetrations in exposed, finished locations. Use deep-pattern escutcheons where required to conceal protruding pipe fittings. Escutcheons are specified in Division 22 Section "Escutcheons for Plumbing Piping."

G. Seal joints between fixtures and walls and floors using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color. Sealants are specified in Section 07 92 00 – Joint Sealants.

3.4 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.5 FIELD QUALITY CONTROL

A. Water Cooler Testing: After electrical circuitry has been energized, test for compliance with requirements. Test and adjust controls and safeties.

1. Remove and replace malfunctioning units and retest as specified above.

2. Report test results in writing.

3.6 ADJUSTING

A. Adjust fixture flow regulators for proper flow and stream height.

B. Adjust water cooler temperature settings.

3.7 CLEANING

A. After completing fixture installation, inspect unit. Remove paint splatters and other spots, dirt, and debris. Repair damaged finish to match original finish.

B. Clean fixtures, on completion of installation, according to manufacturer's written instructions.

END OF SECTION 22 47 13

SECTION 22 61 13 - COMPRESSED-AIR PIPING FOR LABORATORY AND HEALTHCARE FACILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Medical compressed-air piping, designated "medical air."
2. Dental compressed-air piping, designated "dental air."
3. Gas-powered-tool compressed-air piping, designated "instrument air."
4. Healthcare laboratory compressed-air piping, designated "medical laboratory air."
5. Compressed-air piping and specialties for nonmedical laboratory facilities, designated "laboratory air."

B. Related Requirements:

1. Section 115313 "Laboratory Fume Hoods" for compressed-air outlets in laboratory fume hoods.
2. Section 123553 "Laboratory Casework" for compressed-air outlets in laboratory casework.
3. Section 123570 "Healthcare Casework" for compressed-air outlets in healthcare casework.
4. Section 221513 "General-Service Compressed-Air Piping" for general-service compressed-air piping and specialties.
5. Section 226119 "Compressed-Air Equipment for Laboratory and Healthcare Facilities" for air compressors and specialties.
6. Section 226400 "Medical Gas Alarms" for combined medical air, vacuum, and gas alarms.

1.3 DEFINITIONS

A. Medical compressed-air piping systems include medical air, dental air, instrument air, and medical laboratory air.

B. Nonmedical compressed-air piping systems include laboratory air piping systems.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For [**Installer**] [**and**] [**testing agency**].

B. Seismic Qualification Certificates: For medical compressed-air manifolds, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Material Certificates: Signed by Installer certifying that medical compressed-air piping materials comply with requirements in NFPA 99 for positive-pressure medical gas systems.

D. Brazing certificates.

E. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For compressed-air piping specialties to include in emergency, operation, and maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Quick-Coupler Service Connections: Furnish complete noninterchangeable medical compressed-air pressure outlets.

a. Medical Air: Equal to <**Insert number**> percent of amount installed, but no fewer than <**Insert number**> units.
b. Instrument Air: Equal to <**Insert number**> percent of amount installed, but no fewer than <**Insert number**> units.

2. D.I.S.S. Service Connections: Furnish complete medical compressed-air pressure outlets complying with CGA V-5.

a. Medical Air D.I.S.S. No. 1160: Equal to <**Insert number**> percent of amount installed, but no fewer than <**Insert number**> units.
b. Instrument Air D.I.S.S. No. 1160: Equal to <**Insert number**> percent of amount installed, but no fewer than <**Insert number**> units.

1.8 QUALITY ASSURANCE

A. Installer Qualifications:

1. Medical Air Piping Systems for Healthcare Facilities: According to ASSE Standard #6010 for medical-gas-system installers.
2. Shape-Memory-Metal Coupling Joints: An authorized representative who is trained and approved by manufacturer.

B. Testing Agency Qualifications: An independent testing agency, with the experience and capability to conduct the vacuum piping testing indicated, that is[**a member of the Medical Gas Professional Healthcare Organization or is**] an NRTL, and that is acceptable to authorities having jurisdiction.

1. Qualify testing personnel according to ASSE Standard #6020 for medical-gas-system inspectors and ASSE Standard #6030 for medical-gas-system verifiers.

C. Brazing: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code, Section IX, "Welding and Brazing Qualifications"; or AWS B2.2, "Standard for Brazing Procedure and Performance Qualification."

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Medical air operating at [**50 to 55 psig (345 to 380 kPa)**] <**Insert values**>.

B. Dental air operating at [**80 to 100 psig (550 to 690 kPa)**] <**Insert values**>.

C. Instrument air operating at [**175 psig (1200 kPa)**] <**Insert value**>.

D. Medical laboratory air operating at [**100 psig (690 kPa)**] <**Insert value**>.

E. Laboratory air operating at [**50 psig (345 kPa)**] [**100 psig (690 kPa)**] [**125 psig (860 kPa)**] <**Insert value**>.

2.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Medical compressed-air manifolds shall withstand the effects of earthquake motions determined according to [**ASCE/SEI 7**] <**Insert requirement**>.

1. The term "withstand" means "the manifold will remain in place without separation of any parts when subjected to the seismic forces specified[**and the manifold will be fully operational after the seismic event**]."
2. Component Importance Factor is [**1.5**] [**1.0**].
3. <**Insert requirements for Component Amplification Factor and Component Response Modification Factor**>.

2.3 PIPES, TUBES, AND FITTINGS

A. Comply with NFPA 99 for medical air piping materials.

B. Comply with ASME B31.1, "Power Piping," for laboratory air piping operating at more than 150 psig (1035 kPa).

C. Comply with ASME B31.9, "Building Services Piping," for laboratory air piping operating at 150 psig (1035 kPa) or less.

D. Copper Medical Gas Tube: ASTM B 819, [**Type K**] [**and**] [**Type L**], seamless, drawn temper, that has been manufacturer cleaned, purged, and sealed for medical gas service or according to CGA G-4.1 for oxygen service. Include standard color marking "OXY," "MED," "OXY/MED," "OXY/ACR," or "ACR/MED" in green for Type K tube and in blue for Type L tube.

E. Wrought-Copper Fittings: ASME B16.22, solder-joint pressure type that has been manufacturer cleaned, purged, and bagged for oxygen service according to CGA G-4.1.

F. Copper Unions: ASME B16.22 or MSS SP-123, wrought-copper or cast-copper alloy.

G. Cast-Copper-Alloy Flanges: ASME B16.24, Class 150.

1. Pipe-Flange Gasket Materials: ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch (3.2-mm) maximum thickness, full-face type.
2. Flange Bolts and Nuts: ASME B18.2.1, carbon steel.

H. Shape-Memory-Metal Couplings:

1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
2. Description: Cryogenic compression fitting made of nickel-titanium, shape-memory alloy, and that has been manufacturer cleaned, purged, and sealed for oxygen service according to CGA G-4.1.

I. Flexible Pipe Connectors:

1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
2. Description: Corrugated-bronze tubing with bronze wire-braid covering and ends brazed to inner tubing.

a. Working-Pressure Rating: [**200 psig (1380 kPa)**] [**250 psig (1725 kPa)**] minimum.
b. End Connections: Plain-end copper tube.

2.4 JOINING MATERIALS

A. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys.

B. Threaded-Joint Tape: PTFE.

2.5 VALVES

A. General Requirements for Valves: Manufacturer cleaned, purged, and bagged according to CGA G-4.1 for oxygen service.

B. Zone-Valve Box Assemblies: Box with medical gas valves, tube extensions, and gages.

1. Zone-Valve Boxes:

a. Steel Box with Aluminum Cover:

1) <Double click here to find, evaluate, and insert list of manufacturers and products.>

b. Steel Box with Stainless-Steel Cover:

1) <Double click here to find, evaluate, and insert list of manufacturers and products.>

c. Description: Formed steel box with cover, anchors for recessed mounting, holes with grommets in box sides for tubing extension protection, and of size for single or multiple valves with pressure gages and in sizes required to permit manual operation of valves.[**Medical air and medical vacuum tubing, valves, and gages may be incorporated in zone valve boxes for medical gases.**]

1) Interior Finish: Factory-applied white enamel.
2) Cover Plate: [**Aluminum**] [**or**] [**stainless-steel**] with frangible or removable windows.
3) Valve-Box Windows: Clear or tinted transparent plastic with labeling that includes rooms served, according to NFPA 99.

C. Ball Valves:

1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
2. Standard: MSS SP-110.
3. Description: Three-piece body, brass or bronze.
4. Pressure Rating: 300 psig (2070 kPa) minimum.
5. Ball: Full-port, chrome-plated brass.
6. Seats: PTFE or TFE.
7. Handle: Lever[**type with locking device**].
8. Stem: Blowout proof with PTFE or TFE seal.
9. Ends: [**Manufacturer-installed ASTM B 819, copper-tube extensions**] [**and**] [**manufacturer-installed ASTM B 819, copper-tube extensions with pressure gage on one copper-tube extension**].

D. Check Valves:

1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
2. Description: In-line pattern, bronze.
3. Pressure Rating: 300 psig (2070 kPa) minimum.
4. Operation: Spring loaded.
5. Ends: Manufacturer-installed ASTM B 819, copper-tube extensions.

E. Safety Valves:

1. Bronze body.
2. ASME-construction, poppet, pressure-relief type.
3. Settings to match system requirements.

F. Pressure Regulators:

1. Bronze body and trim.
2. Spring-loaded, diaphragm-operated, relieving type.
3. Manual pressure-setting adjustment.
4. Rated for [**250-psig (1725-kPa)**] <**Insert value**> minimum inlet pressure.
5. Capable of controlling delivered air pressure within 0.5 psig for each 10-psig (5.0 kPa for each 100-kPa) inlet pressure.

2.6 MEDICAL COMPRESSED-AIR SERVICE CONNECTIONS

A. <Double click here to find, evaluate, and insert list of manufacturers and products.>

B. General Requirements for Medical Compressed-Air Service Connections:

1. Suitable for specific medical air pressure and service listed.
2. Include roughing-in assemblies, finishing assemblies, and cover plates.
3. Individual cover plates are not required if service connection is in multiple unit or assembly with cover plate.
4. Recessed-type units made for concealed piping unless otherwise indicated.

C. Roughing-in Assembly:

1. Steel outlet box for recessed mounting and concealed piping.
2. Brass-body outlet block with secondary check valve that will prevent gas flow when primary valve is removed.
3. Double seals that will prevent air leakage.
4. ASTM B 819, NPS 3/8 (DN 10) copper outlet tube brazed to valve with service marking and tube-end dust cap.

D. Finishing Assembly:

1. Brass housing with primary check valve.
2. Double seals that will prevent air leakage.
3. Cover plate with gas-service label.

E. Quick-Coupler Pressure Service Connections:

1. Outlets for [**medical air**] [**and**] [**instrument air**] with noninterchangeable keyed indexing to prevent interchange between services.
2. Constructed to permit one-handed connection and removal of equipment.
3. With positive-locking ring that retains equipment stem in valve during use.

F. D.I.S.S. Pressure Service Connections: Outlets, complying with CGA V-5, with threaded indexing to prevent interchange between services, constructed to permit one-handed connection and removal of equipment.

1. Medical Air: D.I.S.S. No. 1160.
2. Instrument Air: D.I.S.S. No. 1160.

G. Cover Plates:

1. One piece.
2. [**Aluminum**] [**or**] [**stainless steel**].
3. Permanent, color-coded, identifying label matching corresponding service.

2.7 MEDICAL COMPRESSED-AIR PRESSURE CONTROL PANELS

A. <Double click here to find, evaluate, and insert list of manufacturers and products.>

B. Description:

1. Steel box and support brackets for recessed roughing-in with stainless-steel or anodized-aluminum cover plate with printed operating instructions.
2. Manifold assembly consisting of inlet supply valve, inlet supply pressure gage, line-pressure control regulator, outlet supply pressure gage, D.I.S.S. service connection, and piping outlet for remote service connection.
3. Minimum Working Pressure: [**200 psig (1380 kPa)**] <**Insert value**>.
4. Line-Pressure Control Regulator: Self-relieving diaphragm type with precision manual adjustment.
5. Pressure Gages: 0 to 300 psig (0 to 2070 kPa).
6. Service Connection: CGA V-5, D.I.S.S. No. 1160, instrument air outlet.
7. Before final assembly, provide temporary dust shield and U-tube for testing.
8. Label cover plate "Air Pressure Control."

2.8 MEDICAL COMPRESSED-AIR MANIFOLDS

A. <Double click here to find, evaluate, and insert list of manufacturers and products.>

B. Comply with NFPA 99, Chapter "Manifolds for Gas Cylinders without Reserve Supply."

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. Central Control-Panel Unit:

1. Weatherproof cabinet.
2. Supply and delivery pressure gages.
3. Electrical alarm-system connections and transformer.
4. Indicator lights or devices.
5. Manifold connection.
6. Pressure changeover switch.
7. Line-pressure regulator.
8. Shutoff valves.
9. Safety valve.

E. Manifold and Headers:

1. Duplex, nonferrous-metal header for number of cylinders indicated, divided into two equal banks.
2. Designed for 2000-psig (13.8-MPa) minimum inlet pressure.
3. Cylinder-bank headers with inlet (pigtail) connections complying with CGA V-1.
4. Individual inlet check valves, shutoff valve, pressure regulator, check valve, and pressure gage.

F. Operation: Automatic, pressure-switch-activated changeover from one cylinder bank to the other when first bank becomes exhausted, without line-pressure fluctuation or resetting of regulators and without supply interruption by shutoff of either cylinder-bank header.

G. Mounting: [**Wall with mounting brackets for manifold control cabinet and headers**] [**Floor with support legs for manifold control cabinet**].

H. Label manifold control unit with permanent label identifying compressed air and system operating pressure.

I. Medical Air Manifolds: For [**four**] [**eight**] <**Insert number**> cylinders and [**55-psig (380-kPa)**] <**Insert value**> line pressure.

J. Instrument Air Manifolds: For [**eight**] [**12**] <**Insert number**> cylinders and [**200-psig (1380-kPa)**] <**Insert value**> minimum line pressure.

K. Compressed-Air Cylinders: [**Furnished by Owner**] [**Number and type of compressed-air cylinders required for complete manifold systems**].

2.9 COMPRESSED-AIR-CYLINDER STORAGE RACKS

A. Wall Storage Racks: Fabricate racks with chain restraints for upright cylinders as indicated or provide equivalent manufactured wall racks.

B. Freestanding Storage Racks: Fabricate racks as indicated or provide equivalent manufactured storage racks.

2.10 NITROGEN

A. Comply with USP 32 - NF 27 for oil-free dry nitrogen.

PART 3 - EXECUTION

3.1 PREPARATION

A. Cleaning of Medical Gas Tubing: If manufacturer-cleaned and -capped fittings or tubing is not available or if precleaned fittings or tubing must be recleaned because of exposure, have supplier or separate agency acceptable to authorities having jurisdiction perform the following procedures:

1. Clean medical gas tube and fittings, valves, gages, and other components of oil, grease, and other readily oxidizable materials as required for oxygen service according to CGA G-4.1.
2. Wash medical gas tubing and components in hot, alkaline-cleaner-water solution of sodium carbonate or trisodium phosphate in proportion of 1 lb (0.453 kg) of chemical to 3 gal. (11.3 L) of water.

    a. Scrub to ensure complete cleaning.
    b. Rinse with clean, hot water to remove cleaning solution.

3.2 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of compressed-air piping. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, air-compressor sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Comply with NFPA 99 for installation of compressed-air piping.

C. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal and coordinate with other services occupying that space.

F. Install piping adjacent to equipment and specialties to allow service and maintenance.

G. Install compressed-air piping with 1 percent slope downward in direction of flow.

H. Install nipples, unions, special fittings, and valves with pressure ratings same as or higher than system pressure rating used in applications specified in "Piping Schedule" Article unless otherwise indicated.

I. Install eccentric reducers, if available, where compressed-air piping is reduced in direction of flow, with bottoms of both pipes and reducer fitting flush.

J. Install branch connections to compressed-air mains from top of main. Provide drain leg and drain trap at end of each main and branch and at low points.

K. Install thermometer and pressure gage on discharge piping from each air compressor and on each receiver. Comply with requirements in Section 220519 "Meters and Gages for Plumbing Piping."

L. Install piping to permit valve servicing.

M. Install piping free of sags and bends.

N. Install fittings for changes in direction and for branch connections.

O. Install medical air piping to medical air service connections specified in this Section, to medical air service connections in equipment specified in Section 226313 "Gas Piping for Laboratory and Healthcare Facilities," and to equipment specified in other Sections requiring medical air service.

P. Piping Restraint Installation: Install seismic restraints on compressed-air piping. Seismic-restraint devices are specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

Q. Install compressed-air service connections recessed in walls. Attach roughing-in assembly to substrate; attach finishing assembly to roughing-in assembly.

R. Connect compressed-air piping to air compressors and to compressed-air outlets and equipment requiring compressed-air service.

S. Install unions in copper compressed-air tubing adjacent to each valve and at final connection to each machine, specialty, and piece of equipment.

T. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

U. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.3 VALVE INSTALLATION

A. Install shutoff valve at each connection to and from compressed-air equipment and specialties.

B. Install check valves to maintain correct direction of compressed-air flow from compressed-air equipment.

C. Install valve boxes recessed in wall and anchored to substrate. Single boxes may be used for multiple valves that serve same area or function.

D. Install zone valves and gages in valve boxes. Rotate valves to angle that prevents closure of cover when valve is in closed position.

E. Install pressure regulators on compressed-air piping where reduced pressure is required.

F. Install flexible pipe connectors in discharge piping[**and in inlet air piping from remote air-inlet filter**] of each air compressor.

3.4 JOINT CONSTRUCTION

A. Remove scale, slag, dirt, and debris from outside of cleaned tubing and fittings before assembly.

B. Threaded Joints: Apply appropriate tape to external pipe threads.

C. Brazed Joints: Join copper tube and fittings according to CDA's "Copper Tube Handbook," "Brazed Joints" chapter. Continuously purge joint with oil-free dry nitrogen during brazing.

D. Flanged Joints: Install flange on copper tubes. Use pipe-flange gasket between flanges. Join flanges with gasket and bolts according to ASME B31.9 for bolting procedure.

E. Shape-Memory-Metal Coupling Joints: Join new copper tube to existing tube according to procedures developed by fitting manufacturer for installation of shape-memory-metal coupling joints.

3.5 COMPRESSED-AIR SERVICE COMPONENT INSTALLATION

A. Install compressed-air pressure control panel in walls. Attach to substrate.

B. Install compressed-air manifolds[**on concrete base**] anchored to substrate.

C. Install compressed-air cylinders and connect to manifold piping.

D. Install compressed-air manifolds with seismic restraints as indicated.

E. Install compressed-air-cylinder wall storage racks attached to substrate.

3.6 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment" for seismic-restraint devices.

B. Comply with requirements in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment" for pipe hanger and support devices.

C. Vertical Piping: MSS Type 8 or Type 42, clamps.

D. Individual, Straight, Horizontal Piping Runs:

1. 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel, clevis hangers.
2. Longer Than 100 Feet (30 m): MSS Type 43, adjustable, roller hangers.

E. Multiple, Straight, Horizontal Piping Runs 100 Feet (30 m) or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze. Comply with requirements in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment" for trapeze hangers.

F. Base of Vertical Piping: MSS Type 52, spring hangers.

G. Support horizontal piping within [**12 inches (300 mm)**] <**Insert dimension**> of each fitting and coupling.

H. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch- (10-mm-) minimum rods.

I. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1/4 (DN 8): 60 inches (1500 mm) with 3/8-inch (10-mm) rod.
2. NPS 3/8 and NPS 1/2 (DN 10 and DN 15): 72 inches (1800 mm) with 3/8-inch (10-mm) rod.
3. NPS 3/4 (DN 20): 84 inches (2100 mm) with 3/8-inch (10-mm) rod.
4. NPS 1 (DN 25): 96 inches (2400 mm) with 3/8-inch (10-mm) rod.
5. NPS 1-1/4 (DN 32): 108 inches (2700 mm) with 3/8-inch (10-mm) rod.
6. NPS 1-1/2 (DN 40): 10 feet (3 m) with 3/8-inch (10-mm) rod.
7. NPS 2 (DN 50): 11 feet (3.4 m) with 3/8-inch (10-mm) rod.
8. NPS 2-1/2 (DN 65): 13 feet (4 m) with 1/2-inch (13-mm) rod.
9. NPS 3 (DN 80): 14 feet (4.3 m) with 1/2-inch (13-mm) rod.
10. NPS 3-1/2 (DN 90): 15 feet (4.6 m) with 1/2-inch (13-mm) rod.
11. NPS 4 (DN 100): 16 feet (4.9 m) with 1/2-inch (13-mm) rod.
12. NPS 5 (DN 125): 18 feet (5.5 m) with 1/2-inch (13-mm) rod.
13. NPS 6 (DN 150): 20 feet (6 m) with 5/8-inch (16-mm) rod.
14. NPS 8 (DN 200): 23 feet (7 m) with 3/4-inch (19-mm) rod.

J. Install supports for vertical copper tubing every 10 feet (3 m).

3.7 IDENTIFICATION

A. Install identifying labels and devices for nonmedical laboratory compressed-air piping, valves, and specialties. Comply with requirements in Section 220553 "Identification for Plumbing Piping and Equipment."

B. Install identifying labels and devices for medical compressed-air piping systems according to NFPA 99. Use the following or similar captions and color-coding for piping products where required by NFPA 99:

1. Medical Air: Black letters on yellow background.
2. Dental Air: [**Black letters on yellow background**] <**Insert color code**>.
3. Instrument Air: White letters on red background.
4. Medical Laboratory Air: Black letters on yellow-and-white checkerboard background.

3.8 FIELD QUALITY CONTROL FOR MEDICAL COMPRESSED-AIR PIPING IN HEALTHCARE FACILITIES

A. Testing Agency: [**Owner will engage**] [**Engage**] a qualified testing agency to perform tests and inspections of medical compressed-air piping in healthcare facilities and to prepare test and inspection reports.

B. Tests and Inspections:

1. Medical Compressed-Air Testing Coordination: Perform tests, inspections, verifications, and certification of medical compressed-air piping systems concurrently with tests, inspections, and certification of [**medical gas piping**] [**and**] [**medical vacuum piping**] systems.
2. Preparation: Perform the following Installer tests according to requirements in NFPA 99 and ASSE Standard #6010:

    a. Initial blowdown.
    b. Initial pressure test.
    c. Cross-connection test.
    d. Piping purge test.
    e. Standing pressure test for positive-pressure medical compressed-air piping.
    f. Repair leaks and retest until no leaks exist.

3. System Verification: Perform the following tests and inspections according to NFPA 99, ASSE Standard #6020, and ASSE Standard #6030:

    a. Standing pressure test.
    b. [**Individual-pressurization**] [**or**] [**pressure-differential**] cross-connection test.
    c. Valve test.
    d. Master and area alarm tests.
    e. Piping purge test.
    f. Piping particulate test.
    g. Piping purity test.
    h. Final tie-in test.
    i. Operational pressure test.
    j. Medical air purity test.
    k. Verify correct labeling of equipment and components.

4. Testing Certification: Certify that specified tests, inspections, and procedures have been performed and certify report results. Include the following:

    a. Inspections performed.
    b. Procedures, materials, and gases used.
    c. Test methods used.

d. Results of tests.

C. Remove and replace components that do not pass tests and inspections and retest as specified above.

3.9 FIELD QUALITY CONTROL FOR COMPRESSED-AIR PIPING IN NONMEDICAL LABORATORY FACILITIES

A. Testing Agency: [**Owner will engage**] [**Engage**] qualified testing agency to perform tests and inspections of compressed-air piping in nonmedical laboratory facilities and to prepare test and inspection reports.

B. Tests and Inspections:

1. Piping Leak Tests for Compressed-Air Piping: Test new and modified parts of existing piping. Cap and fill compressed-air piping with oil-free dry nitrogen to pressure of 50 psig (345 kPa) above system operating pressure, but not less than [**150 psig (1035 kPa)**] <**Insert value**>. Isolate test source and let stand for four hours to equalize temperature. Refill system, if required, to test pressure; hold for two hours with no drop in pressure.
2. Repair leaks and retest until no leaks exist.
3. Inspect [**filters**] [**and**] [**pressure regulators**] for proper operation.

C. Remove and replace components that do not pass tests and inspections and retest as specified above.

3.10 PROTECTION

A. Protect tubing from damage.

B. Retain sealing plugs in tubing, fittings, and specialties until installation.

C. Clean tubing not properly sealed, and where sealing is damaged, according to "Preparation" Article.

3.11 PIPING SCHEDULE

A. Connect new tubing to existing tubing with memory-metal couplings.

B. Flanges may be used where connection to flanged equipment is required.

C. Medical Air Piping except Instrument Air Piping Larger Than NPS 3 (DN 80) and Operating at More Than 185 psig (1275 kPa): Type L, copper medical gas tube; wrought-copper fittings; and brazed joints.

D. Instrument Air Piping Larger Than NPS 3 (DN 80) and Operating at More Than 185 psig (1275 kPa): Type K, copper tube; wrought-copper fittings; and brazed joints.

E. Laboratory Air Piping except Laboratory Air Piping Larger Than NPS 3 (DN 80) and Operating at More Than 185 psig (1275 kPa): Type L, copper medical gas tube; wrought-copper fittings; and brazed joints.

F. Laboratory Air Piping Larger Than NPS 3 (DN 80) and Operating at More Than 185 psig (1275 kPa): Type K, copper medical gas tube; wrought-copper fittings; and brazed joints.

3.12 VALVE SCHEDULE

A. Shutoff Valves: Ball valve with manufacturer-installed ASTM B 819, copper-tube extensions.

B. Zone Valves: Ball valve with manufacturer-installed ASTM B 819, copper-tube extensions with pressure gage on one copper-tube extension.

END OF SECTION 226113

SECTION 23 05 00 - COMMON WORK RESULTS FOR HVAC

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
1. Piping materials and installation instructions common to most piping systems.
2. Transition fittings.
3. Dielectric fittings.
4. Mechanical sleeve seals.
5. Sleeves.
6. Escutcheons.
7. Grout.
8. Equipment installation requirements common to equipment sections.
9. Painting and finishing.
10. Concrete bases.
11. Supports and anchorages.

B. Related Requirements:
1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. The following are industry abbreviations for plastic materials:

1. CPVC: Chlorinated polyvinyl chloride plastic.

2. PE: Polyethylene plastic.

3. PVC: Polyvinyl chloride plastic.

G. The following are industry abbreviations for rubber materials:

1. EPDM: Ethylene-propylene-diene terpolymer rubber.

2. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Transition fittings.

2. Dielectric fittings.

3. Mechanical sleeve seals.

4. Escutcheons.

B. Welding certificates.

1.5 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B. Electrical Characteristics for HVAC Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

1.7 COORDINATION

A. Arrange for pipe spaces and openings in building structure during progress of construction, to allow for HVAC installations.

B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 PIPE, TUBE, AND FITTINGS

A. Refer to individual Division 23 piping Sections for pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.3 JOINING MATERIALS

A. Refer to individual Division 23 piping Sections for special joining materials not listed below.

B. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

2.4 DIELECTRIC FITTINGS

A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.

B. Insulating Material: Suitable for system fluid, pressure, and temperature.

C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig (1725-kPa) minimum working pressure at 180 deg F (82 deg C).

1. Manufacturers:

a. Capitol Manufacturing Co.

b. Central Plastics Company.

c. Eclipse, Inc.

d. Epco Sales, Inc.

e. Hart Industries, International, Inc.

f. Watts Industries, Inc.; Water Products Div.

g. Zurn Industries, Inc.; Wilkins Div.

D. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig (2070-kPa) minimum working pressure at 225 deg F (107 deg C).

1. Manufacturers:

a. Calpico, Inc.

b. Lochinvar Corp.

E. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig (2070-kPa) minimum working pressure at 225 deg F (107 deg C).

1. Manufacturers:

a. Perfection Corp.

b. Precision Plumbing Products, Inc.

c. Sioux Chief Manufacturing Co., Inc.

d. Victaulic Co. of America.

2.5 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

1. Manufacturers:

a. Advance Products & Systems, Inc.

b. Calpico, Inc.

c. Metraflex Co.

d. Pipeline Seal and Insulator, Inc.

2. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.

3. Pressure Plates: Carbon steel. Include two for each sealing element.

4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.6 SLEEVES

A. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

B. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.

2.7 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.

C. One-Piece, Stamped-Steel Type: With set screw or spring clips and chrome-plated finish.

D. One-Piece, Floor-Plate Type: Cast-iron floor plate.

2.8 GROUT

A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.

1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.

2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 23 Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping to permit valve servicing.

E. Install piping at indicated slopes.

F. Install piping free of sags and bends.

G. Install fittings for changes in direction and branch connections.

H. Install piping to allow application of insulation.

I. Select system components with pressure rating equal to or greater than system operating pressure.

J. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:

1. New Piping:

a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.

b. Insulated Piping: One-piece, stamped-steel type with spring clips.

c. Bare Piping in Equipment Rooms: One-piece, cast-brass type.

d. Bare Piping in Equipment Rooms: One-piece, stamped-steel type with set screw or spring clips.

e. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece, floor-plate type.

K. Sleeves are not required for core-drilled holes.

L. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.

1. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches (50 mm) above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.

2. Install sleeves in new walls and slabs as new walls and slabs are constructed.

3. Install sleeves that are large enough to provide 1/4-inch (6.4-mm) annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:

a. Steel Pipe Sleeves: For pipes smaller than NPS 3 (DN 75).

b. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches (50 mm) above finished floor level. Refer to Division 07 Section "Sheet Metal Flashing and Trim" for flashing.

1) Seal space outside of sleeve fittings with grout.

4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Section 07 92 00 – Joint Sealants for materials and installation.

M. Verify final equipment locations for roughing-in.

N. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.2 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 23 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

3.3 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping NPS 2 (DN 50) and smaller, adjacent to each valve and at final connection to each piece of equipment.

3.4 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install HVAC equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope.

3.5 PAINTING

A. Painting of HVAC systems, equipment, and components is specified in Division 09 Sections.

B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.6 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.

1. Construct concrete bases of dimensions indicated, but not less than 4 inches (100 mm) larger in both directions than supported unit.

2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of the base.

3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.

4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

5. Install anchor bolts to elevations required for proper attachment to supported equipment.

6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

7. Use 3000-psi compressive-strength concrete and reinforcement as specified in Section 03 30 00 – Cast-In-Place Concrete.

3.7 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to 05 50 00 Metal Fabrication for structural steel.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor HVAC materials and equipment.

C. Field Welding: Comply with AWS D1.1.

3.8 GROUTING

A. Mix and install grout for HVAC equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placement of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases and provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout.

END OF SECTION 23 05 00

SECTION 23 05 13 - COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.3 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:

1. Motor controllers.

2. Torque, speed, and horsepower requirements of the load.

3. Ratings and characteristics of supply circuit and required control sequence.

4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

A. Comply with requirements in this Section except when stricter requirements are specified in HVAC equipment schedules or Sections.

B. Comply with NEMA MG 1 unless otherwise indicated.

2.2 MOTOR CHARACTERISTICS

A. Rating: Motor shall be rated for Class I, Division 1 operation (explosion proof). A Class I, Division 1 location is a location: (1) in which ignitable concentrations of flammable gases or vapors exist under normal operating conditions; or (2) in which ignitable concentrations of such gases or vapors may exist frequently because of repair or maintenance operations or because of leakage; or (3) in which breakdown or faulty operation of equipment or processes might release ignitable concentrations of flammable gases or vapors, and might also cause simultaneous failure of electric equipment.

B. Duty: Continuous duty at ambient temperature of 40 degree C and at altitude of 3300 feet above sea level.

C. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 POLYPHASE MOTORS

A. Description: NEMA MG 1, Design B, medium induction motor.

B. Efficiency: Energy efficient, as defined in NEMA MG 1.

C. Service Factor: 1.15.

D. Multi speed Motors: Variable torque.

1. For motors with 2:1 speed ratio, consequent pole, single winding.

2. For motors with other than 2:1 speed ratio, separate winding for each speed.

E. Multi speed Motors: Separate winding for each speed.

F. Rotor: Random-wound, squirrel cage.

G. Bearings: Re-greasable, shielded, antifriction ball bearings suitable for radial and thrust loading.

H. Temperature Rise: Match insulation rating.

I. Insulation: Class F.

J. Code Letter Designation:

1. Motors 15 HP and Larger: NEMA starting Code F or Code G.

2. Motors Smaller than 15 HP: Manufacturer's standard starting characteristic.

K. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.

2.4 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

A. Motors Used with Variable Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.

1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.

2. Energy- and Premium-Efficient Motors: Class B temperature rise; Class F insulation.

3. Inverter-Duty Motors: Class F temperature rise; Class H insulation.

4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.

B. Severe-Duty Motors: Comply with IEEE 841, with 1.15 minimum service factor.

2.5 SINGLE-PHASE MOTORS

A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:

1. Permanent-split capacitor.

2. Split phase.

3. Capacitor start, inductor run.

4. Capacitor start, capacitor run.

B. Multi speed Motors: Variable-torque, permanent-split-capacitor type.

C. Bearings: Pre lubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.

D. Motors 1/20 HP and Smaller: Shaded-pole type.

E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 23 05 13

SECTION 23 05 17 - SLEEVES AND SLEEVE SEALS FOR HVAC PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Sleeves.
2. Stack-sleeve fittings.
3. Sleeve-seal systems.
4. Sleeve-seal fittings.
5. Grout.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.

C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.

D. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

E. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

F. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

G. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.

2.2 STACK-SLEEVE FITTINGS

A. Description: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring, bolts, and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with setscrews.

2.3 SLEEVE-SEAL SYSTEMS

A. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.

1. Sealing Elements: EPDM-rubber or NBR interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.

2. Pressure Plates: Stainless steel.

3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, or Stainless steel of length required to secure pressure plates to sealing elements.

2.4 SLEEVE-SEAL FITTINGS

A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for imbedding in concrete slab or wall. Unit has plastic or rubber waterstop collar with center opening to match piping OD.

2.5 GROUT

A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.

1. Sleeves are not required for core-drilled holes.

C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.

1. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.

2. Cut sleeves to length for mounting flush with both surfaces.

    a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.

3. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.

D. Install sleeves for pipes passing through interior partitions.

1. Cut sleeves to length for mounting flush with both surfaces.

2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.

3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Section 07 92 00 – Joint Sealants.

E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 07 84 13 – Penetration Firestopping.

3.2 STACK-SLEEVE-FITTING INSTALLATION

A. Install stack-sleeve fittings in new slabs as slabs are constructed.

1. Install fittings that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.

2. Secure flashing between clamping flanges for pipes penetrating floors with membrane waterproofing. Comply with requirements for flashing specified in Section 07 62 00 "Sheet Metal Flashing and Trim."

3. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level.

4. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.

5. Using grout, seal the space around outside of stack-sleeve fittings.

B. Fire-Barrier Penetrations: Maintain indicated fire rating of floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 07 84 13 – Penetration Firestopping.

3.3 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.4 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using grout, seal the space around outside of sleeve-seal fittings.

3.5 SLEEVE AND SLEEVE-SEAL SCHEDULE

A. Use sleeves and sleeve seals for the following piping-penetration applications:

1. Exterior Concrete Walls above Grade:

a. Piping Smaller Than NPS 6: Galvanized-steel wall sleeves.

b. Piping NPS 6 and Larger: Cast-iron wall sleeves.

2. Exterior Concrete Walls below Grade:

a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves with sleeve-seal system.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

b. Piping NPS 6 and Larger: Galvanized-steel-pipe sleeves with sleeve-seal system.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

3. Concrete Slabs-on-Grade:

a. Piping Smaller Than NPS 6: Sleeve-seal fittings.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

b. Piping NPS 6 and Larger: Galvanized-steel-pipe sleeves.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

4. Concrete Slabs above Grade:

a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves.

b. Piping NPS 6 and Larger: Galvanized-steel-pipe sleeves.

5. Interior Partitions:

a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves.

b. Piping NPS 6 and Larger: Galvanized-steel-sheet sleeves.

END OF SECTION 23 05 17

SECTION 23 05 18 - ESCUTCHEONS FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Escutcheons.
2. Floor plates.

B. Related Requirements:
1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 ESCUTCHEONS

A. One-Piece, Cast-Brass Type: With rough-brass finish and setscrew fastener.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.

C. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.

D. Split-Casting Brass Type: With rough-brass finish and with concealed hinge and setscrew.

E. Split-Plate, Stamped-Steel Type: With chrome-plated finish, exposed-rivet hinge, and spring-clip fasteners.

2.2 FLOOR PLATES

A. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.

B. Split-Casting Floor Plates: Cast brass with concealed hinge.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.

B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. Escutcheons for New Piping:

a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
b. Chrome-Plated Piping: One-piece, cast-brass.
c. Insulated Piping: One-piece, stamped-steel type stamped-steel type with exposed-rivet hinge.
d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass or split-casting brass type with polished, chrome-plated finish.
e. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
f. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, stamped-steel type.
g. Bare Piping in Unfinished Service Spaces: One-piece, rough-brass finish.
h. Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type.
i. Bare Piping in Equipment Rooms: One-piece, cast-brass or rough-brass finish.
j. Bare Piping in Equipment Rooms: One-piece, stamped-steel type stamped-steel type with exposed-rivet hinge.

C. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. New Piping: One-piece, floor-plate type.
2. Existing Piping: Split-casting, floor-plate type.

3.2 FIELD QUALITY CONTROL

A. Replace broken and damaged escutcheons and floor plates using new materials.

END OF SECTION 23 05 18

SECTION 23 05 19 - METERS AND GAGES FOR HVAC PIPING.

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Liquid-in-glass thermometers.
2. Thermowells.
3. Dial-type pressure gages.
4. Gage attachments.
5. Test plugs.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product Certificates: For each type of meter and gage, from manufacturer.

C. Operation and Maintenance Data: For meters and gages to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 LIQUID-IN-GLASS THERMOMETERS

A. Metal-Case, Industrial-Style, Liquid-in-Glass Thermometers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Flo Fab Inc.
   b. Miljoco Corporation.
   c. Palmer Wahl Instrumentation Group.
   d. Tel-Tru Manufacturing Company.
   e. Trerice, H. O. Co.
   f. Weiss Instruments, Inc.
   g. Winters Instruments - U.S.
2. Standard: ASME B40.200.

3. Case: Cast aluminum; 9-inch (229-mm) nominal size unless otherwise indicated.

4. Case Form: Adjustable angle unless otherwise indicated.

5. Tube: Glass with magnifying lens and blue or red organic liquid.

6. Tube Background: Nonreflective aluminum with permanently etched scale markings graduated in deg F (deg C).

7. Window: Glass or plastic .

8. Stem: Aluminum and of length to suit installation.

   a. Design for Air-Duct Installation: With ventilated shroud.

   b. Design for Thermowell Installation: Bare stem.

9. Connector: 1-1/4 inches (32 mm), with ASME B1.1 screw threads.

10. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

2.2 DUCT-THERMOMETER MOUNTING BRACKETS

A. Description: Flanged bracket with screw holes, for attachment to air duct and made to hold thermometer stem.

2.3 THERMOWELLS

A. Thermowells:

1. Standard: ASME B40.200.

2. Description: Pressure-tight, socket-type fitting made for insertion into piping tee fitting.

3. Material for Use with Steel Piping: CRES .

4. Type: Stepped shank unless straight or tapered shank is indicated.

5. External Threads: NPS 1/2, NPS 3/4, or NPS 1, (DN 15, DN 20, or NPS 25,) ASME B1.20.1 pipe threads.

6. Internal Threads: 1/2, 3/4, and 1 inch (13, 19, and 25 mm), with ASME B1.1 screw threads.

7. Bore: Diameter required to match thermometer bulb or stem.

8. Insertion Length: Length required to match thermometer bulb or stem.

9. Lagging Extension: Include on thermowells for insulated piping and tubing.

10. Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.

B. Heat-Transfer Medium: Mixture of graphite and glycerin .

2.4 PRESSURE GAGES

A. Direct-Mounted, Metal-Case, Dial-Type Pressure Gages:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. AMETEK, Inc.; U.S. Gauge.

b. Ashcroft Inc.

c. Ernst Flow Industries.

d. Flo Fab Inc.

e. Marsh Bellofram.

f. Miljoco Corporation.

g. Noshok.

h. Palmer Wahl Instrumentation Group.

i. REOTEMP Instrument Corporation.

j. Tel-Tru Manufacturing Company.

k. Trerice, H. O. Co.

l. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.

m. Weiss Instruments, Inc.

n. WIKA Instrument Corporation - USA.

o. Winters Instruments - U.S.

2. Standard: ASME B40.100.

3. Case: Sealed type; cast aluminum or drawn steel ; 4-1/2-inch (114-mm) nominal diameter.

4. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.

5. Pressure Connection: Brass, with NPS 1/4 or NPS 1/2 (DN 8 or DN 15), ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.

6. Movement: Mechanical, with link to pressure element and connection to pointer.

7. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi (kPa).

8. Pointer: Dark-colored metal.

9. Window: Glass or plastic .

10. Ring: Metal.

11. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.

2.5 GAGE ATTACHMENTS

A. Snubbers: ASME B40.100, brass; with NPS 1/4 or NPS 1/2 (DN 8 or DN 15), ASME B1.20.1 pipe threads and piston-type surge-dampening device. Include extension for use on insulated piping.

B. Siphons: Loop-shaped section of brass pipe with NPS 1/4 or NPS 1/2 (DN 8 or DN 15) pipe threads.

C. Valves: Brass or stainless-steel needle, with NPS 1/4 or NPS 1/2 (DN 8 or DN 15), ASME B1.20.1 pipe threads.

2.6 TEST PLUGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Flow Design, Inc.

2. Miljoco Corporation.

3. National Meter, Inc.

4. Peterson Equipment Co., Inc.

5. Sisco Manufacturing Company, Inc.

6. Trerice, H. O. Co.

7. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.

8. Weiss Instruments, Inc.

B. Description: Test-station fitting made for insertion into piping tee fitting.

C. Body: Brass or stainless steel with core inserts and gasketed and threaded cap. Include extended stem on units to be installed in insulated piping.

D. Thread Size: NPS 1/4 (DN 8) or NPS 1/2 (DN 15), ASME B1.20.1 pipe thread.

E. Minimum Pressure and Temperature Rating: 500 psig at 200 deg F (3450 kPa at 93 deg C).

F. Core Inserts: Chlorosulfonated polyethylene synthetic and EPDM self-sealing rubber.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install thermowells with socket extending to center of pipe and in vertical position in piping tees.

B. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.

C. Install thermowells with extension on insulated piping.

D. Fill thermowells with heat-transfer medium.

E. Install duct-thermometer mounting brackets in walls of ducts. Attach to duct with screws.

F. Install direct-mounted pressure gages in piping tees with pressure gage located on pipe at the most readable position.

G. Install valve and snubber in piping for each pressure gage for fluids.

3.2 CONNECTIONS

A. Install meters and gages adjacent to machines and equipment to allow service and maintenance of meters, gages, machines, and equipment.

3.3 ADJUSTING

A. After installation, calibrate meters according to manufacturer's written instructions.

B. Adjust faces of meters and gages to proper angle for best visibility.

3.4 THERMOMETER SCALE-RANGE SCHEDULE

A. Scale Range for Air Ducts: Minus 40 to plus 110 deg F (Minus 40 to plus 45 deg C).

3.5 PRESSURE-GAGE SCALE-RANGE SCHEDULE

A. Scale Range for Piping: 30 in. Hg to 15 psi (minus 100 to 0 kPa).

END OF SECTION 23 05 19

SECTION 230523 - GENERAL-DUTY VALVES FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Bronze ball valves.
2. Iron ball valves.
3. Iron, single-flange butterfly valves.
4. Bronze lift check valves.
5. Bronze swing check valves.
6. Iron swing check valves.
7. Bronze gate valves.
8. Iron gate valves.
9. Bronze globe valves.
10. Iron globe valves.
11. Lubricated plug valves.
12. Eccentric plug valves.
13. Chainwheels.

B. Related Sections:

1. Division 23 HVAC piping Sections for specialty valves applicable to those Sections only.
2. Division 23 Section "Identification for HVAC Piping and Equipment" for valve tags and schedules.

1.3 DEFINITIONS

A. CWP: Cold working pressure.

B. EPDM: Ethylene propylene copolymer rubber.

C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

D. NRS: Nonrising stem.

E. OS&Y: Outside screw and yoke.

F. RS: Rising stem.

1.4 SUBMITTALS

A. Product Data: For each type of valve indicated.

1.5 QUALITY ASSURANCE

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:

1. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
2. ASME B31.9 for building services piping valves.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, grooves, and weld ends.
3. Set gate valves closed to prevent rattling.
4. Set ball valves open to minimize exposure of functional surfaces.
5. Set butterfly valves closed or slightly open.
6. Block check valves in either closed or open position.

B. Use the following precautions during storage:

1. Maintain valve end protection.
2. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use hand wheels or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Refer to HVAC valve schedule articles for applications of valves.

B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

C. Valve Sizes: Same as upstream piping unless otherwise indicated.

D. Valve Actuator Types:
1. Handwheel: For valves other than quarter-turn types.
2. Handlever: For quarter-turn valves NPS 6 (DN 150) and smaller.

E. Valves in Insulated Piping: With 2-inch (50-mm) stem extensions and the following features:

1. Gate Valves: With rising stem.
2. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
3. Butterfly Valves: With extended neck.

F. Valve-End Connections:

1. Flanged: With flanges according to ASME B16.1 for iron valves.
2. Grooved: With grooves according to AWWA C606.
3. Solder Joint: With sockets according to ASME B16.18.
4. Threaded: With threads according to ASME B1.20.1.

G. Valve Bypass and Drain Connections: MSS SP-45.

2.2 GENERAL REQUIREMENTS FOR VALVES

A. Refer to valve schedule articles for applications of valves.

B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

C. Valve Sizes: Same as upstream piping unless otherwise indicated.

D. Valve Actuator Types:
1. Hand wheel: For valves other than quarter-turn types.
2. Hand lever: For quarter-turn valves NPS 6 (DN 150) and smaller.
3. Chain wheel: Device for attachment to valve hand wheel, stem, or other actuator; of size and with chain for mounting height, as indicated in the "Valve Installation" Article.

E. Valves in Insulated Piping: With 2-inch (50-mm) stem extensions and the following features:

1. Gate Valves: With rising stem.
2. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
3. Butterfly Valves: With extended neck.

F. Valve-End Connections:

1. Flanged: With flanges according to ASME B16.1 for iron valves.
2. Solder Joint: With sockets according to ASME B16.18.
3. Threaded: With threads according to ASME B1.20.1.

G. Valve Bypass and Drain Connections: MSS SP-45.

2.3 BRONZE BALL VALVES

A. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Valve, Inc.
b. Conbraco Industries, Inc.; Apollo Valves.
c. Crane Co.; Crane Valve Group; Crane Valves.
d. Hammond Valve.
e. Lance Valves; a division of Advanced Thermal Systems, Inc.
f. Legend Valve.
g. Milwaukee Valve Company.
h. NIBCO INC.
i. Red-White Valve Corporation.
j. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-110.
b. SWP Rating: 150 psig (1035 kPa).
c. CWP Rating: 600 psig (4140 kPa).
d. Body Design: Two piece.
e. Body Material: Bronze.
f. Ends: Threaded.
g. Seats: PTFE or TFE.
h. Stem: Bronze.
i. Ball: Chrome-plated brass.
j. Port: Full.

2.4 IRON BALL VALVES

A. Class 125, Iron Ball Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Valve, Inc.
b. Conbraco Industries, Inc.; Apollo Valves.
c. Kitz Corporation.
d. Sure Flow Equipment Inc.
e. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-72.
b. CWP Rating: 200 psig (1380 kPa).
c. Body Design: Split body.
d. Body Material: ASTM A 126, gray iron.
e. Ends: Flanged.

f. Seats: PTFE or TFE.
g. Stem: Stainless steel.
h. Ball: Stainless steel.
i. Port: Full.

2.5 IRON, SINGLE-FLANGE BUTTERFLY VALVES

A. 200 CWP, Iron, Single-Flange Butterfly Valves with EPDM Seat and Aluminum-Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Crane Co.; Crane Valve Group; Jenkins Valves.
   b. Crane Co.; Crane Valve Group; Stockham Division.
   c. DeZurik Water Controls.
   d. Hammond Valve.
   e. Kitz Corporation.
   f. Milwaukee Valve Company.
   g. NIBCO INC.
   h. Red-White Valve Corporation.
   i. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

   a. Standard: MSS SP-67, Type I.
   b. CWP Rating: 200 psig (1380 kPa).
   c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
   d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
   e. Seat: EPDM.
   f. Stem: One- or two-piece stainless steel.
   g. Disc: Aluminum bronze.

2.6 BRONZE LIFT CHECK VALVES

A. Class 125, Lift Check Valves with Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Crane Co.; Crane Valve Group; Crane Valves.
   b. Crane Co.; Crane Valve Group; Jenkins Valves.
   c. Crane Co.; Crane Valve Group; Stockham Division.

2. Description:

   a. Standard: MSS SP-80, Type 1.
   b. CWP Rating: 200 psig (1380 kPa).
   c. Body Design: Vertical flow.
   d. Body Material: ASTM B 61 or ASTM B 62, bronze.
   e. Ends: Threaded.

f. Disc: Bronze.

2.7 BRONZE SWING CHECK VALVES

A. Class 125, Bronze Swing Check Valves with Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Valve, Inc.
b. Crane Co.; Crane Valve Group; Crane Valves.
c. Crane Co.; Crane Valve Group; Jenkins Valves.
d. Crane Co.; Crane Valve Group; Stockham Division.
e. Hammond Valve.
f. Kitz Corporation.
g. Milwaukee Valve Company.
h. NIBCO INC.
i. Red-White Valve Corporation.
j. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-80, Type 3.
b. CWP Rating: 200 psig (1380 kPa).
c. Body Design: Horizontal flow.
d. Body Material: ASTM B 62, bronze.
e. Ends: Threaded.
f. Disc: Bronze.

2.8 IRON SWING CHECK VALVES

A. Class 125, Iron Swing Check Valves with Metal Seats:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. Crane Co.; Crane Valve Group; Stockham Division.
d. Hammond Valve.
e. Kitz Corporation.
f. Legend Valve.
g. Milwaukee Valve Company.
h. NIBCO INC.
i. Red-White Valve Corporation.
j. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-71, Type I.

b. CWP Rating: 200 psig (1380 kPa).
c. Body Design: Clear or full waterway.
d. Body Material: ASTM A 126, gray iron with bolted bonnet.
e. Ends: Flanged.
f. Trim: Bronze.
g. Gasket: Asbestos free.

2.9 BRONZE GATE VALVES

A. Class 125, RS Bronze Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Valve, Inc.
b. Crane Co.; Crane Valve Group; Crane Valves.
c. Crane Co.; Crane Valve Group; Jenkins Valves.
d. Crane Co.; Crane Valve Group; Stockham Division.
e. Hammond Valve.
f. Kitz Corporation.
g. Milwaukee Valve Company.
h. NIBCO INC.
i. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-80, Type 2.
b. CWP Rating: 200 psig (1380 kPa).
c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
d. Ends: Threaded or solder joint.
e. Stem: Bronze.
f. Disc: Solid wedge; bronze.
g. Packing: Asbestos free.
h. Hand wheel: Malleable iron.

2.10 IRON GATE VALVES

A. Class 125, OS&Y, Iron Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. Crane Co.; Crane Valve Group; Stockham Division.
d. Hammond Valve.
e. Kitz Corporation.
f. Milwaukee Valve Company.
g. NIBCO INC.
h. Red-White Valve Corporation.

i. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-70, Type I.
b. CWP Rating: 200 psig (1380 kPa).
c. Body Material: ASTM A 126, gray iron with bolted bonnet.
d. Ends: Flanged.
e. Trim: Bronze.
f. Disc: Solid wedge.
g. Packing and Gasket: Asbestos free.

2.11 TRIPLE DUTY VALVES

A. Manufacturers:
1. Armstrong Pumps Inc.
2. Aurora Pump; Division of Pentair Pump Group.
3. Bell & Gossett; Div. of ITT Industries.
4. Taco, Inc.
5. Thrush Company Inc.

B. Pattern: Straight-angle.

C. Material: Cast Iron.

D. Working Pressure: 175 psi.

E. Operating Temperature: 250 deg F.

F. Seat: Bronze, with replaceable bronze disc and EPDM seat insert.

G. Stem: Stainless steel, with chatter preventing stainless steel spring.

H. Brass readout valves with integral check valves for system balancing.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Install check valves for proper direction of flow and as follows:

1. Swing Check Valves: In horizontal position with hinge pin level.
2. Lift Check Valves: With stem upright and plumb.

3.3 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valve applications are not indicated, use the following:

1. Shutoff Service: Ball, butterfly, or gate valves.
2. Butterfly Valve Dead-End Service: Single-flange (lug) type.
3. Throttling Service except Steam: ball, or butterfly valves.
4. Pump-Discharge Check Valves:

    a. NPS 2 (DN 50) and Smaller: Bronze swing check valves with bronze disc.
    b. NPS 2-1/2 (DN 65) and Larger: Iron swing check valves with lever and weight or with spring or iron, center-guided, metal-seat check valves.

B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP classes or CWP ratings may be substituted.

C. Select valves, except wafer types, with the following end connections:
1. For Steel Piping, NPS 2 (DN 50) and Smaller: Threaded ends.
2. For Steel Piping, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Flanged ends except where threaded valve-end option is indicated in valve schedules below.

3. For Steel Piping, NPS 5 (DN 125) and Larger: Flanged ends.

3.5 HEATING-WATER VALVE SCHEDULE

A. Pipe NPS 2 (DN 50) and Smaller:

1. Bronze Valves: May be provided with solder-joint ends instead of threaded ends.
2. Ball Valves: Two piece, full port, bronze with bronze trim.
3. Bronze Swing Check Valves: Class 125 bronze disc.
4. Bronze Gate Valves: Class 125 RS.

B. Pipe NPS 2-1/2 (DN 65) and Larger:

1. Iron Valves, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): May be provided with threaded ends instead of flanged ends.
2. Iron Ball Valves, NPS 2-1/2 to NPS 10 (DN 65 to DN 250): Class 150.
3. Iron, Single-Flange Butterfly Valves, NPS 2-1/2 to NPS 12 (DN 65 to DN 300): 200 CWP, EPDM seat, aluminum-bronze disc.
4. Iron Swing Check Valves: Class 125, metal seats.
5. Iron Gate Valves: Class 125 OS&Y.

END OF SECTION

SECTION 23 05 29 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following hangers and supports for HVAC system piping and equipment:
   1. Steel pipe hangers and supports.
   2. Thermal-hanger shield inserts.

B. Related Requirements:
   1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
   2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 DEFINITIONS

A. MSS: Manufacturers Standardization Society for The Valve and Fittings Industry Inc.

B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.4 SUBMITTALS

A. Product Data: For the following:

   1. Steel pipe hangers and supports.

PART 2 - PRODUCTS

2.1 STEEL PIPE HANGERS AND SUPPORTS

A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.

B. Galvanized, Metallic Coatings: Pregalvanized or hot dipped.

C. Nonmetallic Coatings: Plastic coating, jacket, or liner.

D. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

2.2 THERMAL-HANGER SHIELD INSERTS

A. Description: 100-psig minimum, compressive-strength insulation insert encased in sheet metal shield.

B. Insulation-Insert Material for Cold Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate or ASTM C 552, Type II cellular glass with vapor barrier.

C. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate or ASTM C 552, Type II cellular glass.

D. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

E. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

F. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.3 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

A. Specific hanger and support requirements are specified in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized, metallic coatings for piping and equipment that will not have field-applied finish.

D. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes, NPS 1/2 to NPS 30.

2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of 120 to 450 deg F (49 to 232 deg C) pipes, NPS 4 to NPS 16, requiring up to 4 inches (100 mm) of insulation.

3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes, NPS 3/4 to NPS 24, requiring clamp flexibility and up to 4 inches (100 mm) of insulation.

4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes, NPS 1/2 to NPS 24 (DN 15 to DN 600), if little or no insulation is required.

5. Pipe Hangers (MSS Type 5): For suspension of pipes, NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.

6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated stationary pipes, NPS 3/4 to NPS 8 (DN 20 to DN 200).

7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8 (DN 15 to DN 200).

8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8 (DN 15 to DN 200).

9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 2 (DN 15 to DN 50).

10. Split Pipe-Ring with or without Turnbuckle-Adjustment Hangers (MSS Type 11): For suspension of noninsulated stationary pipes, NPS 3/8 to NPS 8 (DN 10 to DN 200).

11. Extension Hinged or 2-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated stationary pipes, NPS 3/8 to NPS 3 (DN 10 to DN 80).

12. U-Bolts (MSS Type 24): For support of heavy pipes, NPS 1/2 to NPS 30 (DN 15 to DN 750).

13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.

14. Pipe Saddle Supports (MSS Type 36): For support of pipes, NPS 4 to NPS 36 (DN 100 to DN 900), with steel pipe base stanchion support and cast-iron floor flange.

15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes, NPS 4 to NPS 36, with steel pipe base stanchion support and cast-iron floor flange and with U-bolt to retain pipe.

16. Adjustable, Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes, NPS 2-1/2 to NPS 36, if vertical adjustment is required, with steel pipe base stanchion support and cast-iron floor flange.

17. Single Pipe Rolls (MSS Type 41): For suspension of pipes, NPS 1 to NPS 30 o, from 2 rods if longitudinal movement caused by expansion and contraction might occur.

18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes, NPS 2-1/2 to NPS 20, from single rod if horizontal movement caused by expansion and contraction might occur.

19. Complete Pipe Rolls (MSS Type 44): For support of pipes, NPS 2 to NPS 42, if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.

20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes, NPS 2 to NPS 24, if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.

21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes, NPS 2 to NPS 30, if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.

E. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20.

2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20, if longer ends are required for riser clamps.

F. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches (150 mm) for heavy loads.

2. Steel Clevises (MSS Type 14): For 120 to 450 deg F (49 to 232 deg C) piping installations.

3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.

4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.

5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F (49 to 232 deg C) piping installations.

G. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.

2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction to attach to top flange of structural shape.

3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.

4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.

5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.

6. C-Clamps (MSS Type 23): For structural shapes.

7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.

8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.

9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.

10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.

11. Malleable Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.

12. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:

    a. Light (MSS Type 31): 750 lb (340 kg).

    b. Medium (MSS Type 32): 1500 lb (680 kg).

    c. Heavy (MSS Type 33): 3000 lb (1360 kg).

13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.

14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.

15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

H. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.

2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.

3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

I. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.

2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches (32 mm).

3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41 roll hanger with springs.

4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.

5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from hanger.

6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from base support.

7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from trapeze support.

8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include

auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:

a. Horizontal (MSS Type 54): Mounted horizontally.

b. Vertical (MSS Type 55): Mounted vertically.

c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.

J. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.

K. Comply with MFMA-102 for metal framing system selections and applications that are not specified in piping system Sections.

3.2 HANGER AND SUPPORT INSTALLATION

A. Steel Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

C. Insulated Piping: Comply with the following:

1. Attach clamps and spacers to piping.

a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.

b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.

c. Do not exceed pipe stress limits according to ASME B31.1 for power piping and ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:

a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.

b. NPS 4: 12 inches long and 0.06 inch thick.

c. NPS 5 and NPS 6: 18 inches long and 0.06 inch (1.52 mm) thick.

d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.

5. Pipes NPS 8 and Larger: Include wood inserts.

6. Insert Material: Length at least as long as protective shield.

7. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

END OF SECTION 23 05 29

SECTION 23 05 48 - VIBRATION AND SEISMIC CONTROLS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Isolation pads.
   2. Restrained elastomeric isolation mounts.
   3. Freestanding and restrained spring isolators.

B. Related Requirements:
   1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
   2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners

1.3 DEFINITIONS

A. IBC: International Building Code.

B. ICC-ES: ICC-Evaluation Service.

C. OSHPD: Office of Statewide Health Planning and Development for the State of California.

1.4 SUBMITTALS

A. Product Data: For the following:

   1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.

   2. Vibration Isolation Base Details: Detail overall dimensions, including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides and rails, base weights, equipment static loads, power transmission, component misalignment, and cantilever loads.

PART 2 - PRODUCTS

2.1 VIBRATION ISOLATORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Ace Mountings Co., Inc.
   2. Amber/Booth Company, Inc.
   3. California Dynamics Corporation.
   4. Isolation Technology, Inc.

5. Kinetics Noise Control.
6. Mason Industries.
7. Vibration Eliminator Co., Inc.
8. Vibration Isolation.
9. Vibration Mountings & Controls, Inc.

B. Pads: Arranged in single or multiple layers of sufficient stiffness for uniform loading over pad area, molded with a nonslip pattern and galvanized-steel baseplates, and factory cut to sizes that match requirements of supported equipment.

1. Resilient Material: Oil- and water-resistant neoprene.

C. Restrained Mounts : All-directional mountings.

1. Materials: Cast-ductile-iron or welded steel housing containing two separate and opposing, oil-resistant rubber or neoprene elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.

2. Neoprene: Shock-absorbing materials compounded according to the standard for bridge-bearing neoprene as defined by AASHTO.

D. Restrained Spring Isolators Insert drawing designation: Freestanding, steel, open-spring isolators with limit-stop restraint.

1. Housing: Steel with resilient vertical-limit stops to prevent spring extension due to weight being removed; factory-drilled baseplate bonded to 1/4-inch- (6-mm-) thick, neoprene or rubber isolator pad attached to baseplate underside; and adjustable equipment mounting and leveling bolt that acts as blocking during installation.

2. Restraint: Limit stop as required for equipment and authorities having jurisdiction.

3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.

4. Minimum Additional Travel: 50 percent of the required deflection at rated load.

5. Lateral Stiffness: More than 80 percent of rated vertical stiffness.

6. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and equipment to receive vibration isolation control devices for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 VIBRATION-CONTROL AND SEISMIC-RESTRAINT DEVICE INSTALLATION

A. Equipment Restraints:

1. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch (3.2 mm).

B. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

C. Drilled-in Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid pre-stressed tendons.

2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.

3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.

4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.

5. Set anchors to manufacturer's recommended torque, using a torque wrench.

6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.

2. Schedule test with City before connecting anchorage device to restrained component (unless post connection testing has been approved), and with at least seven days' advance notice.

3. Obtain City's approval before transmitting test loads to structure. Provide temporary load-spreading members.

4. Test at least four of each type and size of installed anchors and fasteners selected by Architect.

5. Test to 90 percent of rated proof load of device.

6. Measure isolator restraint clearance.

7. Measure isolator deflection.

8. If a device fails test, modify all installations of same type and retest until satisfactory results are achieved.

C. Remove and replace malfunctioning units and retest as specified above.

D. Prepare test and inspection reports.

3.4 ADJUSTING

A. Adjust limit stops on restrained spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.

B. Adjust active height of spring isolators.

C. Adjust restraints to permit free movement of equipment within normal mode of operation.

3.5 HVAC VIBRATION-CONTROL AND SEISMIC-RESTRAINT DEVICE SCHEDULE

A. Supported or Suspended Equipment: Provide vibration control devices in accordance with manufacturer's written instructions.

END OF SECTION 23 05 48

SECTION 23 05 53 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.
4. Duct labels.
5. Warning tags.

B. Related Requirements:
1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For color, letter style, and graphic representation required for each identification material and device.

C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

1.4 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Plastic Labels for Equipment:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch (3.2 mm) thick, and having predrilled holes for attachment hardware.

2. Letter Color: White.

3. Background Color: Black.

4. Maximum Temperature: Able to withstand temperatures up to 160 deg F (71 deg C).

5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).

6. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

7. Fasteners: Stainless-steel rivets.

8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch (A4) bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch (3.2 mm) thick, and having predrilled holes for attachment hardware.

B. Letter Color: Red.

C. Background Color: Yellow.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F (71 deg C).

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).

F. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Fasteners: Stainless-steel rivets.

H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Label Content: Include caution and warning information, plus emergency notification instructions.

2.3 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.

2. Lettering Size: At least 1-1/2 inches (38 mm) high.

2.4 DUCT LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch (3.2 mm) thick, and having predrilled holes for attachment hardware.

B. Letter Color: White.

C. Background Color: Black.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F (71 deg C).

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).

F. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Fasteners: Stainless-steel rivets.

H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Duct Label Contents: Include identification of duct service using same designations or abbreviations as used on Drawings, duct size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with duct system service lettering to accommodate both directions, or as separate unit on each duct label to indicate flow direction.

2. Lettering Size: At least 1-1/2 inches (38 mm) high.

2.5 WARNING TAGS

A. Warning Tags: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with matte finish suitable for writing.

1. Size: 3 by 5-1/4 inches minimum.

2. Fasteners: Brass grommet and wire.

3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."

4. Color: Yellow background with black lettering.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

A. Piping Color-Coding: Painting of piping is specified in Division 09.

B. Retain first paragraph below only if stenciled labels are permitted.

C. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.

2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.

3. Near penetrations through walls, floors, and inaccessible enclosures.

4. At access doors, manholes, and similar access points that permit view of concealed piping.

5. Near major equipment items and other points of origination and termination.

6. Spaced at maximum intervals of 50 feet (15 m) along each run. Reduce intervals to 25 feet (7.6 m) in areas of congested piping and equipment.

D. Pipe Label Color Schedule:

1. Refrigerant Piping:

a. Background Color: Yellow.

b. Letter Color: Black.

3.4 DUCT LABEL INSTALLATION

A. Install plastic-laminated duct labels with permanent adhesive on air ducts in the following color codes:

1. Green: For exhaust-, outside-, relief-, return-, and mixed-air ducts.

2. ASME A13.1 Colors and Designs: For hazardous material exhaust.

B. Locate labels near points where ducts enter into concealed spaces and at maximum intervals of 50 feet (15 m).

3.5 WARNING-TAG INSTALLATION

A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION 23 05 53

SECTION 23 05 93 – TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Balancing Air Systems:

a. Constant-volume air systems.
b. Variable-air-volume systems.

1.3 DEFINITIONS

A. AABC: Associated Air Balance Council.

B. NEBB: National Environmental Balancing Bureau.

C. TAB: Testing, adjusting, and balancing.

D. TABB: Testing, Adjusting, and Balancing Bureau.

E. TAB Specialist: An entity engaged to perform TAB Work.

1.4 SUBMITTALS

A. Qualification Data: Within 45 days of Contractor's Notice to Proceed, submit documentation that the TAB contractor and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.

B. Certified TAB reports.

C. Instrument calibration reports, to include the following:

1. Instrument type and make.
2. Serial number.
3. Application.
4. Dates of use.
5. Dates of calibration.

1.5 QUALITY ASSURANCE

A. TAB Contractor Qualifications: Engage a TAB entity certified by AABC, NEBB or TABB.

1. TAB Field Supervisor: Employee of the TAB contractor and certified by AABC or NEBB.
2. TAB Technician: Employee of the TAB contractor and who is certified by AABC or NEBB as a TAB technician.

B. Certify TAB field data reports and perform the following:

1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
2. Certify that the TAB team complied with the approved TAB plan and the procedures specified and referenced in this Specification.

C. TAB Report Forms: TAB forms are to be AABC or NEBB standard forms.

D. All equipment and procedures are to follow AABC or NEBB current standards."

1.6 COORDINATION

A. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.

B. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are accessible.

C. Examine the approved submittals for HVAC systems and equipment.

D. Examine ceiling plenums and underfloor air plenums used for supply, return, or relief air to verify that they meet the leakage class of connected ducts as specified in Division 23 Section "Metal Ducts" and are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.

E. Examine equipment performance data including fan and pump curves.

1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.

2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.

F. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.

G. Examine test reports specified in individual system and equipment Sections.

H. Examine HVAC equipment and filters and verify that bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

I. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible and their controls are connected and functioning.

J. Examine heat-transfer coils for correct connections and for clean and straight fins.

K. Examine operating safety interlocks and controls on HVAC equipment.

L. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

A. Prepare a TAB plan that includes strategies and step-by-step procedures.

B. Complete system-readiness checks and prepare reports. Verify the following:

1. Permanent electrical-power wiring is complete.
2. Automatic temperature-control systems are operational.
3. Equipment and duct access doors are securely closed.
4. Balance, smoke, and fire dampers are open.
5. Isolating and balancing valves are open and control valves are operational.
6. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
7. Windows and doors can be closed so indicated conditions for system operations can be met.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance" or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and in this Section.

1. Comply with requirements in ASHRAE 62.1-2004, Section 7.2.2, "Air Balancing."

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.

1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
2. After testing and balancing, install test ports and duct access doors that comply with requirements in Division 23 Section "Air Duct Accessories."
3. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Division 23 Section "HVAC Insulation."

C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.

D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts.

C. For variable-air-volume systems, develop a plan to simulate diversity.

D. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.

E. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.

F. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

G. Verify that motor starters are equipped with properly sized thermal protection.

H. Check dampers for proper position to achieve desired airflow path.

I. Check for airflow blockages.

J. Check condensate drains for proper connections and functioning.

K. Check for proper sealing of air-handling-unit components.

L. Verify that air duct system is sealed as specified in Division 23 Section "Metal Ducts."

3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.

1. Measure total airflow.

a. Where sufficient space in ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow.

2. Measure fan static pressures as follows to determine actual static pressure:

    a. Measure outlet static pressure as far downstream from the fan as practical and upstream from restrictions in ducts such as elbows and transitions.
    b. Measure static pressure directly at the fan outlet or through the flexible connection.
    c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from the flexible connection, and downstream from duct restrictions.
    d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.

3. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and -treating equipment.

    a. Report the cleanliness status of filters and the time static pressures are measured.

4. Measure static pressures entering and leaving other devices, such as sound traps, heat-recovery equipment, and air washers, under final balanced conditions.
5. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
6. Obtain approval from Owner for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in HVAC Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
7. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.

B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.

1. Measure airflow of submain and branch ducts.

    a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.

2. Measure static pressure at a point downstream from the balancing damper, and adjust volume dampers until the proper static pressure is achieved.
3. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.

C. Measure air outlets and inlets without making adjustments.

1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.

D. Adjust air outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using branch volume dampers rather than extractors and the dampers at air terminals.

1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.
2. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.6 PROCEDURES FOR VARIABLE-AIR-VOLUME SYSTEMS

A. Compensating for Diversity: When the total airflow of all terminal units is more than the indicated airflow of the fan, place a selected number of terminal units at a minimum set-point airflow with the remainder at maximum-airflow condition until the total airflow of the terminal units equals the indicated airflow of the fan. Select the reduced-airflow terminal units so they are distributed evenly among the branch ducts.

B. Pressure-Independent, Variable-Air-Volume Systems: After the fan systems have been adjusted, adjust the variable-air-volume systems as follows:

1. Set outdoor-air dampers at minimum, and set return- and exhaust-air dampers at a position that simulates full-cooling load.
2. Select the terminal unit that is most critical to the supply-fan airflow and static pressure. Measure static pressure. Adjust system static pressure so the entering static pressure for the critical terminal unit is not less than the sum of the terminal-unit manufacturer's recommended minimum inlet static pressure plus the static pressure needed to overcome terminal-unit discharge system losses.
3. Measure total system airflow. Adjust to within indicated airflow.
4. Set terminal units at maximum airflow and adjust controller or regulator to deliver the designed maximum airflow. Use terminal-unit manufacturer's written instructions to make this adjustment. When total airflow is correct, balance the air outlets downstream from terminal units the same as described for constant-volume air systems.
5. Set terminal units at minimum airflow and adjust controller or regulator to deliver the designed minimum airflow. Check air outlets for a proportional reduction in airflow the same as described for constant-volume air systems.

    a. If air outlets are out of balance at minimum airflow, report the condition but leave outlets balanced for maximum airflow.

6. Remeasure the return airflow to the fan while operating at maximum return airflow and minimum outdoor airflow.

    a. Adjust the fan and balance the return-air ducts and inlets the same as described for constant-volume air systems.

7. Measure static pressure at the most critical terminal unit and adjust the static-pressure controller at the main supply-air sensing station to ensure that adequate static pressure is maintained at the most critical unit.
8. Record final fan-performance data.

3.7 PROCEDURES FOR MOTORS

A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer's name, model number, and serial number.
2. Motor horsepower rating.

3. Motor rpm.
4. Efficiency rating.
5. Nameplate and measured voltage, each phase.
6. Nameplate and measured amperage, each phase.
7. Starter thermal-protection-element rating.

B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass of the controller to prove proper operation. Record observations including name of controller manufacturer, model number, serial number, and nameplate data.

3.8 PROCEDURES FOR CONDENSING UNITS

A. Verify proper rotation of fans.

B. Measure entering- and leaving-air temperatures.

C. Record compressor data.

3.9 PROCEDURES FOR HEAT-TRANSFER COILS

A. Measure, adjust, and record the following data for each electric heating coil:

1. Nameplate data.
2. Airflow.
3. Entering- and leaving-air temperature at full load.
4. Voltage and amperage input of each phase at full load.
5. Calculated kilowatt at full load.
6. Fuse or circuit-breaker rating for overload protection.

B. Measure, adjust, and record the following data for each refrigerant coil:

1. Dry-bulb temperature of entering and leaving air.
2. Wet-bulb temperature of entering and leaving air.
3. Airflow.
4. Air pressure drop.
5. Refrigerant suction pressure and temperature.

3.10 TOLERANCES

A. Set HVAC system's air flow rates and water flow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10 percent.
2. Air Outlets and Inlets: Plus or minus 10 percent.
3. Heating-Water Flow Rate: Plus or minus 10 percent.
4. Cooling-Water Flow Rate: Plus or minus 10 percent.

3.11 FINAL REPORT

A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.

1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
2. Include a list of instruments used for procedures, along with proof of calibration.

B. Final Report Contents: In addition to certified field-report data, include the following:
1. Fan curves.
2. Manufacturers' test data.
3. Field test reports prepared by system and equipment installers.
4. Other information relative to equipment performance; do not include Shop Drawings and product data.

C. General Report Data: In addition to form titles and entries, include the following data:

1. Title page.
2. Name and address of the TAB contractor.
3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's name and address.
7. Contractor's name and address.
8. Report date.
9. Signature of TAB supervisor who certifies the report.
10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
11. Summary of contents including the following:

a. Indicated versus final performance.
b. Notable characteristics of systems.
c. Description of system operation sequence if it varies from the Contract Documents.

12. Nomenclature sheets for each item of equipment.
13. Data for terminal units, including manufacturer's name, type, size, and fittings.
14. Notes to explain why certain final data in the body of reports vary from indicated values.
15. Test conditions for fans and pump performance forms including the following:

a. Settings for outdoor-, return-, and exhaust-air dampers.
b. Conditions of filters.
c. Cooling coil, wet- and dry-bulb conditions.
d. Face and bypass damper settings at coils.
e. Fan drive settings including settings and percentage of maximum pitch diameter.
f. Inlet vane settings for variable-air-volume systems.
g. Settings for supply-air, static-pressure controller.
h. Other system operating conditions that affect performance.

D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:

1. Quantities of outdoor, supply, return, and exhaust airflows.
2. Water and steam flow rates.

3. Duct, outlet, and inlet sizes.
4. Pipe and valve sizes and locations.
5. Terminal units.
6. Balancing stations.
7. Position of balancing devices.

E. Air-Handling-Unit Test Reports: For air-handling units with coils, include the following:

1. Unit Data:

   a. Unit identification.
   b. Location.
   c. Make and type.
   d. Model number and unit size.
   e. Manufacturer's serial number.
   f. Unit arrangement and class.
   g. Discharge arrangement.

2. Motor Data:

   a. Motor make, and frame type and size.
   b. Horsepower and rpm.
   c. Volts, phase, and hertz.
   d. Full-load amperage and service factor.

3. Test Data (Indicated and Actual Values):

   a. Total air flow rate in cfm (L/s).
   b. Total system static pressure in inches wg (Pa).
   c. Fan rpm.
   d. Discharge static pressure in inches wg (Pa).
   e. Filter static-pressure differential in inches wg (Pa).
   f. Preheat-coil static-pressure differential in inches wg (Pa).
   g. Cooling-coil static-pressure differential in inches wg (Pa).
   h. Heating-coil static-pressure differential in inches wg (Pa).
   i. Outdoor airflow in cfm (L/s).
   j. Return airflow in cfm (L/s).
   k. Outdoor-air damper position.
   l. Return-air damper position.

F. Apparatus-Coil Test Reports:

1. Coil Data:

   a. System identification.
   b. Location.
   c. Coil type.
   d. Number of rows.
   e. Fin spacing in fins per inch (mm) o.c.
   f. Make and model number.
   g. Face area in sq. ft. (sq. m).
   h. Tube size in NPS (DN).
   i. Tube and fin materials.
   j. Circuiting arrangement.

2. Test Data (Indicated and Actual Values):

   a. Air flow rate in cfm (L/s).
   b. Average face velocity in fpm (m/s).
   c. Air pressure drop in inches wg (Pa).
   d. Outdoor-air, wet- and dry-bulb temperatures in deg F (deg C).
   e. Return-air, wet- and dry-bulb temperatures in deg F (deg C).
   f. Entering-air, wet- and dry-bulb temperatures in deg F (deg C).
   g. Leaving-air, wet- and dry-bulb temperatures in deg F (deg C).
   h. Water flow rate in gpm (L/s).
   i. Water pressure differential in feet of head or psig (kPa).
   j. Entering-water temperature in deg F (deg C).
   k. Leaving-water temperature in deg F (deg C).
   l. Refrigerant expansion valve and refrigerant types.
   m. Refrigerant suction pressure in psig (kPa).
   n. Refrigerant suction temperature in deg F (deg C).
   o. Inlet steam pressure in psig (kPa).

G. Gas- -Fired Heat Apparatus Test Reports: In addition to manufacturer's factory startup equipment reports, include the following:

1. Unit Data:

   a. System identification.
   b. Location.
   c. Make and type.
   d. Model number and unit size.
   e. Manufacturer's serial number.
   f. Fuel type in input data.
   g. Output capacity in Btu/h (kW).
   h. Ignition type.
   i. Burner-control types.
   j. Motor horsepower and rpm.
   k. Motor volts, phase, and hertz.
   l. Motor full-load amperage and service factor.

2. Test Data (Indicated and Actual Values):

   a. Total air flow rate in cfm (L/s).
   b. Entering-air temperature in deg F (deg C).
   c. Leaving-air temperature in deg F (deg C).
   d. Air temperature differential in deg F (deg C).
   e. Entering-air static pressure in inches wg (Pa).
   f. Leaving-air static pressure in inches wg (Pa).
   g. Air static-pressure differential in inches wg (Pa).
   h. Low-fire fuel input in Btu/h (kW).
   i. High-fire fuel input in Btu/h (kW).
   j. Manifold pressure in psig (kPa).
   k. High-temperature-limit setting in deg F (deg C).
   l. Operating set point in Btu/h (kW).
   m. Motor voltage at each connection.
   n. Motor amperage for each phase.
   o. Heating value of fuel in Btu/h (kW).

H. Fan Test Reports: For supply, return, and exhaust fans, include the following:

1. Fan Data:

    a. System identification.
    b. Location.
    c. Make and type.
    d. Model number and size.
    e. Manufacturer's serial number.

2. Motor Data:

    a. Motor make, and frame type and size.
    b. Horsepower and rpm.
    c. Volts, phase, and hertz.
    d. Full-load amperage and service factor.

3. Test Data (Indicated and Actual Values):

    a. Total airflow rate in cfm (L/s).
    b. Total system static pressure in inches wg (Pa).
    c. Fan rpm.
    d. Discharge static pressure in inches wg (Pa).
    e. Suction static pressure in inches wg (Pa).

I. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:

1. Report Data:

    a. System and air-handling-unit number.
    b. Location and zone.
    c. Traverse air temperature in deg F (deg C).
    d. Duct static pressure in inches wg (Pa).
    e. Duct size in inches (mm).
    f. Duct area in sq. ft. (sq. m).
    g. Indicated air flow rate in cfm (L/s).
    h. Indicated velocity in fpm (m/s).
    i. Actual air flow rate in cfm (L/s).
    j. Actual average velocity in fpm (m/s).
    k. Barometric pressure in psig (Pa).

J. Air-Terminal-Device Reports:

1. Unit Data:

    a. System and air-handling unit identification.
    b. Location and zone.
    c. Apparatus used for test.
    d. Area served.
    e. Make.
    f. Number from system diagram.
    g. Type and model number.
    h. Size.
    i. Effective area in sq. ft. (sq. m).

2. Test Data (Indicated and Actual Values):

a. Air flow rate in cfm (L/s).
b. Air velocity in fpm (m/s).
c. Preliminary air flow rate as needed in cfm (L/s).
d. Preliminary velocity as needed in fpm (m/s).
e. Final air flow rate in cfm (L/s).
f. Final velocity in fpm (m/s).
g. Space temperature in deg F (deg C).

K. System-Coil Reports: For reheat coils of terminal units, include the following:

1. Unit Data:

a. System and air-handling-unit identification.
b. Location and zone.
c. Room or riser served.
d. Coil make and size.
e. Flowmeter type.

2. Test Data (Indicated and Actual Values):

a. Air flow rate in cfm (L/s).
b. Entering-air temperature in deg F (deg C).
c. Leaving-air temperature in deg F (deg C).

L. Instrument Calibration Reports:

1. Report Data:

a. Instrument type and make.
b. Serial number.
c. Application.
d. Dates of use.
e. Dates of calibration.

3.12 INSPECTIONS

A. Initial Inspection:

1. After testing and balancing are complete, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the final report.
2. Check the following for each system:

a. Measure airflow of at least 5 percent of air outlets.
b. Measure water flow of at least 5 percent of terminals.
c. Measure room temperature at each thermostat/temperature sensor. Compare the reading to the set point.
d. Verify that balancing devices are marked with final balance position.
e. Note deviations from the Contract Documents in the final report.

B. Final Inspection:

1. After initial inspection is complete and documentation by random checks verifies that testing and balancing are complete and accurately documented in the final report, request that a final inspection be made by Commissioning Authority.
2. Commissioning Authority shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.
3. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."
4. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.

C. TAB Work will be considered defective if it does not pass final inspections. If TAB Work fails, proceed as follows:

1. Recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.
2. If the second final inspection also fails, Owner may contract the services of another TAB contractor to complete TAB Work according to the Contract Documents and deduct the cost of the services from the original TAB contractor's final payment.

D. Prepare test and inspection reports.

3.13 ADDITIONAL TESTS

A. Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

END OF SECTION 23 05 93

SECTION 23 07 00 - HVAC INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Insulation Materials:
      a. Mineral fiber.
   2. Adhesives.
   3. Mastics.
   4. Lagging adhesives.
   5. Sealants.
   6. Factory-applied jackets.
   7. Field-applied fabric-reinforcing mesh.
   8. Field-applied cloths.
   9. Field-applied jackets.
   10. Tapes.
   11. Securements.
   12. Corner angles.

B. Related Requirements:
   1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
   2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, thickness, and jackets both factory and field applied.

B. Qualification Data: For qualified Installer.

C. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

D. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing and inspecting agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.6 COORDINATION

A. Coordinate clearance requirements with piping Installer for piping insulation application, duct Installer for duct insulation application, and equipment Installer for equipment insulation application. Before preparing piping and ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

1.7 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing. Insulation application may begin on segments that have satisfactory test results.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in Part 3 schedule articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.

1. Products: Subject to compliance with requirements, provide one of the following:
   1) Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with Aeroflex USA Inc.; Aerocel.
   b. Armacell LLC; AP Armaflex.
   c. RBX Corporation; Insul-Sheet 1800 and Insul-Tube 180.

D. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type I. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. CertainTeed Corp.; Duct Wrap.
   b. Johns Manville; Microlite.
   c. Knauf Insulation; Duct Wrap.

d. Manson Insulation Inc.; Alley Wrap.
e. Owens Corning; All-Service Duct Wrap.

E. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications, provide insulation with factory-applied ASJ. For equipment applications, provide insulation with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. CertainTeed Corp.; Commercial Board.
   b. Fibrex Insulations Inc.; FBX.
   c. Johns Manville; 800 Series Spin-Glas.
   d. Knauf Insulation; Insulation Board.
   e. Manson Insulation Inc.; AK Board.
   f. Owens Corning; Fiberglas 700 Series.

2.2 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

B. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Aeroflex USA Inc.; Aeroseal.
   b. Armacell LCC; 520 Adhesive.
   c. Foster Products Corporation, H. B. Fuller Company; 85-75.
   d. RBX Corporation; Rubatex Contact Adhesive.

2. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Childers Products, Division of ITW; CP-82.
   b. Foster Products Corporation, H. B. Fuller Company; 85-20.
   c. ITW TACC, Division of Illinois Tool Works; S-90/80.
   d. Marathon Industries, Inc.; 225.
   e. Mon-Eco Industries, Inc.; 22-25.

2. For indoor applications, use adhesive that has a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

D. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Childers Products, Division of ITW; CP-82.
   b. Foster Products Corporation, H. B. Fuller Company; 85-20.
   c. ITW TACC, Division of Illinois Tool Works; S-90/80.
   d. Marathon Industries, Inc.; 225.

e. Mon-Eco Industries, Inc.; 22-25.

2. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.3 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-C-19565C, Type II.

B. Vapor-Barrier Mastic: Water based; suitable for indoor and outdoor use on below ambient services.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Childers Products, Division of ITW; CP-35.
   b. Foster Products Corporation, H. B. Fuller Company; 30-90.
   c. ITW TACC, Division of Illinois Tool Works; CB-50.
   d. Marathon Industries, Inc.; 590.
   e. Mon-Eco Industries, Inc.; 55-40.
   f. Vimasco Corporation; 749.

2. Water-Vapor Permeance: ASTM E 96, Procedure B, 0.013 perm at 43-mil dry film thickness.

3. Service Temperature Range: Minus 20 to plus 180 deg F.

4. Solids Content: ASTM D 1644, 59 percent by volume and 71 percent by weight.

5. Color: White.

C. Breather Mastic: Water based; suitable for indoor and outdoor use on above ambient services.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Childers Products, Division of ITW; CP-10.
   b. Foster Products Corporation, H. B. Fuller Company; 35-00.
   c. ITW TACC, Division of Illinois Tool Works; CB-05/15.
   d. Marathon Industries, Inc.; 550.
   e. Mon-Eco Industries, Inc.; 55-50.
   f. Vimasco Corporation; WC-1/WC-5.

2. Water-Vapor Permeance: ASTM F 1249, 3 perms at 0.0625-inch dry film thickness.

3. Service Temperature Range: Minus 20 to plus 200 deg F.

4. Solids Content: 63 percent by volume and 73 percent by weight.

5. Color: White.

2.4 LAGGING ADHESIVES

A. Description: Comply with MIL-A-3316C Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Childers Products, Division of ITW; CP-52.
   b. Foster Products Corporation, H. B. Fuller Company; 81-42.
   c. Marathon Industries, Inc.; 130.
   d. Mon-Eco Industries, Inc.; 11-30.
   e. Vimasco Corporation; 136.

2. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over duct, equipment, and pipe insulation.

3. Service Temperature Range: Minus 50 to plus 180 deg F.

4. Color: White.

2.5 SEALANTS

A. Joint Sealants:

B. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, provide one of the following:

   a. Childers Products, Division of ITW; CP-76.

2. Materials shall be compatible with insulation materials, jackets, and substrates.

3. Fire- and water-resistant, flexible, elastomeric sealant.

4. Service Temperature Range: Minus 40 to plus 250 deg F.

5. Color: White.

6. For indoor applications, use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.6 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.

2. PVDC Jacket for Outdoor Applications: 6-mil- (0.15-mm-) thick, white PVDC biaxially oriented barrier film with a permeance at 0.01 perms (0.007 metric perms) when tested according to ASTM E 96 and with a flame-spread index of 5 and a smoke-developed index of 25 when tested according to ASTM E 84.

   a. Products: Subject to compliance with requirements, provide one of the following:

      1) Dow Chemical Company (The); Saran 540 Vapor Retarder Film and Saran 560 Vapor Retarder Film.

3. Vinyl Jacket: White vinyl with a permeance of 1.3 perms (0.86 metric perms) when tested according to ASTM E 96, Procedure A, and complying with NFPA 90A and NFPA 90B.

2.7 FIELD-APPLIED FABRIC-REINFORCING MESH

A. Woven Glass-Fiber Fabric for Pipe Insulation: Approximately 2 oz./sq. yd. (68 g/sq. m) with a thread count of 10 strands by 10 strands/sq. inch (4 strands by 4 strands/sq. mm) for covering pipe and pipe fittings.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Vimasco Corporation; Elastafab 894.

B. Woven Glass-Fiber Fabric for Duct and Equipment Insulation: Approximately 6 oz./sq. yd. (203 g/sq. m) with a thread count of 5 strands by 5 strands/sq. inch (2 strands by 2 strands/sq. mm) for covering equipment.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Childers Products, Division of ITW; Chil-Glas No. 5.

2.8 FIELD-APPLIED CLOTHS

A. Woven Glass-Fiber Fabric: Comply with MIL-C-20079H, Type I, plain weave, and presized a minimum of 8 oz. /sq. yd. (271 g/sq. m).

1. Products: Subject to compliance with requirements, provide one of the following:

a. Alpha Associates, Inc.; Alpha-Maritex 84215 and 84217/9485RW, Luben 59.

2.9 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.

C. Metal Jacket:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Products, Division of ITW; Metal Jacketing Systems.

b. PABCO Metals Corporation; Surefit.

c. RPR Products, Inc.; Insul-Mate.

2. Aluminum Jacket: Comply with ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105 or 5005, Temper H-14.

a. Sheet and roll stock ready for shop or field sizing.

b. Finish and thickness are indicated in field-applied jacket schedules.

c. Moisture Barrier for Indoor Applications: 1-mil- (0.025-mm-) thick, heat-bonded polyethylene and kraft paper .

d. Moisture Barrier for Outdoor Applications: 3-mil- (0.075-mm-) thick, heat-bonded polyethylene and kraft paper.

e. Factory-Fabricated Fitting Covers:

1) Same material, finish, and thickness as jacket.
2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
3) Tee covers.
4) Flange and union covers.
5) End caps.
6) Beveled collars.
7) Valve covers.
8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

2.10 TAPES

D. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0835.

b. Compac Corp.; 104 and 105.

c. Ideal Tape Co., Inc., an American Biltrite Company; 428 AWF ASJ.

d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.

2. Width: 3 inches.

3. Thickness: 11.5 mils.

4. Adhesion: 90 ounces force/inch in width.

5. Elongation: 2 percent.

6. Tensile Strength: 40 lbf/inch in width.

7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

E. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, provide one of the following]:

a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.

b. Compac Corp.; 110 and 111.

c. Ideal Tape Co., Inc., an American Biltrite Company; 491 AWF FSK.

d. Venture Tape; 1525 CW, 1528 CW, and 1528 CW/SQ.

2. Width: 3 inches.

3. Thickness: 6.5 mils.

4. Adhesion: 90 ounces force/inch in width.

5. Elongation: 2 percent.

6. Tensile Strength: 40 lbf/inch in width.

7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

2.11 SECUREMENTS

F. Bands:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Products; Bands.

b. PABCO Metals Corporation; Bands.

c. RPR Products, Inc.; Bands.

2. Aluminum: ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch (0.51 mm) thick, 1/2 inch (13 mm) wide with wing or closed seal.

3. Springs: Twin spring set constructed of stainless steel with ends flat and slotted to accept metal bands. Spring size determined by manufacturer for application.

G. Insulation Pins and Hangers:

1. Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- (2.6-mm-) diameter shank, length to suit depth of insulation indicated.

a. Products: Subject to compliance with requirements, provide one of the following:

1) AGM Industries, Inc.; CWP-1.

2) GEMCO; CD.

3) Midwest Fasteners, Inc.; CD.

4) Nelson Stud Welding; TPA, TPC, and TPS.

H. Staples: Outward-clinching insulation staples, nominal 3/4-inch- (19-mm-) wide, stainless steel or Monel.

I. Wire: 0.080-inch (2.0-mm) nickel-copper alloy.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. C & F Wire.

   b. Childers Products.

   c. PABCO Metals Corporation.

   d. RPR Products, Inc.

2.12 CORNER ANGLES

A. Aluminum Corner Angles: 0.040 inch (1.0 mm) thick, minimum 1 by 1 inch (25 by 25 mm), aluminum according to ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105 or 5005; Temper H-14.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.

   1. Verify that systems and equipment to be insulated have been tested and are free of defects.

   2. Verify that surfaces to be insulated are clean and dry.

   3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment, ducts and fittings, and piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment, duct system, and pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.

2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.

3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.

4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.

2. Cover circumferential joints with 3-inch- (75-mm-) wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches (100 mm) o.c.

3. Overlap jacket longitudinal seams at least 1-1/2 inches (38 mm). Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at [2 inches (50 mm)] [4 inches (100 mm)] o.c.

a. For below ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.

5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct and pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches (100 mm) beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

P. For above ambient services, do not install insulation to the following:

1. Vibration-control devices.

2. Testing agency labels and stamps.

3. Nameplates and data plates.

4. Manholes.

5. Handholes.

6. Cleanouts.

3.4 PENETRATIONS

A. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

B. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions. Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches (50 mm).

1. Comply with requirements in Section 07 84 13 – Penetration Firestopping and fire-resistive joint sealers.

C. Insulation Installation at Floor Penetrations:

1. Duct: Install insulation continuously through floor penetrations that are not fire rated. For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches (50 mm).

2. Pipe: Install insulation continuously through floor penetrations.

3. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 07 84 13 – Penetration Firestopping.

3.5 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity, unless otherwise indicated.

2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.

3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.

4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.

5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below ambient services, provide a design that maintains vapor barrier.

6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.

7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below ambient services and a breather mastic for above ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.

8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.

9. Label the outside insulation jacket of each union with the word "UNION." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes, vessels, and equipment. Shape insulation at these connections by tapering it to and around

the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.

2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.

3. Construct removable valve insulation covers in same manner as for flanges except divide the two-part section on the vertical center line of valve body.

4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches (50 mm) over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.

5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.6 FLEXIBLE ELASTOMERIC INSULATION INSTALLATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.

2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.

3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.

4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.

2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.

2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.

3. Install insulation to flanges as specified for flange insulation application.

4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.7 MINERAL-FIBER INSULATION INSTALLATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.

2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.

3. For insulation with factory-applied jackets on above ambient surfaces, secure laps with outward clinched staples at 6 inches (150 mm) o.c.

4. For insulation with factory-applied jackets on below ambient surfaces, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.

2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.

3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.

4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch (25 mm), and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.

2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.

2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.

3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.

4. Install insulation to flanges as specified for flange insulation application.

E. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.

2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.

3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

a. On duct sides with dimensions 18 inches (450 mm) and smaller, place pins along longitudinal centerline of duct. Space 3 inches (75 mm) maximum from insulation end joints, and 16 inches (400 mm) o.c.

b. On duct sides with dimensions larger than 18 inches (450 mm), place pins 16 inches (400 mm) o.c. each way, and 3 inches (75 mm) maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.

c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.

d. Do not overcompress insulation during installation.

e. Impale insulation over pins and attach speed washers.

f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches (50 mm) from 1 edge and 1 end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch (13-mm) outward-clinching staples, 1 inch (25 mm) o.c. Install vapor barrier consisting of factory- or field-

applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.

b. Install vapor stops for ductwork and plenums operating below 50 deg F (10 deg C) at 18-foot (5.5-m) intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to 2 times the insulation thickness but not less than 3 inches (75 mm).

5. Overlap unfaced blankets a minimum of 2 inches (50 mm) on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches (450 mm) o.c.

6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.

7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- (150-mm-) wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches (150 mm) o.c.

F. Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.

2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.

3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

a. On duct sides with dimensions 18 inches (450 mm) and smaller, place pins along longitudinal centerline of duct. Space 3 inches (75 mm) maximum from insulation end joints, and 16 inches (400 mm) o.c.

b. On duct sides with dimensions larger than 18 inches (450 mm), space pins 16 inches (400 mm) o.c. each way, and 3 inches (75 mm) maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.

c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.

d. Do not overcompress insulation during installation.

e. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches (50 mm) from 1 edge and 1 end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch (13-mm) outward-clinching staples, 1 inch (25 mm) o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

   a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.

   b. Install vapor stops for ductwork and plenums operating below 50 deg F (10 deg C) at 18-foot (5.5-m) intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to 2 times the insulation thickness but not less than 3 inches (75 mm).

5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.

6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- (150-mm-) wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches (150 mm) o.c.
7.

3.8 FIELD-APPLIED JACKET INSTALLATION

A. Where glass-cloth jackets are indicated, install directly over bare insulation or insulation with factory-applied jackets.

   1. Draw jacket smooth and tight to surface with 2-inch (50-mm) overlap at seams and joints.

   2. Embed glass cloth between two 0.062-inch- (1.6-mm-) thick coats of lagging adhesive.

   3. Completely encapsulate insulation with coating, leaving no exposed insulation.

B. Where FSK jackets are indicated, install as follows:

   1. Draw jacket material smooth and tight.

   2. Install lap or joint strips with same material as jacket.

   3. Secure jacket to insulation with manufacturer's recommended adhesive.

   4. Install jacket with 1-1/2-inch (38-mm) laps at longitudinal seams and 3-inch- (75-mm-) wide joint strips at end joints.

   5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

3.9 FINISHES

A. Duct, Equipment, and Pipe Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Division 9.

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by Engineer. Vary first and second coats to allow visual inspection of the completed Work.

3.10 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Tests and Inspections:

1. Inspect ductwork, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location(s) for each duct system defined in Section 3.11 Duct Insulation, General.

2. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of welded fittings, two locations of threaded strainers, , three locations of threaded valves, and three locations of flanged valves for each pipe service defined in Section 3.13 Piping Insulation Schedule, General. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.11 DUCT INSULATION SCHEDULE, GENERAL

A. Plenums and Ducts Requiring Insulation:

1. Indoor, concealed supply and outdoor air.

2. Indoor, exposed supply and outdoor air.

3. Indoor, concealed return located in non-conditioned space.

4. Indoor, exposed return located in non-conditioned space.

5. Indoor, concealed exhaust between isolation damper and penetration of building.

6. Indoor, exposed exhaust between isolation damper and penetration of building exterior.

B. Items Not Insulated:

1. Factory-insulated plenums and casings.

2. Flexible connectors.

3. Vibration-control devices.

4. Factory-insulated access panels and doors.

5. Exhaust duct directly connected to Exhaust fans

3.12 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

C. Concealed duct insulation shall be the following:

1. Mineral-Fiber Blanket: 1-1/2 inches (38 mm) thick and 0.75-lb/cu. ft. (12-kg/cu. m) nominal density.

D. Exposed, duct insulation shall be the following:

1. Mineral-Fiber Board: 1-1/2 inches (38 mm) thick and 2-lb/cu. ft. (32-kg/cu. m) nominal density.

3.13 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.14 INDOOR PIPING INSULATION SCHEDULE

A. Condensate and Equipment Drain Water below 60 Deg F (16 Deg C):

1. All Pipe Sizes: Insulation shall be the following:

a. Flexible Elastomeric: 3/4 inch (19 mm) thick.

B. Refrigerant Suction and Hot-Gas Piping:

1. All Pipe Sizes: Insulation shall be the following:

a. Flexible Elastomeric: 1 inch (25 mm) thick.

C. Refrigerant Suction and Hot-Gas Flexible Tubing:

1. All Pipe Sizes: Insulation shall be the following:

a. Flexible Elastomeric: 1 inch (25 mm) thick.

END OF SECTION 23 07 00

SECTION 23 08 00 – COMMISSIONING OF MECHANICAL SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of this contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 DESCRIPTION

A. The purpose of this section is to specify Division 23 responsibilities in the commissioning process.

B. The systems to be commissioned are listed in Section 019113

C. Commissioning requires the participation of Division 23 to verify that all systems are operating in a manner consistent with the Contract Documents. The general commissioning requirements and coordination are detailed in Section 019113. Division 23 shall be familiar with all parts of Section 019113 and the commissioning plan issued by the CA and shall execute all commissioning responsibilities assigned to them in the Contract Documents.

1.3 RESPONSIBILITIES

A. Mechanical, Controls, and TAB Contractors. The commissioning responsibilities applicable to each of the mechanical, controls, and TAB contractors of Division 23 are as follows (all references apply to commissioned equipment):

Construction and Acceptance Phases

1. In each purchase order or subcontract written, include requirements for submittal data, commissioning documentation, O&M data and training.
2. Attend a commissioning scoping meeting and other meetings necessary to facilitate the Cx process.
3. Contractors shall provide the CA with normal cut sheets and shop drawing submittals of commissioned equipment.
4. Provide additional requested documentation, prior to normal O&M manual submittals, to the CA for development of start-up and functional testing procedures.
   a. Typically this will include detailed manufacturer installation and start-up, operating, troubleshooting and maintenance procedures, full details of any owner-contracted tests, fan and pump curves, full factory testing reports, if any, and full warranty information, including all responsibilities of the Owner to keep the warranty in force clearly identified. In addition, the installation, start-up, and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the Commissioning Agent.
   b. The Commissioning Agent may request further documentation necessary for the commissioning process.
   c. This data request may be made prior to normal submittals.
5. Provide a copy of the O&M manuals and submittals of commissioned equipment, through normal channels, to the CA for review concurrent with the A/E submission.
6. Contractors shall assist (along with the design engineers) in clarifying the operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.
7. Provide assistance to the CA in preparing the specific functional performance test procedures. Subs shall review test procedures to verify feasibility, safety, equipment, and warranty protection and provide necessary written alarm limits to be used during the tests.

8. Develop a full start-up and initial checkout plan using manufacturer's start-up procedures and the pre-functional checklists from the CA for all commissioned equipment. Submit to CA for review and approval prior to start-up. Refer to Section 019113 for further details on start-up plan preparation.

9. During the start-up and initial checkout process, execute the mechanical-related portions of the pre-functional checklists for all commissioned equipment.

10. Perform and clearly document all completed start-up and system operational checkout procedures, providing a copy to the CA.

11. Address current A/E punch list items before functional testing. Air and water TAB shall be completed with discrepancies and problems remedied before TAB verification and functional testing of the respective air- or water-related systems.

12. Provide skilled technicians to execute starting of equipment and to execute the functional performance tests. Ensure that they are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments and problem-solving.

13. Provide skilled technicians to perform functional performance testing under the direction of the CA and assist in interpreting the monitoring data, as necessary.

14. Correct deficiencies (differences between specified and observed performance) as interpreted by the CA, CT and A/E and retest the equipment.

15. Prepare O&M manuals according to the Contract Documents, including clarifying and updating the original sequences of operation to as-built conditions.

16. During construction, maintain as-built red-line drawings for all drawings and final CAD as-builts for contractor-generated coordination drawings. Update after completion of commissioning (excluding deferred testing).

17. Provide training of the Owner's operating staff using expert qualified personnel, as specified.

18. Coordinate with equipment manufacturers to determine specific requirements to maintain the validity of the warranty.

Warranty Period

1. Execute deferred functional performance testing, witnessed by the CA, according to the specifications.

2. Correct deficiencies and make necessary adjustments to O&M manuals and as-built drawings for applicable issues identified in any seasonal testing.

B. Mechanical Contractor. The responsibilities of the HVAC mechanical contractor, during construction and acceptance phases in addition to those listed in (A) are:

1. Provide start-up for all HVAC equipment, except for the building automation control system.

2. Assist and cooperate with the TAB contractor and CA by:

a. Putting all HVAC equipment and systems into operation and continuing the operation during each working day of TAB and commissioning, as required.

b. Including cost of sheaves and belts that may be required by TAB.

c. Providing test holes in ducts and plenums where directed by TAB to allow air measurements and air balancing. Contractor shall provide an approved plug.

d. Providing temperature and pressure taps according to the Construction Documents for TAB and commissioning testing.

3. Install a P/T plug at each water sensor which is an input point to the control system.

4. List and clearly identify on the as-built drawings the locations of all air-flow stations.

5. Prepare a preliminary schedule for Division 23 pipe and duct system testing, flushing and cleaning, equipment start-up and TAB start and completion for use by the CA. Update the schedule as appropriate.

6. Notify the CT or CA depending on protocol, when pipe and duct system testing, flushing, cleaning, start-up of each piece of equipment and TAB will occur. Be responsible to notify the CT or CA, ahead of time, when commissioning activities not yet performed or not yet sched-

uled will delay construction. Be proactive in insuring that commissioning processes are executed and that the CA has the scheduling information needed to efficiently execute the commissioning process.

7. Provide ductwork leak testing of all ductwork on the project regardless if it is required by SMACNA. The testing is to be witnessed and documented by the TABs Contractor.

C. Controls Contractor. The commissioning responsibilities of the controls contractor, during construction and acceptance phases in addition to those listed in section 15850 and paragraph A above are:

1. Sequences of Operation Submittals. The Controls Contractor's submittals of control drawings shall include complete detailed sequences of operation for each piece of equipment, regardless of the completeness and clarity of the sequences in the specifications. They shall include:

a. An overview narrative of the system generally describing its purpose, components and function.

b. All interactions and interlocks with other systems.

c. Detailed delineation of control between any packaged controls and the building automation system, listing what points the BAS monitors only and what BAS points are control points and are adjustable.

d. Written sequences of control for packaged controlled equipment. (Equipment manufacturers' stock sequences may be included, but will generally require additional narrative).

e. Start-up sequences.

f. Warm-up mode sequences.

g. Normal operating mode sequences.

h. Unoccupied mode sequences.

i. Shutdown sequences.

j. Capacity control sequences and equipment staging.

k. Temperature and pressure control: set-backs, set-ups, resets, etc.

l. Detailed sequences for all control strategies, e.g., economizer control, optimum start/stop, staging, optimization, demand limiting, etc.

m. Effects of power or equipment failure with all stand-by component functions.

n. Sequences for all alarms and emergency shut downs.

o. Seasonal operational differences and recommendations.

p. Initial and recommended values for all adjustable settings, set points and parameters that are typically set or adjusted by operating staff; and any other control settings or fixed values, delays, etc. that will be useful during testing and operating the equipment.

q. Schedules, if known.

r. To facilitate referencing in testing procedures, all sequences shall be written in small statements, each with a number for reference. For a given system, numbers will not repeat for different sequence sections, unless the sections are numbered.

2. Control Drawings Submittal – In addition to the requirements of 15850, the control drawing shall have the following information:

a. A key to all abbreviations

b. Graphic schematic depictions of the systems and each component

c. Schematic drawings including the system and component layout of any equipment that the control system monitors, enables or controls, even if the equipment is primarily controlled by packaged or integral controls.

d. A full points list with at least the following included for each point:

1) Controlled system
2) Point abbreviation
3) Point description
4) Display unit
5) Control point or set point (Yes/No)

6) Monitoring point (Yes/No)
7) Intermediate point (Yes/No)
8) Calculated point (Yes/No)

Key:

Point Description: DB temp, airflow, etc.

Control or Set point: Point that controls equipment and can have its set point changed (OSA, SAT, etc.)

Intermediate Point: Point whose value is used to make a calculation which then controls equipment (space temperatures that are averaged to a virtual point to control reset).

Monitoring Point: Point that does not control or contribute to the control of equipment, but is used for operation, maintenance or performance verification.

Calculated Point: "Virtual" point generated from calculations of other point values.

The Controls Contractor shall keep the CA informed of all changes to this list during programming and set-up.

3. An updated as-built version of the control drawings and sequences of operation shall be included in the final controls O&M manual submittal.

4. Assist and cooperate with the TAB contractor in the following manner:
   a. Meet with the TAB contractor prior to beginning TAB and review the TAB plan to determine the capabilities of the control system toward completing TAB. Provide the TAB any needed unique instruments for setting terminal unit boxes and instruct TAB in their use (handheld control system interface for use around the building during TAB, etc.).
   b. For a given area, have all required pre-functional checklists, calibrations, start-up and selected functional tests of the system completed and approved by the CA prior to TAB.
   c. Provide a qualified technician to operate the controls to assist the TAB contractor in performing TAB, or provide sufficient training for TAB to operate the system without assistance.

5. Assist and cooperate with the CA in the following manner:
   a. Using a skilled technician who is familiar with this building, execute the functional testing of the controls system and all equipment.
   b. Provide two-way radios during the testing.
   b. Provide all control system trend logs.

6. The controls contractor shall prepare a written plan indicating in a step-by-step manner, the procedures that will be followed to test, checkout and adjust the control system prior to functional performance testing, according to the process in Section 019113. At a minimum, the plan shall include for each type of equipment controlled by the automatic controls:
   a. System name.
   b. List of devices.
   c. Step-by-step procedures for testing each controller after installation, including:
      1. Process of verifying proper hardware and wiring installation.
      2. Process of downloading programs to local controllers and verifying that they are addressed correctly.
      3. Process of performing operational checks of each controlled component.
      4. Plan and process for calibrating valve and damper actuators and all sensors.
      5. A description of the expected field adjustments for transmitters, controllers and control actuators should control responses fall outside of expected values.
   d. A copy of the log and field checkout sheets that will document the process. This log must include a place for initial and final read values during field calibration of each point and clearly indicate when a sensor or controller has "passed" and is operating within the contract parameters.
   e. A description of the instrumentation required for testing.

f. Indicate what tests on what systems should be completed prior to TAB using the control system for TAB work. Coordinate with the CA and TAB contractor for this determination.

7. Provide a signed and dated certification to the CA and CT upon completion of the checkout of each controlled device, equipment and system prior to functional testing for each piece of equipment or system, that all system programming is complete as to all respects of the Contract Documents, except functional testing requirements.

8. Beyond the control points necessary to execute all documented control sequences, provide monitoring, control and virtual points as specified in Section 15850.

9. List and clearly identify on the as-built duct and piping drawings the locations of all static and differential pressure sensors (air, water and building pressure).

D. TAB Contractor. The duties of the TAB contractor, in addition to those listed in section 15500 and paragraph A above are:

1. Six weeks prior to starting TAB, submit to the CT the qualifications of the site technician for the project, including the name of the contractor's and facility managers of recent projects the technician on which was lead. The Owner will approve the site technician's qualifications for this project.

2. Submit the outline of the TAB plan and approach for each system and component to the CA, CT and the controls contractor six weeks prior to starting the TAB. This plan will be developed after the TAB has some familiarity with the control system.

3. The submitted plan will include:

a. Certification that the TAB contractor has reviewed the construction documents and the systems with the design engineers and contractors to sufficiently understand the design intent for each system.

b. An explanation of the intended use of the building control system. The controls contractor will comment on feasibility of the plan.

c. All field checkout sheets and logs to be used that list each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.

d. Discussion of what notations and markings will be made on the duct and piping drawings during the process.

e. Final test report forms to be used.

f. Detailed step-by-step procedures for TAB work for each system and issue: terminal flow calibration (for each terminal type), diffuser proportioning, branch/ sub-main proportioning, total flow calculations, rechecking, diversity issues, expected problems and solutions, etc. Criteria for using air flow straightness or relocating flow stations and sensors will be discussed. Provide the analogous explanations for the water side.

g. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.

h. Details of how *total* flow will be determined (Air: sum of terminal flows via BAS calibrated readings or via hood readings of all terminals, supply (SA) and return air (RA) pitot traverse, SA or RA flow stations. Water: pump curves, circuit setter, flow station, ultrasonic, etc.).

i. The identification and types of measurement instruments to be used and their most recent calibration date.

j. Specific procedures that will verify that both air and water side are operating at the lowest possible pressures and provide methods to verify this.

k. Confirmation that TAB understands the outside air ventilation criteria under all conditions.

l. Details of whether and how minimum outside air cfm will be verified and set, and for what level (total building, zone, etc.).

m. Details of how building static and exhaust fan/relief damper capacity will be checked.

n. Proposed selection points for sound measurements and sound measurement methods.

o. Details of methods for making any specified coil or other system plant capacity measurements.

p. Details of any TAB work to be done in phases (by floor, etc.).

q. Details regarding specified deferred or seasonal TAB work.

r. Details of any specified false loading of systems to complete TAB work.

s. Details of all exhaust fan balancing and capacity verifications, including any required room pressure differentials.

t. Details of any required interstitial cavity differential pressure measurements and calculations.

u. Plan for hand-written field technician logs of discrepancies, deficient or uncompleted work by others, contract interpretation requests and lists of completed tests (scope and frequency).

v. Plan for formal progress reports (scope and frequency).

w. Plan for formal deficiency reports (scope, frequency and distribution).

4. A running log of events and issues shall be kept by the TAB field technicians. Submit hand-written reports of discrepancies, deficient or uncompleted work by others, contract interpretation requests and lists of completed tests to the CA and CT at least twice a week.

5. Communicate in writing to the controls contractor all set-point and parameter changes made or problems and discrepancies identified during TAB which affect the control system setup and operation.

6. Provide a draft TAB report within two weeks of completion. A copy will be provided to the CA. The report will contain a full explanation of the methodology, assumptions and the results in a clear format with designations of all uncommon abbreviations and column headings. The report should follow the latest and most rigorous reporting recommendations by AABC, NEBB or ASHRAE Standard 111.

7. Provide the CA with any requested data, gathered, but not shown on the draft reports.

8. Provide a final TAB report for the CA with details, as in the draft.

9. Conduct functional performance tests and checks on the original TAB as specified for TAB in Section 019113.

10. The TAB Contractor is to witness all ductwork leak testing and to provide written detail reports of each test, a log of all testing, drawings keyed to the log and test reports, and a set on noted drawings keyed to the test reports. A final report with summary, testing results, testing reports and keyed drawings are to be forwarded to the CA within 10 days of completing the ductwork leak testing

1.4 RELATED WORK

A. Refer to Section 019113, Part 1.4 for a listing of all sections where commissioning requirements are found.

B. Refer to Section 019113, Part 1.7 for systems to be commissioned.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. Division 23 shall provide all test equipment necessary to fulfill the testing requirements of this Division.

B. Refer to Section 019113, for additional Division 23 requirements.

PART 3 - EXECUTION

3.1 SUBMITTALS

A. Division 23 shall provide submittal documentation relative to commissioning as required in this Section Part 1, Section 0191130.

3.2 START-UP

A. The HVAC mechanical and controls contractors shall follow the start-up and initial check-out procedures listed in the Responsibilities list in this section and in 0181000. Division 23 has start-up responsibility and is required to complete systems and sub-systems so they are fully functional, meeting the design objectives of the Contract Documents. The commissioning procedures and functional testing do not relieve or lessen this responsibility or shift that responsibility partially to the commissioning agent or Owner.

B. Functional testing is intended to begin upon completion of a system. Functional testing may proceed prior to the completion of systems or sub-systems at the discretion of the CA and CT. Beginning system testing before full completion does not relieve the Contractor from fully completing the system, including all pre-functional checklists as soon as possible.

3.3 TAB

A. Refer to the TAB responsibilities in Part 1.3 above.

3.4 FUNCTIONAL PERFORMANCE TESTS

A. Refer to Section 019113 Part 1.7 for a list of systems to be commissioned, 019113 Part 3.6 for a description of the process, and to appendices in this section for specific details on the required functional performance tests.

3.5 TESTING DOCUMENTATION, NON-CONFORMANCE AND APPROVALS

A. Refer to Section 019113 Part 3.4 for specific details on non-conformance issues relating to pre-functional checklists and tests.

B. Refer to Section 019113 Part 3.7 for issues relating to functional performance tests.

3.6 OPERATION AND MAINTENANCE (O&M) MANUALS

A. The following O&M manual requirements do not replace O&M manual documentation requirements elsewhere in these specifications.

B. Division 23 shall compile and prepare documentation for all equipment and systems covered in Division 23 and deliver this documentation to the CT for inclusion in the O&M manuals, according to this section, and Division 01, prior to the training of owner personnel.

C. The CA shall receive a copy of the O&M manuals for review.

D. Special Control System O&M Manual Requirements. In addition to documentation that may be specified elsewhere, the controls contractor shall compile and organize at minimum the following data on the control system for incorporation into the commissioning systems manual:

1. Controls training manuals in a separate manual from the O&M manuals.
2. Operation and Maintenance Manuals containing:

a. Specific instructions on how to perform and apply all functions, features, modes, etc. mentioned in the controls training sections of this specification and other features of this system. These instructions shall be step-by-step. Indexes and clear tables of contents shall be in-

cluded. The detailed technical manual for programming and customizing control loops and algorithms shall be included.

b. Full as-built set of control drawings (refer to Submittal section above for details).
c. Full as-built sequence of operations for each piece of equipment.
d. Full points list. In addition to the updated points list required in the original submittals (Part 1 of this section), a listing of all rooms shall be provided with the following information for each room:
   1. Floor
   2. Room number
   3. Room name
   4. Air handler unit ID
   5. Reference drawing number
   6. Air terminal unit tag ID
   7. Heating and/or cooling valve tag ID
   8. Minimum cfm
   9. Maximum cfm
e. Full print out of all schedules and set points after testing and acceptance of the system.
f. Full as-built print out of software program.
g. Electronic copy on disk of the entire program for this facility.
h. Marking of all system sensors and thermostats on the as-built floor plan and mechanical drawings with their control system designations.
i. Maintenance instructions, including sensor calibration requirements and methods by sensor type, etc.
j. Control equipment component submittals, parts lists, etc.
k. Warranty requirements.
l. Copies of all checkout tests and calibrations performed by the Contractor (not commissioning tests).

3. The manual shall be organized and subdivided with permanently labeled tabs for each of the following data in the given order:
   a. Sequences of operation
   b. Control drawings
   c. Points lists
   d. Controller/module data
   e. Thermostats and timers
   f. Sensors and DP switches
   g. Valves and valve actuators
   h. Dampers and damper actuators
   i. Program set-ups (software program printouts)

4. Field checkout sheets and trend logs should be provided to the CA for inclusion in the Commissioning Record Book.

E. Special TAB Documentation Requirements. The TAB will compile and submit the following with other documentation that may be specified elsewhere in the *Specifications.*

1. Final report containing an explanation of the methodology, assumptions, test conditions and the results in a clear format with designations of all uncommon abbreviations and column headings.
2. The TAB shall mark on the drawings where all traverse and other critical measurements were taken and cross reference the location in the TAB report.

F. Review and Approvals. Review of the commissioning related sections of the O&M manuals shall be made by the A/E. Refer to Section 019113, Part 3.8 for details.

3.7. TRAINING OF OWNER PERSONNEL

A. The CT shall be responsible for training coordination and scheduling and ultimately to verify that training is completed. Refer to Section 019113 for additional details.

B. The CA shall be responsible for overseeing and approving the content and adequacy of the training of Owner personnel for commissioned equipment. Refer to Section 019113 for additional details.

C. Mechanical Contractor. The mechanical contractor shall have the following training responsibilities:

1. Provide the CA with a training plan a minimum of eight (8) weeks before the planned training according to the outline described in Section 019113, Part 3.9.
2. Provide designated Owner personnel with comprehensive orientation and training in the understanding of the systems and the operation and maintenance of each piece of HVAC equipment including, but not limited to, pumps, geothermal well field, heat rejection equipment, water source heat pumps, outside air units, fans, heating and ventilating units, controls and water treatment systems, etc.
3. Training shall normally start with classroom sessions followed by hands-on training on each piece of equipment, which shall illustrate the various modes of operation, including start-up, shut down, fire/smoke alarm, power failure, etc.
4. During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system will be repaired or adjusted as necessary and the demonstration repeated.
5. The appropriate trade or manufacturer's representative shall provide the instructions on each major piece of equipment. This person may be the start-up technician for the piece of equipment, the installing contractor or manufacturer’s representative. Practical building operating expertise, as well as in-depth knowledge of all modes of operation of the specific piece of equipment, is required. More than one party may be required to execute the training.
6. The controls contractor shall attend sessions other than the controls training, as requested, to discuss the interaction of the controls system as it relates to the equipment being discussed.
7. The training sessions shall follow the outline in the Table of Contents of the operation and maintenance manual and illustrate whenever possible the use of the O&M manuals for reference.
8. Training shall include:

a. Use of the printed installation, operation and maintenance instruction material included in the O&M manuals.
b. A review of the written O&M instructions emphasizing safe and proper operating requirements, preventative maintenance, special tools needed and spare parts inventory suggestions. The training shall include start-up, operation in all modes possible, shut down, seasonal changeover and any emergency procedures.
c. Discussion of relevant health and safety issues and concerns.
d. Discussion of warranties and guarantees.
e. Common troubleshooting problems and solutions.
f. Explanatory information included in the O&M manuals and the location of all plans and manuals in the facility.
g. Discussion of any peculiarities of equipment installation or operation.
h. The format and training agenda in *The Commissioning Process, ASHRAE* Guideline 0-2005 is recommended.
i. Classroom sessions shall include the use of overhead projections, slides, video/audio-taped material as might be appropriate.

9. Hands-on training shall include start-up, operation in all modes possible, including manual, shut down and any emergency procedures and preventative maintenance for all pieces of equipment.

10. The mechanical contractor shall fully explain and demonstrate the operation, function and overrides of any local packaged controls, not *controlled* by the central control system.

11. Training shall occur after functional testing is complete, unless approved otherwise by the Project Manager.

12. Duration of Training. The CT and MC shall provide training and demonstration requirements as specified in each specification section and Section 019113 and 017900.

3.8. DEFERRED TESTING

A. Refer to Section 019113, Part 3.10 for requirements of deferred testing.

3.9 WRITTEN WORK PRODUCTS

A. Written work products of Contractors will consist of the start-up and initial checkout plan described in Section 019113 and the filled out start-up, initial checkout and pre-functional checklists.

4.0 TESTING REQUIREMENTS

This section specifies the functional testing requirements for Division 23 systems and equipment. From these requirements, the Commissioning Authority (CA) shall develop step-by-step procedures to be executed by the contractor. The general functional testing process, requirements and test method definitions are described in Section 019113. The test requirements for each piece of equipment or system contain the following:

1. The contractors responsible to execute the tests, under the direction of the CA.
2. A list of the integral components being tested.
3. Pre-functional checklists associated with the components.
4. Functions and modes to be tested.
5. Required conditions of the test for each mode.
6. Special procedures.
7. Required methods of testing.
8. Required monitoring.
9. Acceptance criteria.
10. Sampling strategies allowed.

TESTING

A. A sample listing of the systems and equipment to be tested are included on the following pages to illustrate the extent of testing to be provided. The sample testing scripts are not detailed for this project and are not inclusive of all requirements. The actual forms for this section will be produced by the CA after the equipment has been approved and before the testing.

B. Additional systems and included may be included for testing as required at the discretion of the CA in order to fulfill LEED Commissioning Requirements.

4.1. BUILDING AUTOMATION SYSTEM (BAS)

A. Parties Responsible to Execute Functional Test
1. Controls contractor: operate the controls to activate the equipment.
2. CA: to witness, direct and document testing.

B. Related Equipment Being Tested Pre-functional Checklist ID
1. Building Automation System PFC-_____
2. All pre-functional checklists of controlled equipment PFC-_____

C. Prerequisites The applicable prerequisite checklist shall be completed prior to beginning the functional testing. The commissioning agent may also spot-check misc. items and calibrations on the pre-functional checklists previously completed by the installer, before or as part of functional testing.

D. A significant part of the BAS functional testing requirements is the successful completion of the functional tests of equipment the BAS controls or interlocks between system components. Uncompleted equipment functional tests or outstanding deficiencies in those tests lend the required BAS functional testing incomplete.

E. Integral or stand-alone controls are functionally tested with the equipment they are attached to, including any interlocks with other equipment or systems and thus are not covered under the BAS testing requirements, except for any integrated functions or interlocks listed below.

F. In addition to the controlled equipment testing, the following tests are required for the BAS, where features have been specified. The following testing requirements are in addition to and do not replace any testing requirements elsewhere in the specifications.

	Function/Mode	Test Method Manual (demonstration), Monitoring, Either or Both
MISC. FUNCTIONS		
1.	All specified functions and features are set-up, debugged and fully operable	Demonstration
2.	Power failure and battery back-up and power-up restart functions	Demonstration
3.	Specified trending and graphing features demonstration	See equipment trends
4.	Global commands features	Demonstration
5.	Security and access codes	Demonstration
6.	Occupant over-rides (manual, telephone, key, keypad, etc.)	Demonstration
7.	O&M schedules and alarms	Demonstration
8.	Scheduling features fully functional and set-up, including holidays	Observation in terminal screens or printouts
9.	Date and time setting in central computer and verify field panels read the same time	Demonstration
10.	Included features not specified to be setup are installed (list)	Demonstration
11.	Occupancy sensors and controls	Demonstration
12.	Demonstrate functionality of field panels using local operator keypads and local ports (plug-ins) using portable computer/keypad	Demonstration of 100% of panels and 10% of ports
13.	All graphic screens and value readouts completed	Demonstration
14.	Set point changing features and functions	Done during equipment testing
15.	Communications to remote sites	Demonstration
16.	Sensor calibrations	Sampled during equipment

	Function/Mode	Test Method Manual (demonstration), Monitoring, Either or Both
		testing
17.	"After hours" use tracking and billing	Demonstration
18.	Final as-built or redlines (per spec) control drawings, final points list, program code, set points, schedules, warranties, etc. per specs, submitted for O&Ms.	Observation
19.	Verify that points that are monitored only, having no control function, are checked for proper reporting to BAS.	Observation
INTEGRATED TESTS		
20.	Fire alarm interlocks and response	Demonstration
21.	Duty cycling	Monitoring
22.	Demand limiting (including over-ride of limiting)	Monitoring
23.	Sequential staging ON of equipment	Either
24.	Optimum start-stop functions	Monitoring
25.	All control strategies and sequences not tested during controlled equipment testing	Either
26.	Other integrated tests specified in the contract documents	

G. Special Procedures (other equipment to test with, etc.; reference to function ID)
None

H. Required Monitoring
1. Provide trending and monitoring as required by Section 15850.

I. Acceptance Criteria (referenced by function or mode ID)
For all the conditions, sequences and modes tested, the BAS, integral components and related equipment respond to changing conditions and parameters appropriately as expected, as specified and according to acceptable operating practice.

J. Sampling Strategy for Identical Units
1. No sampling, test all.

END OF REQUIREMENTS FOR BAS TEST

4.2 HEATING WATER DISTRIBUTION SYSTEM

A. Parties Responsible to Execute Functional Test
1. Controls contractor: operate the controls, as needed.
2. HVAC mechanical contractor or vendor: assist in testing sequences.
3. CA: to witness, direct and document testing.

B. Related Equipment Being Tested Pre-functional Checklist ID
1. Boilers PFC-____
2. Heating Water Circulating Pumps PFC-____
3. Heat Exchanger PFC-____
4. Piping system PFC-____

C. Prerequisites The applicable prerequisite checklist shall be completed prior to beginning the functional testing. The commissioning agent may also spot-check misc. items and calibrations on the pre-functional checklists previously completed by the installer, before or as part of functional testing.

D. Functions/Modes Required To Be Tested, Test Methods and Seasonal Test Requirements

The following testing requirements are in addition to and do not replace any testing requirements elsewhere in this Division.

	Function/Mode	Test Method Manual, Monitoring, Either or Both	Required Seasonal Test[1]
Boilers and Pumps			
1.	Test each sequence in the sequence of operations, and other significant modes and sequences not mentioned; including start-up, shut down, unoccupied & manual modes and power failure. Test functionality of this piece of equipment or system in all control strategies or interlocks that it is associated with.	Manual	Both
2.	Lead/lag staging and modulation of boilers and pumps.	Both	Both
3.	Boiler and pump staging, VFD operation: modulation to minimum, control system PID, proportional band of speed vs. controlling parameter, verification of program settings, alarms, etc.	Both	Both
4.	Sensor and actuator calibration checks on: supply and return temperatures, pressure sensor controlling pump speed, mixing valve and other random checks (EMS readout against hand-held calibrated instrument must be within 0.5°F for temps. or within a tolerance equal to 10% of the pressure set point, with a test gage)	Manual	Both
5.	Verify schedules and set points		

E. Special Procedures (other equipment to test with, etc.; reference to function ID)

1. None.

F. Required Monitoring
1. Provide trending and monitoring as required by Section 15850.

G. Acceptance Criteria (referenced by function or mode ID)

1. For the conditions, sequences and modes tested, the boilers, pumps, integral components, and related equipment respond to varying loads and changing conditions and parameters appropriately as expected, as specified and according to acceptable operating practice.
2. Boilers shall maintain the supply water set point to within +/- 1.0F of set point dead band without excessive hunting.
3. Pumping system and controls shall maintain the current desired pressure set point to within an amount equal to 10% of the set point value either side of the dead band without excessive hunting.

H. Sampling Strategy for Identical Units
1. No sampling, test all.

END OF REQUIREMENTS FOR HEATING WATER SYSTEM TEST

4.3 AIR HANDLING UNITS (AHUS)

Test requirements of this section shall include Dedicated Outdoor Air System (DOAS) Units, Air Handling Units (AHUs), Heating and Ventilating (H&V) Units, and Air Curtain Units

A. Parties Responsible to Execute Functional Test
   1. Controls contractor: Operate the controls to activate the equipment as needed.
   2. HVAC Mechanical Contractor
   3. CA: to witness, direct and document testing.

B. Related Equipment Being Tested — Pre-functional Checklist ID
   1. DOAS Units and components (fans, coils, valves, ducts, VFD) PFC-_____
   2. AHUs and components (fans, coils, valves, ducts, VFD) PFC-_____
   3. H&V Units and components (fans, coils, valves, ducts, VFD) PFC-_____
   4. Air Curtain Units and components (fans, coils, valves, ducts, VFD) PFC-_____

C. Prerequisites The applicable prerequisite checklist shall be completed prior to beginning the functional testing. The commissioning agent may also spot-check misc. items and calibrations on the pre-functional checklists previously completed by the installer, before or as part of functional testing.

D. Functions/Modes Required To Be Tested, Test Methods and Seasonal Test Requirements

The following testing requirements are an addition to and do not replace any testing requirements elsewhere in this Division.

	Function/Mode	Test Method Manual, Monitoring, Either or Both[3]	Required Seasonal Test[1]
	DOAS Units, AHUs, and H&V Units		
1.	Test each sequence in the sequence of operations, and other significant modes and sequences not mentioned; including start-up, shut down, unoccupied & manual modes and power failure. Test functionality of this piece of equipment or system in all control strategies or interlocks with which it is associated.	Manual	
2.	Mixed & supply air, & reset temperature control functions.	Both	
3.	Economizer functions.	Both	Heating
4.	SF, RF and exhaust fan interlocks.	Either	
5.	No CCV flow when there is HCV flow.	Both	
6.	CCV & HCV modulation & positive shut-off (no leak-thru).	Manual	
7.	Duct static pressure (SP) control.	Both	
8.	Return or exhaust fan tracking and building SP.	Monitoring	
9.	VFD operation on SF and RF: modulation to minimum, control system PID, proportional band of speed vs. controlling parameter, constancy of static pressure, verification of program settings, alarms, etc.	Both	
10.	Damper interlocks and correct modulation in all modes, including smoke and fire dampers.	Manual	
11.	Temperature difference across HC & CC per specifications.	Manual	
12.	Verification of minimum and maximum OSA control.	Either	
13.	Heating and cooling coils freeze protection.	Manual	

	Function/Mode	Test Method Manual, Monitoring, Either or Both[3]	Required Seasonal Test[1]
14.	Branch duct control damper control.	Manual	
15.	Night low limit, morning warm-up cycle.	Either	
16.	Heat recovery operation.	Monitoring	
17.	Verify TAB reported CFM with control system reading.	Manual	
18.	All alarms (low limits, high static, etc.).	Manual	
19.	Sensor and actuator calibration checks: on duct static pressure sensor on SAT, MAT, OSAT, OSA & RA damper and valve positions, SF cfm reading with TAB, and other random checks (EMS readout against hand-held calibrated instrument or observation must be within specified tolerances)	Manual	
20.	Verify schedules and set points		

E. Special Procedures (other equipment to test with, etc.; reference to function ID)

1. None.

F. Required Monitoring
1. Provide trending and monitoring as required by Section 15850.

F. Acceptance Criteria (referenced by function or mode ID)
1. For the conditions, sequences and modes tested, the DOAS units, AHUs, H&V units, integral components, and related equipment respond to varying loads and changing conditions and parameters appropriately as expected, as specified and according to acceptable operating practice.
2. AHU with supporting systems shall be able to maintain the SA temperature within .1°F either side of the dead band of the current set point without excessive hunting.
3. AHU and controls shall control the duct static pressure so that it does not drift more than an amount equal to 10% of the set point value either side of the dead band without excessive hunting.

G. Sampling Strategy for Identical Units
1. No sampling, test all units

END OF REQUIREMENTS FOR AIR HANDLER UNITS (AHU) TEST

4.4 FAN COIL UNITS

A. Parties Responsible to Execute Functional Test
1. Controls contractor: operate the controls to activate the equipment.
2. CA: to witness, direct and document testing.

B. Related Equipment Being Tested — Pre-functional Checklist ID
1. Unit (fans, coils, ducts, piping) — PFC-_____

C. Prerequisites The applicable prerequisite checklist shall be completed prior to beginning the functional testing. The commissioning agent may also spot-check misc. items and calibrations on the pre-functional checklists previously completed by the installer, before or as part of functional testing.

D. Functions/Modes Required To Be Tested, Test Methods and Seasonal Test Requirements

The following testing requirements are in addition to and do not replace any testing requirements elsewhere in this Division.

	Function/Mode	Test Method Manual, Monitoring, Either or Both	Required Seasonal Test
1.	Test each sequence in the sequence of operations, and other significant modes and sequences not mentioned; including start-up, shut down, unoccupied & manual modes and power failure. Test functionality of this piece of equipment or system in all control strategies or interlocks that it is associated with.	Manual	
2.	Space Temperature	Both	
3.	Sensor calibration checks on: Space temperature (EMS readout against hand-held calibrated instrument must be within 0.5°F for temps.	Manual	
4.	Verify control strategies, schedules and set points to be reasonable and appropriate		

E. Special Procedures (other equipment to test with, etc.; reference to function ID)

1. None.

F. Required Monitoring
1. Provide trending and monitoring as required by Section 15850.

F. Acceptance Criteria (referenced by function or mode ID)
1. For the conditions, sequences and modes tested, the system, integral components and related equipment respond to varying loads and changing conditions and parameters appropriately as expected, as specified and according to acceptable operating practice.
2. Unit shall be able to maintain the SA temperature within 1.0 F either side of the dead band of the current set point without excessive hunting.

G. Sampling Strategy for Identical Units
1. Randomly test at least 20% of the Exhaust and Supply Fans in the 1st sample. In no case test less than three units in each group. If 10% of the units in the first sample fail the functional performance tests, test another 20% of the group (the 2nd sample). If 10% of the units in the 2nd sample fail, test all remaining units in the whole group. This sampling applies to the testing subsections. That is, if calibration is off on more than 10% of the tested piece of equipment,

then another sample shall have calibrations checked, but not all other tests need to be done on the second sample.

2. All units not included in the sampling testing and monitoring shall be fully monitored per the requirements of Section 15850.

END OF REQUIREMENTS FOR FAN COIL UNIT TEST

4.5 FANS (Exhaust/Supply Fans)

The testing requirements apply to the following fans: central restroom, mechanical room, stairwell pressurization and garage.

A. Parties Responsible to Execute Functional Test
1. Controls contractor: operate the controls to activate the equipment, if BAS controlled.
2. CA: to witness, direct and document testing.

B. Integral Components or Related Equipment Being Tested Pre-functional Checklist ID
1. Exhaust/Supply Fans PFC-_____

C. Prerequisites The applicable prerequisite checklist shall be completed prior to beginning the functional testing. The commissioning agent may also spot-check misc. items and calibrations on the pre-functional checklists previously completed by the installer, before or as part of functional testing.

D. Functions/Modes Required To Be Tested, Test Methods and Seasonal Test Requirements

The following testing requirements are in addition to and do not replace any testing requirements elsewhere in this Division.

	Function/Mode	Test Method Manual, Monitoring, Either or Both	Required Seasonal Test
Exhaust and Supply Fans			
1.	Test each sequence in the sequence of operations, and other significant modes and sequences not mentioned; including start-up, shut down, unoccupied & manual modes and power failure. Test functionality of this piece of equipment or system in all control strategies or interlocks that it is associated with.	Manual	
2.	Verify schedules and set points to be reasonable and appropriate		
3.	Function at fire alarm (off, depressurization, etc.)	Manual	
4.	Interlocks to building pressurization or ventilation damper control	Manual	
5.	Speed controls	Either	
6.	Check TAB report , compare to specifications	Review	
7.	Sensor calibration checks on any controlling temperature or pressure sensor	Manual	

E. Special Procedures (other equipment to test with, etc.; reference to function ID)

1. None.

F. Required Monitoring
1. Provide trending and monitoring as required by Section 15850.

G. Acceptance Criteria (referenced by function or mode ID)
1. For the conditions, sequences and modes tested, the fans, integral components and related equipment respond to changing conditions and parameters appropriately as expected, as specified and according to acceptable operating practice.

H. Sampling Check Scope Strategy for Identical

1. Units of the same type and function, but different in size, are considered identical for sampling purposes.
2. Randomly test at least 20% of the Exhaust and Supply Fans in the 1st sample. In no case test less than three units in each group. If 10% of the units in the first sample fail the functional performance tests, test another 20% of the group (the 2nd sample). If 10% of the units in the 2nd sample fail, test all remaining units in the whole group. This sampling applies to the testing subsections. That is, if calibration is off on more than 10% of the tested piece of equipment, then another sample shall have calibrations checked, but not all other tests need to be done on the second sample.
3. All units not included in the sampling testing and monitoring shall be fully monitored per the requirements of Section 15850.

END OF REQUIREMENTS FOR FANS TEST

4.6 UNIT HEATERS, CABINET UNIT HEATERS, BASEBOARD RADIATION (ELECTRIC AND HYDRONIC)

(This applies to standard applications, critical applications will have additional tests and a higher fraction tested.)

A. Parties Responsible to Execute Functional Test
   1. Controls contractor: operate the controls to activate the equipment.

B. Related Equipment Being Tested — Pre-functional Checklist ID
   1. Unit Heaters — PFC-_____
   2. Cabinet Unit Heaters — PFC-_____
   3. Baseboard Radiation — PFC-_____

C. Prerequisites The applicable prerequisite checklist shall be completed prior to beginning the functional testing. The commissioning agent may also spot-check misc. items and calibrations on the pre-functional checklists previously completed by the installer, before or as part of functional testing.

D. Functions/Modes Required To Be Tested, Test Methods and Seasonal Test Requirements

The following testing requirements are in addition to and do not replace any testing requirements elsewhere in this Division.

	Function/Mode	Test Method Manual, Monitoring, Either or Both	Required Seasonal Test
1.	Test each sequence in the sequence of operations, and other significant modes and sequences not mentioned; including start-up, warm-up, shut down, unoccupied & manual modes and power failure and restoration. Test functionality of this piece of equipment or system in all control strategies or interlocks that it is associated with, including all damper, valve and fan functions.	Manual	

E. Special Procedures (other equipment to test with, etc.; reference to function ID)

1. None.

F. Required Monitoring
   1. Provide trending and monitoring as required by Section 15850.

G. Acceptance Criteria (referenced by function or mode ID)
   1. For the conditions, sequences and modes tested, the TU, integral components, and related equipment respond to varying loads and changing conditions and parameters appropriately as expected, as specified and according to acceptable operating practice. Space temperature during occupied modes shall average within +/- 1°F of set point and always remain within 1°F of the ends of the dead band without excessive hunting of either the fan or control, or complaints of drafts or stuffiness from occupants.

H. Sampling Check Scope Strategy for Identical

1. Units of the same type and function, but different in size, are considered identical for sampling purposes.
2. Randomly test at least 20% of the group of identical equipment in the 1st sample. In no case test less than three units in each group. If 10% of the units in the first sample fail the

functional performance tests, test another 20% of the group (the 2nd sample). If 10% of the units in the 2nd sample fail, test all remaining units in the whole group. This sampling applies to the testing subsections. That is, if calibration is off on more than 10% of the tested piece of equipment, then another sample shall have calibrations checked, but not all other tests need to be done on the second sample.

3. All units not included in the sampling testing and monitoring shall be fully monitored per the requirements of Section 15850.

END OF REQUIREMENTS FOR UNIT HEATERS, CABINET UNIT HEATERS, AND BASEBOARD RADIATION

4.7 DUCTLESS SPLIT AIR CONDITIONING (A/C) UNITS

A. Parties Responsible to Execute Functional Test
1. Controls contractor: operate the controls to activate the equipment.
2. CA: to witness, direct and document testing.

B. Related Equipment Being Tested Pre-functional Checklist ID
1. A/C Unit (fans, coils, condenser, compressors, ducts) PFC-_____

C. Prerequisites The applicable prerequisite checklist shall be completed prior to beginning the functional testing. The commissioning agent may also spot-check misc. items and calibrations on the pre-functional checklists previously completed by the installer, before or as part of functional testing.

D. Functions/Modes Required To Be Tested, Test Methods and Seasonal Test Requirements

The following testing requirements are in addition to and do not replace any testing requirements elsewhere in this Division.

	Function/Mode	Test Method Manual, Monitoring, Either or Both	Required Seasonal Test
1.	Test each sequence in the sequence of operations, and other significant modes and sequences not mentioned; including start-up, shut down, unoccupied & manual modes and power failure. Test functionality of this piece of equipment or system in all control strategies or interlocks that it is associated with.	Manual	
2.	Space Temperature	Both	
3.	Sensor calibration checks on: Space temperature (EMS readout against hand-held calibrated instrument must be within 1.0°F for temps.	Manual	
4.	Verify control strategies, schedules and set points to be reasonable and appropriate		

E. Special Procedures (other equipment to test with, etc.; reference to function ID)

1. None.

F. Required Monitoring
1. Provide trending and monitoring as required by Section 15850.

H. Sampling Check Scope Strategy for Identical

F. Acceptance Criteria (referenced by function or mode ID)

1. For the conditions, sequences and modes tested, the system, integral components and related equipment respond to varying loads and changing conditions and parameters appropriately as expected, as specified and according to acceptable operating practice.

2. Unit shall be able to maintain the SA temperature within 1.0 F either side of the dead band of the current set point without excessive hunting.

G. Sampling Strategy for Identical Units

1. Units of the same type and function, but different in size, are considered identical for sampling purposes.

2. Randomly test at least 20% of the group of identical equipment in the 1st sample. In no case test less than three units in each group. If 10% of the units in the first sample fail the functional performance tests, test another 20% of the group (the 2nd sample). If 10% of the units in the 2nd sample fail, test all remaining units in the whole group. This sampling applies to the testing subsections. That is, if calibration is off on more than 10% of the tested piece of equipment, then another sample shall have calibrations checked, but not all other tests need to be done on the second sample.

3. All units not included in the sampling testing and monitoring shall be fully monitored per the requirements of Section 15850.

END OF REQUIREMENTS FOR DUCTLESS SPLIT AIR CONDITIONING (A/C) UNIT TEST

4.8 DOMESTIC HOT WATER HEATER AND RECIRCULATION PUMP

A. Parties Responsible to Execute Functional Test
1. Controls contractor: operate the controls to activate the equipment.

B. Related Equipment Being Tested Pre-functional Checklist ID
1. Domestic Hot Water Heater PFC-_____
2. Recirculation Pump PFC-_____

C. Prerequisites The applicable prerequisite checklist shall be completed prior to beginning the functional testing. The commissioning agent may also spot-check misc. items and calibrations on the pre-functional checklists previously completed by the installer, before or as part of functional testing.

D. Functions/Modes Required To Be Tested, Test Methods and Seasonal Test Requirements

The following testing requirements are in addition to and do not replace any testing requirements elsewhere in this Division.

	Function/Mode	Test Method Manual, Monitoring, Either or Both	Required Seasonal Test
1.	Test each sequence in the sequence of operations, and other significant modes and sequences not mentioned; including start-up, warm-up, shut down, unoccupied & manual modes and power failure and restoration. Test functionality of this piece of equipment or system in all control strategies or interlocks that it is associated with.	Manual	

E. Special Procedures (other equipment to test with, etc.; reference to function ID)

1. None.

F. Required Monitoring
1. Provide trending and monitoring as required by Section 15850.

G. Acceptance Criteria (referenced by function or mode ID)
1. For the conditions, sequences and modes tested, the domestic hot water heater, integral components, and related equipment respond to varying loads and changing conditions and parameters appropriately as expected, as specified and according to acceptable operating practice. Water temperature during occupied modes shall average within +/- 1°F of set point and always remain within 1°F of the ends of the dead band without excessive hunting of either the burner or recirculation pump.

H. Sampling Check Scope Strategy for Identical

1. No sampling, test all.

END OF REQUIREMENTS FOR DOMESTIC HOT WATER HEATER AND RECIRCULATION PUMP TEST

4.9 TESTING, ADJUSTING, AND BALANCING (TAB) VERIFICATION

A. Parties Responsible to Execute Functional Test
1. TAB contractor: perform checks using test instruments.
2. Controls contractor: operate the controls to activate the equipment.
3. CA: to witness, direct, and document testing.

B. Related Equipment Being Tested Pre-functional Checklist ID
1. TAB water-side PFC-_____
2. TAB air-side PFC-_____

C. Prerequisites The applicable prerequisite checklist shall be completed prior to beginning the functional testing. The commissioning agent may also spot-check misc. items and calibrations on the pre-functional checklists previously completed by the installer, before or as part of functional testing.

D. Purpose. The purpose of this test is to spot check the TAB work to verify that it was done in accordance with the contract documents and acceptable practice and that the TAB report is accurate.

E. The following tests and checks will be conducted. The following testing requirements are in addition to and do not replace any testing requirements elsewhere in this Division.

	Test or Check	Test Method	Required Seasonal Test[3]
1.	A random sample of up to 20 % the TAB report data shall be selected for verification (air velocity, air or water flow rate, pressure differential, electrical or sound measurement, etc.). The original TAB contractor will execute the checks, witnessed by the commissioning authority. The TAB contractor will use the same test instruments as used in the original TAB work. A failure of more than 10% of the selected items of a given system shall result in the failure of acceptance of the system TAB report and the TAB contractor shall be responsible to rebalance the system, provide a new system TAB report and repeat random verifications of the new TAB report. The random testing will include the verification of minimum outdoor air intake flows at minimum, maximum and intermediate total airflow rates for 100 % of the air handlers. Other selected data to be verified will be made known upon day of testing.	Demonstration	
2.	Verify that final settings of all valves, splitters, dampers and other adjustment devices have been permanently marked by the TAB Contractor.	Demonstration	
3.	Verification that the air system is being controlled to the lowest possible static pressure while still meeting design loads, less diversity. This shall include a review of TAB methods, control set points established by TAB and a physical verification of at least one leg from fan to diffuser having all balancing dampers wide open and that during full cooling of all TUs taking off downstream of the static pressure sensor, the TU on the critical leg has its damper 90% or more open.	Demonstration	
4.	Verification that the water system is being controlled to the lowest possible pressure while still meeting design loads, less diversity. This shall include a review of TAB methods, control set points es-	Demonstration	

	Test or Check	Test Method	Required Seasonal Test[3]
	tablished by TAB and a physical verification of at least one leg from the pump to the coil having all balancing valves wide open and that during full cooling the cooling coil valve of that leg is 90% or more open.		

F. Special Procedures (other equipment to test with, etc.; reference to function ID)
   1. None

G. Required Monitoring
   1. None

H. Acceptance Criteria
   1. As specified by Section 15550.

I. Sampling Strategy for Identical Units
   Described in test table above.

END OF REQUIREMENTS FOR TAB TEST

5.0 PRE-FUNCTIONAL CHECKLISTS

PRE-FUNCTIONAL CHECKLISTS

Pre-functional checklists shall be developed by the CA and completed by the Contractor for the following equipment/systems:

Front End Energy Management System
Hot Water Heating System
Air Handling Units including DOAS Units, AHUs, H&V Units, and Air Curtain Units
Fan Coil Units
Exhaust and Supply Fans
Unit Heaters
VRFs
Terminal Equipment
Unit Heaters
Baseboard Radiation
Split System A/C Units
Domestic Hot Water System

The attached sample checklists are intended to serve as an example only and are not detailed for this project. The actual pre-functional checklists for each piece of equipment and system will be developed by the CA after the submittals have been approved and will be reviewed by the Cx Team prior to distribution for use. The pre-functional checklists will be written to verify conformance to the requirements of the plans, specifications, manufacturer's product information and actual field conditions prior to proceeding with functional performance testing.

5.1 PREFUNCTIONAL CHECKLIST: FAN COIL UNITS

1. Submittal/Approvals

Submittal. The above equipment and systems integral to them are complete and ready for functional testing. The checklist items are complete and have been checked off only by parties having direct knowledge of the event, as marked below, respective to each responsible contractor. This pre-functional checklist is submitted for approval, subject to an attached list of outstanding items yet to be completed. A Statement of Correction will be submitted upon completion of any outstanding areas. None of the outstanding items preclude safe and reliable functional tests being performed. ___ List attached.

Mechanical Contractor	Date	Controls Contractor	Date
Electrical Contractor	Date	TAB Contractor	Date
Construction Manager	Date		

Pre-functional checklist items are to be completed as part of startup & initial checkout, preparatory to functional testing.

- This checklist does not take the place of the manufacturer's recommended checkout and startup procedures or report.
- Items that do not apply shall be noted with the reasons on this form (N/A = not applicable, BO = by others).
- If this form is not used for documenting, one of similar rigor shall be used.
- Contractors assigned responsibility for sections of the checklist shall be responsible to see that checklist items by their subcontractors are completed and checked off.

Approvals. This filled-out checklist has been reviewed. Its completion is approved with the exceptions noted below.

Commissioning Agent	Date	Owner's Representative	Date

Model Verification

Complete:

	Specified	Submitted	Installed
Manufacturer			
Model Number			
Serial Number			
Fan HP			
Fan V/PH			

Documentation

Complete:

Yes/No/NA	Item Check	Yes/No/NA	Item Check
	1. Manufacturer's submittals/shop drawings approved by A/E		2. Submittals/shop drawings include performance data (fan curves, coil data, etc.)
	3. Submittals/shop drawings include installation & startup manual and plan		4. O&M manuals approved by A/E
	5. Warranty certificate submitted		

Installation Checks

Complete:

General

Yes/No/NA	Item Check	Yes/No/NA	Item Check
	1. Unit ID tags affixed		2. Box properly labeled
	3. Installation is per mfg's instructions		2. Access panels installed with adequate clearance for maintenance
	5. All shipping & installation materials removed		6. Vibration isolators installed
	7. Equipment casing is clean		8. Unit free of physical damage

Piping

Yes/No/NA	Item Check	Yes/No/NA	Item Check
	1. Pipe fittings complete & pipes properly supported		2. Pipes properly labeled
	3. Pipes properly insulated		4. No leaking apparent around fittings
	5. Coils/fins are clean and in good condition		6. Condensate drain pans clean and slope to drain

Fans

Yes/No/NA	Item Check	Yes/No/NA	Item Check
	1. Fans lubricated		2. Fan drive properly aligned

	3. Fan turns freely, fan wheel balanced		4. Fan and motor rotation checked
	5. Fan guard or shield properly installed		6. Vibration isolation devices installed and Functional

Electrical

Yes/No/NA	Item Check	Yes/No/NA	Item Check
	1. Power disconnects located within sight of the unit it controls & labeled		2. All electrical connections tight
	3. Grounding installed for components and unit		4. Safeties installed and operational
	5. Starter overload breakers installed and correct size		6. All control devices & wiring complete
	7. Control system interlocks connected & functional		8. HOA switch installed per mfg's instructions
	9. Proper safeties in control when HOA switch in hand position		10. Operation of HOA switch checked in all positions

Sensors & Gages

Yes/No/NA	Item Check	Yes/No/NA	Item Check
	1. Temperature, pressure, and flow gages and sensors installed		2. Piping gages, BAS & associated panel temperature and pressure readouts match

Verify operation and calibration of sensors on control devices and actuators:

Sensor or Actuator	Location ok	Initial Gauge or BAS Value	Initial Measured Value	Final Gauge or BAS Value	Final Measure Value	Pass Y/N

Operational Checks Complete:

Operational Checks

Yes/No/NA	Item Check	Yes/No/NA	Item Check

☐	1. Specified sequences of operation & operating schedules provided with all variations documented	☐	2. Specified point-to-point checks have been completed and documentation record submitted for this system
☐	3. Startup record completed including full list of internal settings (with notes as to which settings are BAS controlled or monitored and which are integrated)	☐	4. Connections and interlocks with exterior Fan Coil Unit complete and operational
☐	5. Manufacturer startup requirements complete	☐	

End of Checklist

6.0 FUNCTIONAL PERFORMANCE TESTS

Functional performance test procedures shall be developed by the CA and executed by the Contractor with coordination from the CA for the following equipment/systems:

1. Front End Energy Management System
2. Hot Water Heating System
3. Air Handling Units including DOAS Units, AHUs, H&V Units, and Air Curtain Units
4. Fan Coil Units
5. Exhaust and Supply Fans
6. VRFs,
7. Fan Coil Units
8. Terminal Equipment
9. Unit Heaters
10. Cabinet Unit Heaters
11. Baseboard Radiation
12. Split System A/C Units
13. Domestic Hot Water System

The attached sample FPTs are intended to serve as an example only and are not detailed for this project. The actual pre-functional checklists for each piece of equipment and system will be developed by the CA after the submittals have been approved and will be reviewed by the Cx Team prior to distribution for use. The functional performance tests will be written to verify conformance to the requirements of the plans, specifications, manufacturer's product information and actual field conditions.

FUNCTIONAL PERFORMANCE TEST
FAN COIL UNITS

1. Participants:

Representing	Participant

Party filling out this form & witnessing _____ Date of Test: _____

Unit ID: _____

Location: _____

Area Served: _____

2. Prerequisite Checklist:

   a. The following have been started up, startup reports provided, and prefunctional checklists submitted and approved prior to functional testing - Y/N: _____

   b. These functional test procedures reviewed by installing contractors and are acceptable for use for the FPTs - Y/N: _____

3. Record of All Values:
Record of "All Values for Current Setpoints(SP), Control Parameters, Limits, Delays, Lockouts, Schedules, etc., changed to accommodate testing:

Parameter	Pre-Test Values	Returned to Pre-Test Values
Space Temperature (SP)		
Discharge Air Temperature (SP)		
Co_2 Sensor (SP)		
Occupied Cooling Setpoint		
Occupied Heating Setpoint		
Unoccupied Cooling Setpoint		
Uncccupied Heating Setpoint		

4. Sensor Calibration Checks: Check the sensors listed below for calibration and adequate location. This is a sampling check of calibrations done during prefunctional checklisting.

"In calibration" means making a reading with a calibrated test instrument within 6 inches of the site sensor. Verify that the sensor reading (via the permanent thermostat, gauge, or building automation system [BAS]) compared to the test instrument-measured value is within tolerances specified in the prefunctional checklist requirements. If not, calibrate or replace sensor. Use the same test instruments as used for the original calibration, if possible.

Calibration Instrument Data:		
Type:	Manufacturer/Model:	Calibration Date:

Type:	Manufacturer/Model:	Calibration Date:
Type:	Manufacturer/Model:	Calibration Date:

Type = Temperature, Humidity, CO2, etc.

Sensor & Location	Location OK*	1st Gage or BAS Value	Instr. Measured Value	Final Gage or BAS Value	Pass Y/N?
Room Sensor ZTE-1					
Discharge Air Sensor DAT-1					
CO_2 Sensor CO_2-1					
Float Switch FTL-1					

*Sensor location is appropriate and away from causes of erratic operation.

5. Device Operational Checks: The actuators or devices listed below checked for proper adjustment. This spot check on a sample of the adjustment done during prefunctional checklisting and startup.

"Proper adjustment" means observing a readout in the BAS and going to the actuator or controlled device and verifying that the BAS reading is correct. For items out of adjustment, fix now if easy, via an adjustment in the BAS, or a mechanical fix.

Device or Actuator & Location	Procedure or State	1st BAS Value	Site Observation	Final BAS Reading	Pass Y/N
Cooling coil value (V-1). Normally closed*	1. Closed				
	2. Full/Open				
	3. Fail Safe Operation				
Heating coil value (V-2). Normally open*	1. Closed				
	2. Full/Open				
	3. Fail Safe Operation				
Supply Fan Status **	1. On				
	2. Off				

6. Functional Performance Testing Record: The Commissioning Agent (CxA) will make and document any changes/addition/deletions to this test procedure required by current system conditions (i.e. weather, system load, etc.). The mechanical and control contractors are responsible to ensure any test or override does not cause damage. The CA reserves the right to alter or modify the test process or procedure as necessary to establish system operation.

Mode	Expected Response	Pass Y/N	Note
Unoccupied Shutdown	When indexed to unoccupied via the BAS, verify that:		
	1. Fan is off		
	2. Cooling coil control valve V-1 is closed		
	3. Heating coil control valve V-2 is closed		
Unoccupied - Cooling	When the space temperature is above the unoccupied cooling setpoint, verify that:		
	1. Fan is enabled		
	2. Cooling coil control valve V-1 is open		
	3. Heating coil control valve V-2 is closed		
	4. Unit returns to unoccupied mode when thermostat		

Mode	Expected Response	Pass Y/N	Note
	is satisfied		
Unoccupied - Heating	When the space temperature is below the unoccupied cooling setpoint, verify that:		
	1. Fan is enabled		
	2. Cooling coil control valve V-1 is open		
	3. Heating coil control valve V-2 is closed		
	4. Unit returns to unoccupied mode when Thermostat is satisfied		
Occupied - Cooling	When the space temperature is above the occupied cooling setpoint, verify that:		
	1. Fan runs continuously		
	2. Cooling coil control valve V-1 is open		
	3. Heating coil control valve V-2 is closed		
	4. Cooling coil closes when Thermostat is satisfied		
Occupied - Heating	When the space temperature is below the occupied heating setpoint, verify that:		
	1. Fan runs continuously		
	2. Heating coil control valve V-2 is open		
	3. Cooling coil control valve V-1 is closed		
	4. Heating coil closes when Thermostat is satisfied		
CO_2 Control	When the space CO_2 level is above the CO_2 sensor setpoint, verify that:		
	1. Make-up air damper D-2 is fully open		
Alarms	At the BAS verify status and receipt of the following:		
	1. Condensate drain pan overflow condition alarm as reported by FLT-1		

-- END OF TEST --

END OF SECTION 230800

SECTION 23 09 00 - HVAC INSTRUMENTATION AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes control equipment for HVAC systems and components, including control components for split system units, and other HVAC units that are not supplied with factory-wired controls.

B. The documentation contained in this section and other contract documents pertaining to HVAC controls is schematic in nature. The contractor shall coordinate and provide hardware and software necessary to implement the functions shown or as implied in these contract documents.

1.3 DESCRIPTION

A. Furnish and install a complete Automatic Temperature Control System (ATC) consisting of a Direct Digital Control Automatic Temperature Control System. The system shall be complete in all respects including labor, materials, equipment, and services necessary. HVAC system controls shall be based on Tridium Niagara AX platform and shall conform to ASHRAE standard 135 - BACnet. All controllers shall be resident BACnet appliances and shall require no gateways. The control contractor shall provide all necessary controllers, relays and appurtenances etc. as required, to provide a complete HVAC system operation in accordance with the sequence of operation.

B. The System Supplier shall assume and execute full responsibility to select, furnish, install and connect, test and calibrate, place into operation all specified components, assemblies, and accessories needed for a complete and functional system of HVAC monitoring and control in full compliance with the requirements of the contract documents.

C. The System shall be accessed through a standard web browser (Internet Explorer or equal). A graphical (GUI) interface shall be provided to allow for monitoring, remote alarm reporting and system set point adjustments.

1.4 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

a. Manufacturers:

1) Alerton by Havtech

2) Honeywell International Inc.; Home & Building Control.

3) Invensys Building Systems.

4) Johnson Controls, Inc.; Controls Group.

1.5 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Section 01 33 00 – Submittal Procedures.

B. Product Data for each type of product specified. Include manufacturer's technical Product Data for each control device furnished, indicating dimensions, capacities, performance characteristics, electrical characteristics, finishes of materials, installation instructions, and startup instructions.

C. Shop Drawings from manufacturer detailing equipment assemblies and indicating dimensions, weights, loadings, required clearances, methods of field assembly, components, and location and size of each field connection. Submit damper leakage and flow characteristics, plus size schedule for controlled dampers.

D. Shop Drawings containing the following information for each control system:

1. Schematic flow diagram showing fans, coils, dampers, airflow measurement devices, and control devices.

2. Each control device labeled with setting or adjustable range of control.

3. Diagrams for all required electrical wiring. Clearly differentiate between factory-installed and field-installed wiring.

4. Details of control panel faces, including controls, instruments, and labeling.

5. Written description of sequence of operation.

6. Trunk cable schematic showing programmable control unit locations and trunk data conductors.

7. Listing of connected data points, including connected control unit and input and input devices.

8. System graphics indicating monitoring systems, data (connected and calculated) point addresses, and operation notations.

9. Software description and sequence of operation.

10. System configuration showing peripheral devices, diagrams, and intercommunications.

E. Wiring diagrams detailing wiring for power, signal, and control systems and differentiating clearly between manufacturer-installed and field-installed wiring.

F. Maintenance data for control systems equipment to include in the operation and maintenance manual specified Section 01 78 23 – Operation and Maintenance Data. Including the following:

1. Maintenance instructions and spare parts lists for each type of control device.

2. Intercommunication wiring diagram with identified and numbered system components and devices.

3. Inspection period, cleaning methods, cleaning materials recommended, and calibrate tolerances.

4. Calibration records and list of set points.

G. Project Record Documents: Record actual locations of control components, including control units, thermostats, and sensors. Revise Shop Drawings to reflect actual installation and operating sequences.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is a certified installer of the automatic control system manufacturer for both installation and maintenance of units required for this project.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NFPA 90A, “Installation of Air Conditioning and Ventilation Systems.”

1.7 DELIVERY, STORAGE AND HANDLING

A. Store equipment and materials inside and protected from weather.

B. Factory-Mounted Components: Where control devices specified in this Section are indicated to be factory mounted on equipment, arrange for shipping control devices to unit manufacturer.

1.8 RESPONSIBILITIES

A. Electrical Subcontractor:

1. All power wiring as shown on electrical drawings. Power wiring required for the ATC system and not identified on the electrical drawings shall be provided by the ATC contractor.

B. Complying with the principle of “unit responsibility” all electrical work for automatic controls, except as otherwise specified, or shown on the electrical drawings shall be included in Division 23.

C. Electrical work shall, in general, comply with the following:

1. All low voltage wiring in finished rooms shall be concealed below working heights and exposed above.

2. Electrical work may include both low voltage power and control wiring, as required.

3. Conduit network for power systems may be used for running control voltage wiring.

4. All electrical work shall comply with the NEC and local electrical codes.

5. All safety devices shall be wired through both hand and auto positions of motor starting device to insure 100% safety shut-off.

6. All magnetic starters furnished by Electrical Contractor for mechanical equipment shall be furnished with integral 120 volt control transformers, sized to handle the additional VA needed for the controls - pilots, EP valves, etc.

7. The motor starter supplier shall provide auxiliary contacts as required for interlocking by ATC Contractor, the supplier shall estimate an allowance of at least one spare auxiliary contact per starter. All interlock and control wiring shown on the electrical prints is by the electrical subcontractor.

8. Low voltage plenum rated wiring can be run exposed above working heights in equipment rooms and above accessible ceiling. Wiring shall be neatly tied to pipes, EMT or other devices and not laid on ceiling tile.

9. Power to all control devices and panels shall be by the ATC Contractor, unless otherwise indicated in the electrical drawings.

1.9 DRAWINGS AND LAYOUTS

A. The ATC system manufacturer shall submit description of operation and schematic drawings of the System to the Engineer for approval before starting work. At least eight sets of submittals shall be sent through channels. At least four sets of operator and maintenance manuals with "as built" drawings, parts lists, etc., shall be provided at job completion.

PART 2 - PRODUCTS

2.1 CONTROL EQUIPMENT AND DEVICES

A. The control system shall include all necessary and specified control equipment properly installed in accordance with specifications and drawings, and shall include the automatic control of the following:

1. Control Valves: Provide factory fabricated control valves with operators as required by this specification. Provide selection as determined by manufacturer for installation requirements and pressure class, based on maximum pressure and temperature in piping system. Provide valve size in accordance with specified maximum pressure drop across control valve. Equipment control valves with heavy duty actuators, with proper shut off rating for each individual application.

a. Water Service Valves: Equal percentage characteristics for throttling service, linear characteristics for 3-way mixing or diverting service, with a range ability of 30 to 1, and maximum full flow pressure drop of 5 psig. (Not less than 3 psig; not more than 7 psig). Two-position valves shall be line size.

b. Single Seated Valves: Cage type trim, providing seating and guiding surfaces for plug on "top and bottom" guided plugs.

c. Valve Trim and Stems: Polished stainless steel.

d. Packing: Spring-loaded Teflon, self-adjusting.

e. Bodies, 2" and Smaller: Bronze with screwed end connections, replaceable brass seat. 125 psig rated, minimum.

2. Control Dampers: Dampers required in the temperature control functions of the automatic control system shall be AMCA-rated, factory fabricated manufactured by the ATC systems manufacturer. All dampers shall be sized as shown on drawings or as specified. All damper frames shall be constructed of 13 gauge galvanized sheet metal and shall have a flange. The blades shall be parallel or opposed, as required, and suitable for the air velocities to be encountered in the system. Replaceable Butyl rubber seals are to be provided on damper blades and installed along with the top and bottom of the frame. Seals and bearings shall be able to withstand temperatures ranging from minus 40 degrees F to plus 200 degrees F. Dampers shall be leak rated for 3 CFM/foot squared at 1" WG and 20 CFM/foot. squared at 4" WG or less in full closed position at 4" WG pressure differential across damper.

3. Damper blades shall not exceed 6" in width. All blades shall not exceed 6" in width. All blades are to be corrugated type construction, fabricated from two sheets of #22 gauge galvanized sheet steel, spot welded together. Blades are to be suitable for high velocity performance. Damper blades shall be a maximum of 48" long. Longer units shall be fabricated in sections. Dampers shall be Ruskin CD-60 or Johnson Controls D-1300 or approved equal.

4. Operators: A damper operator shall be electric and be provided for each automatic damper and shall be of sufficient capacity to operate the damper under all conditions and to guarantee tight close-off of dampers, as specified, against system pressure encountered. Each damper operator shall be provided with spring-return for normally closed or normally open position for fail safe operation to account for fire, low temperatures, or power interruption as indicated. Damper operators shall be manufactured from die-cast metal; no plastic or sheet metal bodies will be allowed.

B. Sensors and Controllers:

1. Thermistor temperature sensors shall be Vibration and Corrosion Resistant for wall, immersion, or duct mounting a required.. Accuracy shall be +/-0.36degF between the range of 32.0 deg. F - 158.0deg F.

a. Room Sensors

1) The room sensor shall incorporate an on-board 10K thermistor for room temperature sensing.

2) The room sensor shall provide a five-position slide switch to allow the occupant to offset the programmed temperature setpoint of the unit controller by a programmable amount.

3) Push-button switch located on the room sensor shall be monitored by the unit controller. The status of the switch shall be usable in a supervisory control logic or algorithm or to override to an occupied mode for a programmable amount of time.

4) The room sensor shall include an override LED which shall illumi nate when an override has been requested. Under normal scheduled operation, the LED shall flash periodically indicating proper operation of the unit controller.

5) The room sensor cover shall be provided with tamper resistant screws.

6) Screw terminals and pluggable RJ-11 type connectors shall be provided for wiring terminations between the controller and the room sensor.

b. Duct Sensors

1) Single point duct mounted sensors shall have a minimum 9" rigid probe and be used when the duct size is less than 24".

2) Averaging duct mounted sensors shall have a minimum 12.5' long averaging element and be used when the duct size is greater than 24".

2. Temperature Transmitters

a. Transmitters shall be of 2-wire, 4-20 mA output type with a solid state or RTD type element having an accuracy of +/- 1% of span. Transmitter shall include protection against reverse polarity and supply voltage transients. A span and zero adjustment shall be provided with each transmitter to allow for recalibration as necessary.

1) Room Sensors

a) Sensor covers shall be provided with tamper resistant screws.

2) Duct Sensors

a) Single point duct mounted sensors shall have a minimum 9" rigid probe and be used when the duct size is less than 24".

b) Averaging duct mounted sensors shall have a minimum 12.5' long averaging element and be used when the duct size is greater than 24".

3. Humidity Transmitters

a. Transmitters shall be of 2-wire, 4-20 mA output type with a resistance or capacitance element having an accuracy of +/- 2% between 20-95% Rh. Transmitter shall include protection against reverse polarity and supply voltage transients. An accuracy adjustment shall be provided with each transmitter to allow for recalibration as necessary.

b. Duct Mounted

a) Sensor shall have a minimum 6" rigid probe with a pressure cast aluminum weatherproof box with gasketed cover.

c. Room Sensor.

a) Set-Point Adjustment: Concealed.

b) Set-Point Indication: Keyed.

c) Thermometer: Spiral bimetal.

d) Color: Standard.

e) Orientation: Horizontal.

f) Cover: Manufacturer's standard lockable cover.

4. Differential Pressure Transmitters

a. Differential pressure transmitters shall be of 2-wire, 4-20 mA output type having an accuracy of +/- 3% over the entire range (0-1.00" water gage). An accuracy and zero span adjustment shall be provided with each transmitter to allow for recalibration as necessary. Air Filter Differential: Dwyer Series 630or approved equal.

5. Freezestats

a. Shall be heavy duty temperature controls that incorporate a vapor charged sensing element.

b. The low temperature cut-out must be adjustable.

c. The sensor shall have a 4-wire, 2 circuit contact that is designed to close when the main contact opens.

d. Must be wired in series with the fan.

6. Smoke Detectors

a. Duct smoke detectors shall be furnished under the Electrical Section of these Specifications, and installed in the ductwork of air moving equipment as required.

b. All control connections and wiring will be done under this Section of the Specifications. Power to smoke detector and connection to fire alarm system shall be performed by the electrical contractor.

7. Wall Mounted Sensor Guard

a. This Contractor shall furnish and install on all wall mounted sensors except those furnished with packaged equipment metal thermostat guards.

b. The guards will be constructed so that they cannot be twisted or jimmied open and so that pencils, letter openers, etc., cannot be inserted through the cover to adjust the thermostat.

c. All guards shall be mounted independent of the sensor and shall be anchored to wall.

8. Static Pressure sensor

a. The device shall output a 4 ~ 20 milli-amp which is linear in relation to the sensor pressure for air or water.

b. Accuracy shall be 0.5 % of full scale.

9. Relay

a. Plug-in relay blade type. Coil voltages shall be 12VDC, 24VDC, or VAC. Relay bases shall have contract ratings of 300V, 10 amperes.

C. Line-Voltage, On-Off Thermostats: Bimetal-actuated, open contact or bellows-actuated, enclosed, snap-switch type, or equivalent solid-state type, with heat anticipator, integral manual on-off-auto selector switch.

1. Equip thermostats, which control electric heating loads directly, with off position on dial wired to break unground conductors.

2. Dead Band: Maximum 2 deg F (1 deg C).

D. Low-Voltage, On-Off Thermostats: NEMA DC 3, 24-V, bimetal-operated, mercury-switch type, with adjustable or fixed anticipation heater, concealed set-point adjustment, 55 to 85 deg F (13 to 30 deg C) set-point range, and 2 deg F (1 deg C) maximum differential.

E. Room Thermostat Cover Construction: Manufacturer's standard locking covers.

1. Set-Point Adjustment: Concealed.

2. Thermometer: Concealed.

3. Color: Manufacturer's standard.

4. Orientation: Horizontal.

F. Room thermostat accessories include the following:

1. Insulating Bases: For thermostats located on exterior walls.

2. Thermostat Guards: Locking; heavy-duty, mounted on separated base.

3. Adjusting Key: As required for calibration and cover screws.

4. Aspirating Boxes: For flush-mounted aspirating thermostats.

5. Set-Point Adjustment: ½-inch- (13-mm-) diameter, adjustment knob.

G. Electric, Low-Limit Duct Thermostat: Snap-acting, single-pole, single-throw, manual- or automatic-reset switch that trips if temperature sensed across any 12 inches (300 mm) of bulb length is equal to or below set point.

1. Bulb Length: Minimum 20 feet (6 m).

2. Quantity: One thermostat for every 20 sq. ft. (2 sq. m) of coil surface.

H. Electric, High-Limit Duct Thermostat: Snap-acting, single-pole, single-throw, manual- or automatic-]reset switch that trips if temperature sensed across any 12 inches (300 mm) of bulb length is equal to or above set point.

1. Bulb Length: Minimum 20 feet (6 m).

2. Quantity: One thermostat for every 20 sq. ft. (2 sq. m) of coil surface.

2.2 STATUS SENSORS

B. Status Inputs for Fans: Differential-pressure switch with pilot-duty rating and with adjustable range of 0- to 5-inch wg (0 to 1240 Pa).

C. Status Inputs for Electric Motors: Comply with ISA 50.00.01, current-sensing fixed- or split-core transformers with self-powered transmitter, adjustable and suitable for 175 percent of rated motor current.

D. Current Switches: Self-powered, solid-state with adjustable trip current, selected to match current and system output requirements.

E. Electronic Valve/Damper Position Indicator: Visual scale indicating percent of travel and 2- to 10-V dc, feedback signal.

2.3 FLOW MEASURING STATIONS

A. Duct Airflow Station: Combination of air straightener and multiport, self-averaging pitot tube station.

1. Manufacturers:

a. Air Monitor Corporation.

b. Paragon Inc.

2. Casing: Galvanized-steel frame.

3. Flow Straightener: Aluminum honeycomb, 3/4-inch (20-mm) parallel cell, 3 inches (75 mm) deep.

4. Sensing Manifold: Copper manifold with bullet-nosed static pressure sensors positioned on equal area basis.

2.4 APPLICATION SPECIFIC CONTROLLERS - HVAC APPLICATIONS

A. Each Digital Panel shall be able to extend its monitoring and control through the use of standalone Application Specific Controllers (Application Specific Controllers).

B. Each ASC shall operate as a standalone controller capable of performing its specified control responsibilities independently of other controllers in the network. Each ASC shall be a microprocessor-based, multi-tasking, real-time digital control processor.

C. Each ASC shall have sufficient memory to support its own operating system and data bases including:

1. Control Processes

2. Energy Management Applications

3. Operator Interface

D. The operator interface to any ASC point data or programs shall be through the Digital Panel or portable operator's terminal connected to any ASC on the network.

E. Application Specific Controllers shall directly support the temporary use of a portable service terminal that can be connected to the ASC via zone temperature or directly at the controller. The capabilities of the portable service terminal that can be connected to the ASC via zone temperature or directly at the controller. The capabilities of the portable service terminal shall include, but not be limited to, the following:

1. Display temperatures

2. Display status

3. Display set points

4. Display control parameters

5. Override binary output control

6. Override analog set points

7. Modification of gain and offset constants

F. Powerfail Protection: All system set points, proportional bands, control algorithms, and any other programmable parameters shall be stored such that a power failure of any duration does not necessitate reprogramming the ASC.

G. Application Descriptions:

1. Unitary Controllers:

a. Unitary Controllers shall support, but not limited to, the following types of systems to address specific applications described in the "Execution" portion of this specification, and for future expansion:

b. Unitary Controllers shall support the following types of point inputs and outputs:

1) Heating and Cooling Outputs

2) 1 to 3 Stages

3) Analog Output with two-pipe logic

4) Fan Output

5) On/Off Logic Control

2.5 TRAINING

A. The ATC Contractor will provide a minimum of 16 hours of instructions to the Baltimore City' personnel in the operation and maintenance of the control system. Training will be provided after the system has been commissioned and demonstrated to the Architect or his representative.

2.6 SEQUENCE OF OPERATIONS

A. See Contract Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that power supply is available to control units.

B. Verify that duct-, pipe-, and equipment-mounted devices are installed before proceeding with installation.

3.2 INSTALLATION

A. Install software in control units. Implement all features of programs to specified requirements and as appropriate to sequence of operation.

B. Connect and configure equipment and software to achieve sequence of operation specified.

C. Verify location of thermostats, humidistats, and other exposed control sensors with Drawings and room details before installation. Install devices 48 inches (1220 mm) above the floor.

D. Install averaging elements in ducts and plenums in crossing or zigzag pattern.

E. Install guards on thermostats at all locations unless otherwise indicated.

F. Expand list of locations below or clearly indicate on Drawings.

G. Install automatic dampers according to Section 23 33 00 – Air Duct Accessories.

1. Install damper motors on outside of duct in warm areas, not in locations exposed to outdoor temperatures.

2. Install labels and nameplates to identify control components according to Section 23 05 53 – Identification for HVAC Piping and Equipment.

3. Install refrigerant instrument wells, valves, and other accessories according to Section 23 23 00 – Refrigerant Piping.

4. Install duct volume-control dampers according to Section 23 33 00 – Air Duct Accessories.

5. Install electronic and fiber-optic cables according to 27 13 23 – Fiber Optic Cables.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports:

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation. Remove and replace malfunctioning units and retest.

2. Test and adjust controls and safeties.

3. Test calibration of electronic controllers by disconnecting input sensors and stimulating operation with compatible signal generator.

4. Test each point through its full operating range to verify that safety and operating control set points are as required.

5. Test each control loop to verify stable mode of operation and compliance with sequence of operation. Adjust PID actions.

6. Test each system for compliance with sequence of operation.

7. Test software and hardware interlocks.

a. DDC Verification:

1) Verify that instruments are installed before calibration, testing, and loop or leak checks.

2) Check instruments for proper location and accessibility.

3) Check instrument installation for direction of flow, elevation, orientation, insertion depth, and other applicable considerations.

4) Check temperature instruments and material and length of sensing elements.

5) Check control valves. Verify that they are in correct direction.

6) Check DDC system as follows:

a) Verify that DDC controller power supply is from emergency power supply, if applicable.

b) Verify that wires at control panels are tagged with their service designation and approved tagging system.

c) Verify that spare I/O capacity has been provided.

d) Verify that DDC controllers are protected from power supply surges.

b. Replace damaged or malfunctioning controls and equipment and repeat testing procedures.

3.4 ADJUSTING

A. Calibrating and Adjusting:

1. Calibrate instruments.

2. Make three-point calibration test for both linearity and accuracy for each analog instrument.

3. Calibrate equipment and procedures using manufacturer's written recommendations and instruction manuals. Use test equipment with accuracy at least double that of instrument being calibrated.

4. Control System Inputs and Outputs:

a. Check analog inputs at 0, 50, and 100 percent of span.

b. Check analog outputs using milliampere meter at 0, 50, and 100 percent output.

c. Check digital inputs using jumper wire.

d. Check digital outputs using ohmmeter to test for contact making or breaking.

e. Check resistance temperature inputs at 0, 50, and 100 percent of span using a precision-resistant source.

5. Flow:

a. Set differential pressure flow transmitters for 0 and 100 percent values with 3-point calibration accomplished at 50, 90, and 100 percent of span.

b. Manually operate flow switches to verify that they make or break contact.

6. Pressure:

a. Calibrate pressure transmitters at 0, 50, and 100 percent of span.

b. Calibrate pressure switches to make or break contacts, with adjustable differential set at minimum.

7. Temperature:

a. Calibrate resistance temperature transmitters at 0, 50, and 100 percent of span using a precision-resistance source.

b. Calibrate temperature switches to make or break contacts.

8. Stroke and adjust control valves and dampers without positioners, following the manufacturer's recommended procedure, so that valve or damper is 100 percent open and closed.

9. Stroke and adjust control valves and dampers with positioners, following manufacturer's recommended procedure, so that valve and damper is 0, 50, and 100 percent closed.

10. Provide diagnostic and test instruments for calibration and adjustment of system.

11. Provide written description of procedures and equipment for calibrating each type of instrument. Submit procedures review and approval before initiating startup procedures.

B. Adjust initial temperature and humidity set points.

C. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to three visits to Project during other than normal occupancy hours for this purpose.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain HVAC instrumentation and controls. Refer to Division 01 Section "Demonstration and Training."

B. Refer Division 01 for administrative and procedural requirements for demonstration and training.

END OF SECTION 23 09 00

SECTION 23 09 23.11 - CONTROL VALVES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes control valves and actuators for DDC systems.

B. Related Requirements:

1. Section 230923 "Direct-Digital Control System for HVAC" control equipment and software, relays, electrical power devices, uninterruptible power supply units, wire, and cable.
2. Section 230933 "Electric and Electronic Control System for HVAC" for electric/electronic control valves and actuators in electric and electronic control systems.
3. Section 230943 "Pneumatic Control System for HVAC" for pneumatic control valves and actuators in pneumatic control systems.
4. Section 230993 "Sequence of Operations for HVAC Controls" for requirements that relate to Section 230923.11.

1.3 DEFINITIONS

A. Cv: Design valve coefficient.

B. DDC: Direct-digital control.

C. NBR: Nitrile butadiene rubber.

D. PTFE: Polytetrafluoroethylene

E. RMS: Root-mean-square value of alternating voltage, which is the square root of the mean value of the square of the voltage values during a complete cycle.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product, including the following:

1. Construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Operating characteristics, electrical characteristics, and furnished accessories indicating process operating range, accuracy over range, control signal over range, default control signal with loss of power, calibration data specific to each unique application, electrical power requirements, and limitations of ambient operating environment, including temperature and humidity.

3. Product description with complete technical data, performance curves, and product specification sheets.
4. Installation, operation, and maintenance instructions, including factors affecting performance.

B. Shop Drawings:

1. Include plans, elevations, sections, and mounting details.
2. Include details of product assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.
4. Include diagrams for pneumatic signal and main air tubing.

C. Delegated-Design Submittal:

1. Schedule and design calculations for control valves and actuators, including the following:

a. Flow at project design and minimum flow conditions.
b. Pressure differential drop across valve at project design flow condition.
c. Maximum system pressure differential drop (pump close-off pressure) across valve at project minimum flow condition.
d. Design and minimum control valve coefficient with corresponding valve position.
e. Maximum close-off pressure.
f. Leakage flow at maximum system pressure differential.
g. Torque required at worst case condition for sizing actuator.
h. Actuator selection indicating torque provided.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plan drawings and corresponding product installation details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Control valve installation location shown in relationship to room, duct, pipe, and equipment.
2. Size and location of wall access panels for control valves installed behind walls.
3. Size and location of ceiling access panels for control valves installed above inaccessible ceilings.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For control valves to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ASME Compliance: Fabricate and label products to comply with ASME Boiler and Pressure Vessel Code where required by authorities having jurisdiction.

C. Delegated Design: Engage a qualified professional[engineer], as defined in Section 014000 "Quality Requirements," to size products where indicated as delegated design.

D. Ground Fault: Products shall not fail due to ground fault condition when suitably grounded.

E. Backup Power Source: Systems and equipment served by a backup power source shall have associated control valve actuators served from a backup power source.

F. Environmental Conditions:

1. Provide electric control valve actuators, with protective enclosures satisfying the following minimum requirements unless more stringent requirements are indicated. Electric control valve actuators not available with integral enclosures, complying with requirements indicated, shall be housed in protective secondary enclosures.

    a. Hazardous Locations: Explosion-proof rating for condition.

G. Determine control valve sizes and flow coefficients by ISA 75.01.01.

H. Control valve characteristics and rangeability shall comply with ISA 75.11.01.

2.2 GLOBE-STYLE CONTROL VALVES

A. General Globe-Style Valve Requirements:

1. Globe-style control valve body dimensions shall comply with ISA 75.08.01.
2. Construct the valves to be serviceable from the top.
3. For cage guided valves, trim shall be field interchangeable for different valve flow characteristics, such as equal percentage, linear, and quick opening.
4. Reduced trim for one nominal size smaller shall be available for industrial valves NPS 1 (DN 25) and larger.
5. Replaceable seats and plugs.
6. Furnish each control valve with a corrosion-resistant nameplate indicating the following:

    a. Manufacturer's name, model number, and serial number.
    b. Body and trim size.
    c. Arrow indicating direction of flow.

2.3 SOLENOID VALVES

A. Description:

1. Action: Either normally open or normally closed in the event of electrical power failure as required by the application.
2. Size to close against the system pressure.
3. Manual override capable.
4. Heavy-duty assembly.
5. Body: Brass.
6. Seats and Discs: NBR or PTFE.
7. Solenoid Enclosure: NEMA 250, Type 4.

2.4 ELECTRIC AND ELECTRONIC CONTROL VALVE ACTUATORS

A. Position indicator and graduated scale on each actuator.

B. Type: Motor operated, with or without gears, electric and electronic.

C. Deliver torque required for continuous uniform movement of controlled device from limit to limit when operated at rated voltage.

D. Function properly within a range of 85 to 120 percent of nameplate voltage.

E. Construction:

1. For Actuators Less Than 100 W: Fiber or reinforced nylon gears with steel shaft, copper alloy or nylon bearings, and pressed steel enclosures.
2. For Actuators from 100 to 400 W: Gears ground steel, oil immersed, shaft hardened steel running in bronze, copper alloy or ball bearings. Operator and gear trains shall be totally enclosed in dustproof cast-iron, cast-steel or cast-aluminum housing.
3. For Actuators Larger Than 400 W: Totally enclosed reversible induction motors with auxiliary hand crank and permanently lubricated bearings.

F. Field Adjustment:

1. Spring Return Actuators: Easily switchable from fail open to fail closed in the field without replacement.
2. Gear Type Actuators: External manual adjustment mechanism to allow manual positioning when the actuator is not powered.

G. Two-Position Actuators: Single direction, spring return or reversing type.

H. Modulating Actuators:

1. Operation: Capable of stopping at all points across full range, and starting in either direction from any point in range.
2. Control Input Signal:

a. Three Point, Tristate, or Floating Point: Clockwise and counter-clockwise inputs. One input drives actuator to open position and other input drives actuator to close position. No signal of either input remains in last position.
b. Proportional: Actuator drives proportional to input signal and modulates throughout its angle of rotation. Suitable for zero- to 10 signals.

c. Pulse Width Modulation (PWM): Actuator drives to a specified position according to pulse duration (length) of signal from a dry contact closure, triac sink, or source controller.
d. Programmable Multi-Function:

1) Control Input, Position Feedback, and Running Time: Factory or field programmable.
2) Diagnostic: Feedback of hunting or oscillation, mechanical overload, mechanical travel, and mechanical load limit.
3) Service Data: Include, at a minimum, number of hours powered and number of hours in motion.

I. Fail-Safe:

1. Where indicated, provide actuator to fail to an end position.
2. Internal spring return mechanism to drive controlled device to an end position (open or close) on loss of power.
3. Batteries, capacitors, and other non-mechanical forms of fail-safe operation are acceptable only where uniquely indicated.

J. Integral Overload Protection:

1. Provide against overload throughout the entire operating range in both directions.
2. Electronic overload, digital rotation sensing circuitry, mechanical end switches, or magnetic clutches are acceptable methods of protection.

K. Enclosure:

1. Suitable for ambient conditions encountered by application.
2. NEMA 250, Type 2 for indoor and protected applications.
3. NEMA 250, Type 4 or Type 4X for outdoor and unprotected applications.
4. Provide actuator enclosure with heater and control where required by application.

5. Spring Return: 62 dBA.
6. Non-Spring Return: 45 dBA.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for valves installed in piping to verify actual locations of piping connections before installation.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Furnish and install products required to satisfy most stringent requirements indicated.

B. Install products level, plumb, parallel, and perpendicular with building construction.

C. Properly support instruments, tubing, piping, wiring, and conduits to comply with requirements indicated. Brace all products to prevent lateral movement and sway or a break in attachment when subjected to a <Insert value> force.

D. Provide ceiling, floor, roof, and wall openings and sleeves required by installation. Before proceeding with drilling, punching, or cutting, check location first for concealed products that could potentially be damaged. Patch, flash, grout, seal, and refinish openings to match adjacent condition.

E. Firestop penetrations made in fire-rated assemblies and seal penetrations made in acoustically rated assemblies.

F. Fastening Hardware:

1. Stillson wrenches, pliers, and other tools that will cause injury to or mar surfaces of rods, nuts, and other parts are prohibited for assembling and tightening nuts.
2. Tighten bolts and nuts firmly and uniformly. Do not overstress threads by excessive force or by oversized wrenches.
3. Lubricate threads of bolts, nuts, and screws with graphite and oil before assembly.

G. Install products in locations that are accessible and that will permit calibration and maintenance from floor, equipment platforms, or catwalks. Where ladders are required for Owner's access, confirm unrestricted ladder placement is possible under occupied condition.

H. Corrosive Environments:

1. Use products that are suitable for environment to which they will be subjected.

2. Use Type 316 stainless-steel tubing and fittings when in contact with a corrosive environment.
3. When conduit is in contact with a corrosive environment, use Type 316 stainless-steel conduit and fittings or conduit and fittings that are coated with a corrosive-resistant coating that is suitable for environment.
4. Where control devices are located in a corrosive environment and are not corrosive resistant from manufacturer, field install products in a NEMA 250, Type 4X enclosure constructed of Type 316L stainless steel.

3.3 ELECTRIC POWER

A. Furnish and install electrical power to products requiring electrical connections.

B. Furnish and install circuit breakers. Comply with requirements in Section 262816 "Enclosed Switches and Circuit Breakers."

C. Furnish and install power wiring. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

D. Furnish and install raceways. Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems."

3.4 CONTROL VALVES

A. Install pipe reducers for valves smaller than line size. Position reducers as close to valve as possible but at distance to avoid interference and impact to performance. Install with manufacturer-recommended clearance.

B. Install flanges or unions to allow drop-in and -out valve installation.

C. Clearance:

1. Locate valves for easy access and provide separate support of valves that cannot be handled by service personnel without hoisting mechanism.
2. Install valves with at least 12 inches of clear space around valve and between valves and adjacent surfaces.

D. Threaded Valves:

1. Note internal length of threads in valve ends, and proximity of valve internal seat or wall, to determine how far pipe should be threaded into valve.
2. Align threads at point of assembly.
3. Apply thread compound to external pipe threads, except where dry seal threading is specified.
4. Assemble joint, wrench tight. Apply wrench on valve end as pipe is being threaded.

E. Flanged Valves:

1. Align flange surfaces parallel.
2. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly with a torque wrench.

3.5 CONNECTIONS

A. Connect electrical devices and components to electrical grounding system. Comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

3.6 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Each piece of wire, cable, and tubing shall have the same designation at each end for operators to determine continuity at points of connection. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.7 CLEANING

A. Remove grease, mastic, adhesives, dust, dirt, stains, fingerprints, labels, and other foreign materials from exposed interior and exterior surfaces.

B. Wash and shine glazing.

C. Polish glossy surfaces to a clean shine.

3.8 CHECKOUT PROCEDURES

A. Control Valve Checkout:

1. Check installed products before continuity tests, leak tests, and calibration.
2. Check valves for proper location and accessibility.
3. Check valves for proper installation for direction of flow, elevation, orientation, insertion depth, or other applicable considerations that will impact performance.
4. For pneumatic products, verify air supply for each product is properly installed.
5. For pneumatic valves, verify that pressure gauges are provided in each air line to valve actuator and positioner.
6. Verify that control valves are installed correctly for flow direction.
7. Verify that valve body attachment is properly secured and sealed.
8. Verify that valve actuator and linkage attachment are secure.
9. Verify that actuator wiring is complete, enclosed, and connected to correct power source.
10. Verify that valve ball, disc, and plug travel are unobstructed.
11. After piping systems have been tested and put into service, but before insulating and balancing, inspect each valve for leaks. Adjust or replace packing to stop leaks. Replace the valve if leaks persist.

3.9 ADJUSTMENT, CALIBRATION, AND TESTING

A. Stroke and adjust control valves following manufacturer's recommended procedure, from 100 percent open to 100 percent closed back to 100 percent open.

B. Stroke control valves with pilot positioners. Adjust valve and positioner following manufacturer's recommended procedure, so valve is 100 percent closed, 50 percent closed, and 100 percent open at proper air pressures.

C. Check and document open and close cycle times for applications with a cycle time of less than 30 seconds.

D. For control valves equipped with positive position indication, check feedback signal at multiple positions to confirm proper position indication.

END OF SECTION 230923.11

SECTION 23 09 23.12 - CONTROL DAMPERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes control dampers and actuators for DDC systems.

B. Related Requirements:

1. Section 230923 "Direct-Digital Control System for HVAC" for control equipment and software, relays, electrical power devices, uninterruptible power supply units, wire, and cable.
2. Section 230993 "Sequence of Operations for HVAC Controls" for requirements that relate to Section 230923.12.

1.3 DEFINITIONS

A. DDC: Direct-digital control.

B. RMS: Root-mean-square value of alternating voltage, which is the square root of the mean value of the square of the voltage values during a complete cycle.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product, including the following:

1. Construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Operating characteristics, electrical characteristics, and furnished accessories indicating process operating range, accuracy over range, control signal over range, default control signal with loss of power, calibration data specific to each unique application, electrical power requirements, and limitations of ambient operating environment, including temperature and humidity.
3. Product description with complete technical data, performance curves, and product specification sheets.
4. Installation instructions, including factors affecting performance.

B. Shop Drawings:

1. Include plans, elevations, sections, and mounting details.
2. Include details of product assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

3. Include diagrams for power, signal, and control wiring.
4. Include diagrams for air and process signal tubing.
5. Include diagrams for pneumatic signal and main air tubing.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plan drawings and corresponding product installation details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Product installation location shown in relationship to room, duct, and equipment.
2. Size and location of wall access panels for control dampers and actuators installed behind walls.
3. Size and location of ceiling access panels for control dampers and actuators installed above inaccessible ceilings.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For control dampers to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ASME Compliance: Fabricate and label products to comply with ASME Boiler and Pressure Vessel Code where required by authorities having jurisdiction.

C. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to size products where indicated as delegated design.

D. Ground Fault: Products shall not fail due to ground fault condition when suitably grounded.

E. Backup Power Source: Systems and equipment served by a backup power source shall have associated control damper actuators served from a backup power source.

F. Environmental Conditions:

1. Provide electric control-damper actuators, with protective enclosures satisfying the following minimum requirements unless more stringent requirements are indicated. Electric control-damper actuators not available with integral enclosures, complying with requirements indicated, shall be housed in protective secondary enclosures.

a. Hazardous Locations: Explosion-proof rating for condition.

G. Selection Criteria:

1. Fail positions unless otherwise indicated:

a. Supply Air: Open.
b. Return Air: Open.
c. Outdoor Air: Close.
d. Mixed Air: Close.
e. Exhaust Air: Close.

2. Dampers shall have stable operation throughout full range of operation, from design to minimum airflow over varying pressures and temperatures encountered.
3. Select modulating dampers for a pressure drop of 2 percent of fan total static pressure unless otherwise indicated.
4. Two-position dampers shall be full size of duct or equipment connection unless otherwise indicated.

2.2 RECTANGULAR CONTROL DAMPERS

A. General Requirements:

1. Unless otherwise indicated, use parallel blade configuration for two-position control, equipment isolation service, and when mixing two airstreams. For other applications, use opposed blade configuration.
2. Factory assemble multiple damper sections to provide a single damper assembly of size required by the application.
3. Damper actuator shall be factory installed by damper manufacturer as integral part of damper assembly. Coordinate actuator location and mounting requirements with damper manufacturer.

B. Rectangular Dampers with Aluminum Airfoil Blades:

1. Performance:

a. Leakage: AMCA 511, Class 1A. Leakage shall not exceed 3 cfm/sq. ft. against 1-in. wg differential static pressure.
b. Pressure Drop: 0.05-in. wg at 1500 fpm across a 24-by-24-inch damper when tested according to AMCA 500-D, figure 5.3.
c. Velocity: Up to 6000 fpm.
d. Temperature: Minus 40 to plus 185 deg F.
e. Pressure Rating: Damper close-off pressure equal to fan shutoff pressure with a maximum blade deflection of 1/200 of blade length.
f. Damper shall have AMCA seal for both air leakage and air performance.

2. Construction:

a. Frame:

1) Material: ASTM B 211, Alloy 6063 T5 extruded-aluminum profiles,0.07 inch thick.
2) Hat-shaped channel with integral flange(s). Mating face shall be a minimum of 1 inch.
3) Width not less than 5 inches.

b. Blades:

1) Hollow, airfoil, extruded aluminum.
2) Parallel or opposed blade configuration as required by application.

3) Material: ASTM B 211, Alloy 6063 T5 aluminum, 0.07 inch thick.
4) Width not to exceed 6 inches.
5) Length as required by close-off pressure, not to exceed 48 inches.

c. Seals:

1) Blades: Replaceable, mechanically attached extruded silicone, vinyl, or plastic composite.
2) Jambs: Stainless steel, compression type.

d. Axles: 0.5-inch-diameter plate steel, mechanically attached to blades.
e. Bearings:

1) Molded synthetic or stainless-steel sleeve mounted in frame.
2) Where blade axles are installed in vertical position, provide thrust bearings.

f. Linkage:

1) Concealed in frame.
2) Constructed of aluminum and plated steel.
3) Hardware: Stainless steel.

g. Transition:

1) For round and flat oval duct applications, provide damper assembly with integral transitions to mate to adjoining field connection.
2) Factory mount damper in a sleeve with a close transition to mate to field connection.
3) Damper size and sleeve shall be connection size plus 2 inches.
4) Sleeve length shall be not less than 12 inches for dampers without jackshafts and shall be not less than 16 inches for dampers with jackshafts.
5) Sleeve material shall match adjacent duct.

h. Additional Corrosion Protection for Corrosive Environments:

1) Provide anodized finish for aluminum surfaces in contact with airstream. Anodized finish shall be a minimum of 0.0007 inch thick.
2) Axles, damper linkage, and hardware shall be constructed of Type 316L stainless steel.

3. Airflow Measurement:

a. Where indicated, provide damper assembly with integral airflow monitoring.
b. Zero- to 10-V dc or 4- to 20-mA scaled output signal for remote monitoring of actual airflow.
c. Accuracy shall be within 5 percent of the actual flow rate between the range of minimum and design airflow. For applications with a large variation in range between the minimum and design airflow, configure the damper sections and flow measurement assembly as required to comply with the stated accuracy over the entire modulating range.
d. Provide a straightening device as part of the flow measurement assembly to achieve the specified accuracy with configuration indicated.
e. Suitable for operation in untreated and unfiltered air.
f. Provide temperature and altitude compensation and correction to maintain accuracy over temperature range encountered at site altitude.

g. Provide automatic zeroing feature.

4. Airflow Control:

a. Where indicated, provide damper assembly with integral airflow measurement and control.
b. A factory-furnished and -calibrated controller shall be programmed, in nonvolatile EPROM, with application-specific airflow set point and range.
c. The controller and actuator shall communicate to control the desired airflow.
d. The controller shall receive a zero- to 10-V dc input signal and report a zero- to 20-mA output signal that is proportional to the airflow.
e. Airflow measurement and control range shall be suitable for operation between 150 to 2000 fpm.

C. Rectangular Dampers with Steel Airfoil Blades:

1. Performance:

a. Leakage: AMCA 511, Class 1A. Leakage shall not exceed 3 cfm/sq. ft. against 1-in. wg differential static pressure.
b. Pressure Drop: 0.06-in. wg at 1500 fpm across a 24-by-24-inch damper when tested according to AMCA 500-D, figure 5.3.
c. Velocity: Up to 6000 fpm.
d. Temperature: Minus 40 to plus 185 deg F.
e. Pressure Rating: Damper close-off pressure equal to fan shutoff pressure with a maximum blade deflection of 1/200 of blade length.
f. Damper shall have AMCA seal for both air leakage and air performance.

2. Construction:

a. Frame:

1) Material: ASTM A 653/A 653M galvanized-steel profiles, 0.06 inch thick.
2) Hat-shaped channel with integral flanges. Mating face shall be a minimum of 1 inch.
3) Width not less than 5 inches.

b. Blades:

1) Hollow, airfoil, galvanized steel.
2) Parallel or opposed blade configuration as required by application.
3) Material: ASTM A 653/A 653M galvanized steel, 0.05 inch thick.
4) Width not to exceed 6 inches.
5) Length as required by close-off pressure, not to exceed 48 inches.

c. Seals:

1) Blades: Replaceable, mechanically attached extruded silicone, vinyl, or plastic composite.
2) Jambs: Stainless steel, compression type.

d. Axles: 0.5-inch- diameter stainless steel, mechanically attached to blades.
e. Bearings:

1) Stainless steel mounted in frame.

2) Where blade axles are installed in vertical position, provide thrust bearings.

f. Linkage:

1) Concealed in frame.
2) Constructed of aluminum and plated steel.
3) Hardware: Stainless steel.

g. Transition:

1) For round and flat oval duct applications, provide damper assembly with integral transitions to mate to adjoining field connection.
2) Factory mount damper in a sleeve with a close transition to mate to field connection.
3) Damper size and sleeve shall be connection size plus 2 inches.
4) Sleeve length shall be not less than 12 inche for dampers without jackshafts and shall be not less than 16 inches for dampers with jackshafts.
5) Sleeve material shall match adjacent duct.

h. Additional Corrosion Protection for Corrosive Environments:

1) Provide epoxy finish for surfaces in contact with airstream.
2) Axles, damper linkage, and hardware shall be constructed of Type 316L stainless steel.

2.3 ROUND CONTROL DAMPERS

A. Round Dampers, Sleeve Type:

1. Construction:

a. Frame:

1) Material: Galvanized steel, 0.04 in thick.
2) Outward rolled stiffener beads positioned approximately 1 inch inboard of each end.
3) Sleeve-type connection for mating to adjacent ductwork.
4) Size Range: 4 to 24 inches.
5) Length not less than 7 inches.
6) Provide 2-inch sheet metal stand-off for mounting actuator.

b. Blade: Double-thickness circular flat blades sandwiched together and constructed of galvanized steel.
c. Blade Seal: Polyethylene foam seal sandwiched between two sides of blades and fully encompassing blade edge.
d. Axle: 0.5-inch-diameter plated steel, mechanically attached to blade.
e. Bearings: Stainless-steel sleeve pressed into frame.

2.4 GENERAL CONTROL-DAMPER ACTUATORS REQUIREMENTS

A. Actuators shall operate related damper(s) with sufficient reserve power to provide smooth modulating action or two-position action and proper speed of response at velocity and pressure conditions to which the damper is subjected.

B. Actuators shall produce sufficient power and torque to close off against the maximum system pressures encountered. Actuators shall be sized to close off against the fan shutoff pressure as a minimum requirement.

C. The total damper area operated by an actuator shall not exceed 80 percent of manufacturer's maximum area rating.

D. Provide one actuator for each damper assembly where possible. Multiple actuators required to drive a single damper assembly shall operate in unison.

E. Avoid the use of excessively oversized actuators which could overdrive and cause linkage failure when the damper blade has reached either its full open or closed position.

F. Use jackshafts and shaft couplings in lieu of blade-to-blade linkages when driving axially aligned damper sections.

G. Provide mounting hardware and linkages for connecting actuator to damper.

H. Select actuators to fail in desired position in the event of a power failure.

I. Actuator Fail Positions: As indicated below:

1. Exhaust Air: Close.
2. Outdoor Air: Close.
3. Supply Air: Open.
4. Return Air: Open.

2.5 ELECTRIC AND ELECTRONIC ACTUATORS

A. Type: Motor operated, with or without gears, electric and electronic.

B. Voltage:

1. Voltage selection is delegated to professional designing control system.
2. Actuator shall deliver torque required for continuous uniform movement of controlled device from limit to limit when operated at rated voltage.
3. Actuator shall function properly within a range of 85 to 120 percent of nameplate voltage.

C. Construction:

1. Less Than 100 W: Fiber or reinforced nylon gears with steel shaft, copper alloy or nylon bearings, and pressed steel enclosures.
2. 100 up to 400 W: Gears ground steel, oil immersed, shaft-hardened steel running in bronze, copper alloy, or ball bearings. Operator and gear trains shall be totally enclosed in dustproof cast-iron, cast-steel, or cast-aluminum housing.
3. Greater Than 400 W: Totally enclosed reversible induction motors with auxiliary hand crank and permanently lubricated bearings.

D. Field Adjustment:

1. Spring return actuators shall be easily switchable from fail open to fail closed in the field without replacement.
2. Provide gear-type actuators with an external manual adjustment mechanism to allow manual positioning of the damper when the actuator is not powered.

E. Two-Position Actuators: Single direction, spring return or reversing type.

1. Where indicated, provide actuator to fail to an end position.
2. Internal spring return mechanism to drive controlled device to an end position (open or close) on loss of power.
3. Batteries, capacitors, and other non-mechanical forms of fail-safe operation are acceptable only where uniquely indicated.

F. Integral Overload Protection:

1. Provide against overload throughout the entire operating range in both directions.
2. Electronic overload, digital rotation sensing circuitry, mechanical end switches, or magnetic clutches are acceptable methods of protection.

G. Damper Attachment:

1. Unless otherwise required for damper interface, provide actuator designed to be directly coupled to damper shaft without need for connecting linkages.
2. Attach actuator to damper drive shaft in a way that ensures maximum transfer of power and torque without slippage.
3. Bolt and set screw method of attachment is acceptable only if provided with at least two points of attachment.

H. Temperature and Humidity:

1. Temperature: Suitable for operating temperature range encountered by application with minimum operating temperature range of minus 20 to plus 120 deg.
2. Humidity: Suitable for humidity range encountered by application; minimum operating range shall be from 5 to 95 percent relative humidity, non-condensing.

I. Enclosure:

1. Suitable for ambient conditions encountered by application.
2. NEMA 250, Type 2 for indoor and protected applications.
3. NEMA 250, Type 4 or Type 4X for outdoor and unprotected applications.
4. Provide actuator enclosure with a heater and controller where required by application.

J. Stroke Time:

1. Operate damper from fully closed to fully open within 60 seconds.
2. Operate damper from fully open to fully closed within 60 seconds.
3. Move damper to failed position within 15 seconds.
4. Select operating speed to be compatible with equipment and system operation.
5. Actuators operating in smoke control systems comply with governing code and NFPA requirements.

K. Sound:

1. Spring Return: 62 dBA.
2. Non-Spring Return: 45 dBA.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for dampers and instruments installed in duct systems to verify actual locations of connections before installation.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Furnish and install products required to satisfy most stringent requirements indicated.

B. Properly support dampers and actuators, tubing, wiring, and conduit to comply with requirements indicated. Brace all products to prevent lateral movement and sway or a break in attachment when subjected to a force.

C. Provide ceiling, floor, roof, and wall openings and sleeves required by installation. Before proceeding with drilling, punching, or cutting, check location first for concealed products that could potentially be damaged. Patch, flash, grout, seal, and refinish openings to match adjacent condition.

D. Seal penetrations made in fire-rated and acoustically rated assemblies.

E. Fastening Hardware:

1. Stillson wrenches, pliers, or other tools that will cause injury to or mar surfaces of rods, nuts, and other parts are prohibited for assembling and tightening nuts.
2. Tighten bolts and nuts firmly and uniformly. Do not overstress threads by excessive force or by oversized wrenches.
3. Lubricate threads of bolts, nuts, and screws with graphite and oil before assembly.

F. Install products in locations that are accessible and that will permit calibration and maintenance from floor, equipment platforms, or catwalks. Where ladders are required for Owner's access, confirm unrestricted ladder placement is possible under occupied condition.

G. Corrosive Environments:

1. Use products that are suitable for environment to which they will be subjected.

2. Use Type 316 stainless-steel tubing and fittings when in contact with a corrosive environment.

3. When conduit is in contact with a corrosive environment, use Type 316 stainless-steel conduit and fittings or conduit and fittings that are coated with a corrosive-resistant coating that is suitable for environment.
4. Where actuators are located in a corrosive environment and are not corrosive resistant from manufacturer, field install products in a NEMA 250, Type 4X enclosure constructed of Type 316L stainless steel.

3.3 ELECTRIC POWER

A. Furnish and install electrical power to products requiring electrical connections.

B. Furnish and install circuit breakers. Comply with requirements in Section 262816 "Enclosed Switches and Circuit Breakers."

C. Furnish and install power wiring. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

D. Furnish and install raceways. Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems."

3.4 CONTROL DAMPERS

A. Install smooth transitions, not exceeding 30 degrees, to dampers smaller than adjacent duct. Install transitions as close to damper as possible but at distance to avoid interference and impact to performance. Consult manufacturer for recommended clearance.

B. Clearance:

1. Locate dampers for easy access and provide separate support of dampers that cannot be handled by service personnel without hoisting mechanism.
2. Install dampers with at least 24 inches of clear space on sides of dampers requiring service access.

C. Service Access:

1. Dampers and actuators shall be accessible for visual inspection and service.
2. Install access door(s) in duct or equipment located upstream of damper to allow service personnel to hand clean any portion of damper, linkage, and actuator. Comply with requirements in Section 233300 "Air Duct Accessories."

D. Install dampers straight and true, level in all planes, and square in all dimensions. Install supplementary structural steel reinforcement for large multiple-section dampers if factory support alone cannot handle loading.

E. Attach actuator(s) to damper drive shaft.

F. For duct-mounted and equipment-mounted dampers installed outside of equipment, install a visible and accessible indication of damper position from outside.

3.5 CONNECTIONS

A. Connect electrical devices and components to electrical grounding system. Comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

3.6 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Each piece of wire, cable, and tubing shall have the same designation at each end for operators to determine continuity at points of connection. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems. "Section 260553 "Electrical Identification."

B. Install engraved phenolic nameplate with damper identification on damper.

3.7 CHECKOUT PROCEDURES

A. Control-Damper Checkout:

1. Check installed products before continuity tests, leak tests, and calibration.
2. Check dampers for proper location and accessibility.
3. Check instrument tubing for proper isolation, fittings, slope, dirt legs, drains, material, and support.
4. For pneumatic products, verify air supply for each product is properly installed.
5. For pneumatic dampers, verify that pressure gages are provided in each airline to damper actuator and positioner.
6. Verify that control dampers are installed correctly for flow direction.
7. Verify that proper blade alignment, either parallel or opposed, has been provided.
8. Verify that damper frame attachment is properly secured and sealed.
9. Verify that damper actuator and linkage attachment are secure.
10. Verify that actuator wiring is complete, enclosed, and connected to correct power source.
11. Verify that damper blade travel is unobstructed.

3.8 ADJUSTMENT, CALIBRATION, AND TESTING:

A. Stroke and adjust control dampers following manufacturer's recommended procedure, from 100 percent open to 100 percent closed back to 100 percent open.

B. Stroke control dampers with pilot positioners. Adjust damper and positioner following manufacturer's recommended procedure, so damper is 100 percent closed, 50 percent closed, and 100 percent open at proper air pressure.

C. Check and document open and close cycle times for applications with a cycle time of less than 30 seconds.

D. For control dampers equipped with positive position indication, check feedback signal at multiple positions to confirm proper position indication.

END OF SECTION 230923.12

SECTION 23 11 23 - FACILITY NATURAL-GAS PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Pipes, tubes, and fittings.
2. Piping and tubing joining materials.
3. Valves.
4. Remote reading gas meters

B. Related Requirements:
1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

1.4 PERFORMANCE REQUIREMENTS

A. Minimum Operating-Pressure Ratings:

1. Piping and Valves: 100 psig (690 kPa) minimum unless otherwise indicated.

B. Natural-Gas System Pressure within Buildings: More than 0.5 psig (3.45 kPa) but not more than 2 psig (13.8 kPa).

1.5 SUBMITTALS

A. Product Data: For each type of the following:

1. Piping specialties.

2. Valves. Include pressure rating, capacity, settings, and electrical connection data of selected models.

3. Gas Meters: Include pressure rating, capacity, settings, and accessories of selected models.

4. Dielectric fittings.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

PART 2 - PRODUCTS

2.1 NATURAL GAS PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Steel Pipe: ASTM A53/A53M Schedule 40 black.

1. Fittings: ASTM A234/A234M forged steel welding type.

2. Joints: ASME B31.9, welded. For 3” and larger; threader for 2” and smaller.

3. Jacket: AWWA C105 polyethylene jacket or double layer, half-lapped 10 mil polyethylene tape.

2.2 NATURAL GAS PIPING, TUBES, AND FITTINGS ABOVE GRADE

A. Steel Pipe: ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.

1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.

2. Fittings: ASME B16.3, malleable iron, 150 psig.

3. Joints: Threaded for pipe 2 inch and smaller; welded for pipe 2-1/2 inches and larger.

2.3 PIPING SPECIALTIES

A. Y-Pattern Strainers:

1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.

2. End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.

3. Strainer Screen: 40-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.

4. CWP Rating: 125 psig (862 kPa).

2.4 JOINING MATERIALS

A. Joint Compound and Tape: Suitable for natural gas.

2.5 MANUAL GAS SHUTOFF VALVES

A. General Requirements for Metallic Valves, NPS 2 and Smaller: Comply with ASME B16.33.

1. CWP Rating: 125 psig (862 kPa).
2. Threaded Ends: Comply with ASME B1.20.1.
3. Dryseal Threads on Flare Ends: Comply with ASME B1.20.3.
4. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction for valves 1 inch and smaller.
5. Service Mark: Valves 1-1/4 inches to NPS 2shall have initials "WOG" permanently marked on valve body.

B. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim: MSS SP-110.

1. Body: Bronze, complying with ASTM B 584.
2. Ball: Chrome-plated bronze.
3. Stem: Bronze; blowout proof.
4. Seats: Reinforced TFE; blowout proof.
5. Packing: Threaded-body packnut design with adjustable-stem packing.
6. Ends: Threaded, flared, or socket.
7. CWP Rating: 600 psig (4140 kPa).
8. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
9. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

2.6 DIELECTRIC FITTINGS

A. Dielectric Unions:

1. Minimum Operating-Pressure Rating: 150 psig (1034 kPa).
2. Combination fitting of copper alloy and ferrous materials.
3. Insulating materials suitable for natural gas.
4. Combination fitting of copper alloy and ferrous materials with threaded, brazed-joint, plain, or welded end connections that match piping system materials.

2.7 REMOTE READING GAS METERS

A. Gas Meters: Basis of design Norgas Metering Technology, model NDM or approved equal.

1. Casing: Steel
2. Standards: EN12480, ISO 9951, ANS, NMi
3. Power Source: Not Required
4. Gas flow measurement: Positive displacement rotary meter.
5. Rotor: Twin rotors.

B. Remote Pulse Counter: Basis of design EKM Metering Inc., model Omnimeter Pulse v.4 or approved equal.

1. Casing: Plastic
2. Display: Digital
3. Pulse input ports: Three
4. Power required: Yes

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for natural-gas piping system to verify actual locations of piping connections before equipment installation.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INDOOR PIPING INSTALLATION

A. Comply with the International Fuel Gas Code for installation and purging of natural-gas piping.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Arrange for pipe spaces, chases, slots, sleeves, and openings in building structure during progress of construction, to allow for mechanical installations.

D. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

E. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

G. Locate valves for easy access.

H. Install natural-gas piping at uniform grade of 2 percent down toward drip and sediment traps.

I. Install piping free of sags and bends.

J. Install fittings for changes in direction and branch connections.

K. Verify final equipment locations for roughing-in.

L. Comply with requirements in Sections specifying gas-fired appliances and equipment for roughing-in requirements.

M. Drips and Sediment Traps: Install drips at points where condensate may collect, including service-meter outlets. Locate where accessible to permit cleaning and emptying. Do not install where condensate is subject to freezing.

1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use nipple a minimum length of 3 pipe diameters, but not less than 3 inches (75 mm) long and same size as connected pipe. Install with space below bottom of drip to remove plug or cap.

N. Extend relief vent connections for service regulators, line regulators, and overpressure protection devices to outdoors and terminate with weatherproof vent cap.

O. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels unless indicated to be exposed to view.

P. Concealed Location Installations: Except as specified below, install concealed natural-gas piping and piping installed under the building in containment conduit constructed of steel pipe with welded joints as described in Part 2. Install a vent pipe from containment conduit to outdoors and terminate with weatherproof vent cap.

1. Above Accessible Ceilings: Natural-gas piping, fittings, valves, and regulators may be installed in accessible spaces without containment conduit.

2. In Floors: Install natural-gas piping with welded or brazed joints and protective coating in cast-in-place concrete floors. Cover piping to be cast in concrete slabs with minimum of 1-1/2 inches (38 mm) of concrete. Piping may not be in physical contact with other metallic structures such as reinforcing rods or electrically neutral conductors. Do not embed piping in concrete slabs containing quick-set additives or cinder aggregate.

3. In Floor Channels: Install natural-gas piping in floor channels. Channels must have cover and be open to space above cover for ventilation.

4. In Walls or Partitions: Protect tubing installed inside partitions or hollow walls from physical damage using steel striker barriers at rigid supports.

a. Exception: Tubing passing through partitions or walls does not require striker barriers.

5. Prohibited Locations:

a. Do not install natural-gas piping in or through circulating air ducts, clothes or trash chutes, chimneys or gas vents (flues), ventilating ducts, or dumbwaiter or elevator shafts.

b. Do not install natural-gas piping in solid walls or partitions.

Q. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.

R. Connect branch piping from top or side of horizontal piping.

S. Install unions in pipes NPS 2 (DN 50) and smaller, adjacent to each valve, at final connection to each piece of equipment. Unions are not required at flanged connections.

T. Do not use natural-gas piping as grounding electrode.

U. Install strainer on inlet of each line-pressure regulator and automatic or electrically operated valve.

V. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in 23 05 17 – Sleeves and Sleeve Seals for HVAC Piping.

W. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 23 05 17 – Sleeves and Sleeve Seals for HVAC Piping.

X. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 23 05 18 – Escutcheons for HVAC Piping.

Y. Install remote reading gas meters in accordance with manufacturer's written instructions. Provide required wiring, power, and other associated accessories to complete the system installation.

3.3 VALVE INSTALLATION

A. Install manual gas shutoff valve for each gas appliance ahead of corrugated stainless-steel tubing, aluminum, or copper connector.

B. Install regulators and overpressure protection devices with maintenance access space adequate for servicing and testing.

C. Install anode for metallic valves in underground PE piping.

3.4 PIPING JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Threaded Joints:

1. Thread pipe with tapered pipe threads complying with ASME B1.20.1.

2. Cut threads full and clean using sharp dies.

3. Ream threaded pipe ends to remove burrs and restore full inside diameter of pipe.

4. Apply appropriate tape or thread compound to external pipe threads unless dryseal threading is specified.

5. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

3.5 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for pipe hangers and supports specified in Section 23 05 29 – Hangers and Supports for HVAC Piping and Equipment.

B. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:

1. NPS 1 and Smaller: Maximum span, 96 inches (2438 mm); minimum rod size, 3/8 inch (10 mm).

2. NPS 1-1/4: Maximum span, 108 inches (2743 mm); minimum rod size, 3/8 inch (10 mm).

3. NPS 1-1/2 and NPS 2: Maximum span, 108 inches (2743 mm); minimum rod size, 3/8 inch (10 mm).

4. NPS 2-1/2 to NPS 3-1/2: Maximum span, 10 feet (3 m); minimum rod size, 1/2 inch (13 mm).

5. NPS 4 (DN 100) and Larger: Maximum span, 10 feet (3 m); minimum rod size, 5/8 inch (15.8 mm).

3.6 CONNECTIONS

A. Connect to utility's gas main according to utility's procedures and requirements.

B. Install natural-gas piping electrically continuous, and bonded to gas appliance equipment grounding conductor of the circuit powering the appliance according to NFPA 70.

C. Install piping adjacent to appliances to allow service and maintenance of appliances.

D. Connect piping to appliances using manual gas shutoff valves and unions. Install valve within 72 inches (1800 mm) of each gas-fired appliance and equipment. Install union between valve and appliances or equipment.

E. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance.

3.7 LABELING AND IDENTIFYING

A. Comply with requirements in Section 23 05 53 – Identification for HVAC Piping and Equipment for piping and valve identification.

B. Install detectable warning tape directly above gas piping, 12 inches (300 mm) below finished grade, except 6 inches (150 mm) below subgrade under pavements and slabs.

3.8 PAINTING

A. Comply with requirements in Division 09 for painting interior and exterior natural-gas piping.

B. Paint exposed, exterior metal piping, valves, service regulators, service meters and meter bars, earthquake valves, and piping specialties, except components, with factory-applied paint or protective coating.

1. Alkyd System: MPI EXT 5.1D.

a. Prime Coat: Alkyd anticorrosive metal primer.

b. Intermediate Coat: Exterior alkyd enamel matching topcoat.

c. Topcoat: Exterior alkyd enamel (gloss).

d. Color: Gray.

C. Paint exposed, interior metal piping, valves, service regulators, service meters and meter bars, earthquake valves, and piping specialties, except components, with factory-applied paint or protective coating.

1. Latex Over Alkyd Primer System: MPI INT 5.1Q.

a. Prime Coat: Alkyd anticorrosive metal primer.

b. Intermediate Coat: Interior latex matching topcoat.

c. Topcoat: Interior latex (gloss).

d. Color: Yellow.

D. Damage and Touchup: Repair marred and damaged factory-applied finishes with materials and by procedures to match original factory finish.

3.9 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Test, inspect, and purge natural gas according to the International Fuel Gas Code and authorities having jurisdiction.

C. Natural-gas piping will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.10 INDOOR PIPING SCHEDULE

A. Aboveground, distribution piping shall be the following:

1. Steel pipe with malleable-iron fittings and threaded joints.

3.11 ABOVEGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE

A. Distribution piping valves for pipe sizes NPS 2 and smaller shall be the following:

1. Two-piece, full-port, bronze ball valves with bronze trim.

B. Valves in branch piping for single appliance shall be the following:

1. Two-piece, full-port, bronze ball valves with bronze trim.

END OF SECTION 23 11 23

SECTION 23 21 13 - HYDRONIC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes pipe and fitting materials and joining methods for the following:
   1. Condensate-drain piping.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Piping layout, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

   1. Suspended ceiling components.
   2. Other building services.
   3. Structural members.

B. Qualification Data: For Installer.

1.4 QUALITY ASSURANCE

A. Installer Qualifications:

   1. Installers of Pressure-Sealed Joints: Installers shall be certified by pressure-seal joint manufacturer as having been trained and qualified to join piping with pressure-seal pipe couplings and fittings.

B. Steel Support Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

C. Pipe Welding: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code: Section IX.

   1. Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation.
   2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature unless otherwise indicated:
   1. Condensate-Drain Piping: 150 deg F

2.2 COPPER TUBE AND FITTINGS

A. DWV Copper Tubing: ASTM B 306, Type DWV.

B. Copper or Bronze Pressure-Seal Fittings:
   1. Housing: Copper.
   2. O-Rings and Pipe Stops: EPDM.
   3. Tools: Manufacturer's special tools.
   4. Minimum 200-psig working-pressure rating at 250 deg F.

C. Wrought-Copper Unions: ASME B16.22.

2.3 JOINING MATERIALS

A. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Condensate-Drain Piping: Type DWV, drawn-temper copper tubing, wrought-copper fittings, and soldered joints.

3.2 PIPING INSTALLATIONS

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Install piping as approved on Shop drawings.

B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Install piping at indicated slopes.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping to allow application of insulation.

J. Select system components with pressure rating equal to or greater than system operating pressure.

K. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.

L. Install drains, consisting of a tee fitting, NPS 3/4 ball valve, and short NPS 3/4 threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.

M. Install piping at a uniform grade of 0.2 percent upward in direction of flow.

N. Reduce pipe sizes using eccentric reducer fitting installed with level side up.

O. Install branch connections to mains usingtee fittings in main pipe, with the branch connected to the bottom of the main pipe. For up-feed risers, connect the branch to the top of the main pipe.

P. Install unions in piping, NPS 2 and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.

Q. Comply with requirements in Section 230553 "Identification for HVAC Piping and Equipment" for identifying piping.

R. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."

S. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."

T. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230518 "Escutcheons for HVAC Piping."

3.3 HANGERS AND SUPPORTS

A. Comply with requirements in Section 230529 "Hangers and Supports for HVAC Piping and Equipment" for hanger, support, and anchor devices. Comply with the following requirements for maximum spacing of supports.

B. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal piping less than 20 feet long.
2. Provide copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
3. 7 m).

C. Install hangers for drawn-temper copper piping with the following maximum spacing and minimum rod sizes:

1. NPS 3/4: Maximum span, 5 feet; minimum rod size, 1/4 inch.
2. NPS 1: Maximum span, 6 feet; minimum rod size, 1/4 inch.
3. NPS 1-1/4: Maximum span, 7 feet; minimum rod size, 3/8 inch.
4. NPS 1-1/2: Maximum span, 8 feet; minimum rod size, 3/8 inch.
5. NPS 2: Maximum span, 8 feet; minimum rod size, 3/8 inch.

D. Support vertical runs at roof, at each floor, and at 10-foot intervals between floors.

3.4 PIPE JOINT CONSTRUCTION

A. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

B. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

3.5 FIELD QUALITY CONTROL

A. Prepare hydronic piping according to ASME B31.9 and as follows:

1. Leave joints, including welds, uninsulated and exposed for examination during test.

B. Perform the following tests on hydronic piping:

1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
2. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the system's working pressure.
3. After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.
4. Prepare written report of testing.

END OF SECTION 232113

SECTION 23 23 00 - REFRIGERANT PIPING.

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes refrigerant piping used for air-conditioning applications.

B. Related Requirements:
1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 PERFORMANCE REQUIREMENTS

A. Line Test Pressure for Refrigerant R-410A:

1. Suction Lines for Air-Conditioning Applications: 300 psig.

2. Hot-Gas and Liquid Lines: 535 psig.

1.4 SUBMITTALS

A. Product Data: For each type of valve and refrigerant piping specialty indicated. Include pressure drop, based on manufacturer's test data, for the following:

1. Thermostatic expansion valves.

2. Solenoid valves.

3. Hot-gas bypass valves.

4. Filter dryers.

5. Strainers.

6. Pressure-regulating valves.

B. Welding certificates.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For refrigerant valves and piping specialties to include in maintenance manuals.

E. Layout plans of Refrigerant lines between the outdoor and indoor units including control boxes, in full coordination with architectural, structural and other services.

1.5 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

B. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."

C. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

1.6 PRODUCT STORAGE AND HANDLING

A. Store piping in a clean and protected area with end caps in place to ensure that piping interior and exterior are clean when installed.

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

A. Copper Tube: ASTM B 88, Type K or L.

B. Wrought-Copper Fittings: ASME B16.22.

C. Wrought-Copper Unions: ASME B16.22.

D. Solder Filler Metals: ASTM B 32. Use 95-5 tin antimony or alloy HB solder to join copper socket fittings on copper pipe.

E. Flexible Connectors:

1. Body: Tin-bronze bellows with woven, flexible, tinned-bronze-wire-reinforced protective jacket.

2. End Connections: Socket ends.

3. Offset Performance: Capable of minimum 3/4-inch misalignment in minimum 7-inch-(180-mm-) long assembly.

4. Pressure Rating: Factory test at minimum 500 psig.

5. Maximum Operating Temperature: 250 deg F.

2.2 VALVES AND SPECIALTIES

A. Diaphragm Packless Valves:

1. Body and Bonnet: Forged brass or cast bronze; globe design with straight-through or angle pattern.

2. Diaphragm: Phosphor bronze and stainless steel with stainless-steel spring.

3. Operator: Rising stem and hand wheel.

4. Seat: Nylon.
5. End Connections: Socket, union, or flanged.
6. Working Pressure Rating: 500 psig.
7. Maximum Operating Temperature: 275 deg F.

B. Packed-Angle Valves:

1. Body and Bonnet: Forged brass or cast bronze.
2. Packing: Molded stem, back seating, and replaceable under pressure.
3. Operator: Rising stem.
4. Seat: Nonrotating, self-aligning polytetrafluoroethylene.
5. Seal Cap: Forged-brass or valox hex cap.
6. End Connections: Socket, union, threaded, or flanged.
7. Working Pressure Rating: 500 psig.
8. Maximum Operating Temperature: 275 deg F.

C. Check Valves:

1. Body: Ductile iron, forged brass, or cast bronze; globe pattern.
2. Bonnet: Bolted ductile iron, forged brass, or cast bronze; or brass hex plug.
3. Piston: Removable polytetrafluoroethylene seat.
4. Closing Spring: Stainless steel.
5. Retain first subparagraph below for optional manual opening feature.
6. Manual Opening Stem: Seal cap, plated-steel stem, and graphite seal.
7. End Connections: Socket, union, threaded, or flanged.
8. Maximum Opening Pressure: 0.50 psig.
9. Working Pressure Rating: 500 psig.
10. Maximum Operating Temperature: 275 deg F.

D. Service Valves:

1. Body: Forged brass with brass cap including key end to remove core.
2. Core: Removable ball-type check valve with stainless-steel spring.

3. Seat: Polytetrafluoroethylene.

4. End Connections: Copper spring.

5. Working Pressure Rating: 500 psig.

E. Solenoid Valves: Comply with ARI 760 and UL 429; listed and labeled by an NRTL.

1. Body and Bonnet: Plated steel.

2. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.

3. Seat: Polytetrafluoroethylene.

4. End Connections: Threaded.

5. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch (16-GRC) conduit adapter, and 24-V ac coil.

6. Working Pressure Rating: 400 psig.

7. Maximum Operating Temperature: 240 deg F.

8. Subparagraph below is an optional feature.

9. Manual operator.

F. Safety Relief Valves: Comply with ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.

1. Body and Bonnet: Ductile iron and steel, with neoprene O-ring seal.

2. Piston, Closing Spring, and Seat Insert: Stainless steel.

3. Seat Disc: Polytetrafluoroethylene.

4. End Connections: Threaded.

5. Working Pressure Rating: 400 psig.

6. Maximum Operating Temperature: 240 deg F.

G. Thermostatic Expansion Valves: Comply with ARI 750.

1. Body, Bonnet, and Seal Cap: Forged brass or steel.

2. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.

3. Packing and Gaskets: Non-asbestos.

4. Capillary and Bulb: Copper tubing filled with refrigerant charge.

5. Suction Temperature: 40 deg F.

6. Superheat: Adjustable.

7. End Connections: Socket, flare, or threaded union.

8. Working Pressure Rating: 700 psig.

H. Hot-Gas Bypass Valves: Comply with UL 429; listed and labeled by an NRTL.

1. Body, Bonnet, and Seal Cap: Ductile iron or steel.

2. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.

3. Packing and Gaskets: Non-asbestos.

4. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.

5. Seat: Polytetrafluoroethylene.

6. Equalizer: Internal.

7. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch (16-GRC) conduit adapter, and 24-V ac coil.

8. End Connections: Socket.

9. Throttling Range: Maximum 5 psig.

10. Working Pressure Rating: 500 psig.

11. Maximum Operating Temperature: 240 deg F.

I. Straight-Type Strainers:

1. Body: Welded steel with corrosion-resistant coating.

2. Screen: 100-mesh stainless steel.

3. End Connections: Socket or flare.

4. Working Pressure Rating: 500 psig.

5. Maximum Operating Temperature: 275 deg F.

J. Angle-Type Strainers:

1. Body: Forged brass or cast bronze.

2. Drain Plug: Brass hex plug.

3. Screen: 100-mesh monel.

4. End Connections: Socket or flare.

5. Working Pressure Rating: 500 psig.

6. Maximum Operating Temperature: 275 deg F.

K. Moisture/Liquid Indicators:

1. Body: Forged brass.

2. Window: Replaceable, clear, fused glass window with indicating element protected by filter screen.

3. Indicator: Color coded to show moisture content in ppm.

4. Minimum Moisture Indicator Sensitivity: Indicate moisture above 60 ppm.

5. End Connections: Socket or flare.

6. Working Pressure Rating: 500 psig.

7. Maximum Operating Temperature: 240 deg F.

L. Permanent Filter Dryers: Comply with ARI 730.

1. Body and Cover: Painted-steel shell.

2. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.

3. Desiccant Media: Activated alumina.

4. Designed for reverse flow (for heat-pump applications).

5. End Connections: Socket.

6. Access Ports: NPS 1/4 connections at entering and leaving sides for pressure differential measurement.

7. Maximum Pressure Loss: 2 psig.

8. Working Pressure Rating: 500 psig.

9. Maximum Operating Temperature: 240 deg F.

M. Mufflers:

1. Body: Welded steel with corrosion-resistant coating.

2. End Connections: Socket or flare.

3. Working Pressure Rating: 500 psig.

4. Maximum Operating Temperature: 275 deg F.

N. Receivers: Comply with ARI 495.

1. Comply with ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.

2. Comply with UL 207; listed and labeled by an NRTL.

3. Body: Welded steel with corrosion-resistant coating.

4. Tappings: Inlet, outlet, liquid level indicator, and safety relief valve.

5. End Connections: Socket or threaded.

6. Working Pressure Rating: 500 psig.

7. Maximum Operating Temperature: 275 deg F.

O. Liquid Accumulators: Comply with ARI 495.

1. Body: Welded steel with corrosion-resistant coating.

2. End Connections: Socket or threaded.

3. Working Pressure Rating: 500 psig.

4. Maximum Operating Temperature: 275 deg F.

2.3 REFRIGERANTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. DuPont Company; Fluorochemicals Div.

2. Honeywell, Inc.; Genetron Refrigerants.

3. INEOS Fluor Americas LLC.

B. ASHRAE 34, R-410A: Pentafluoroethane/Difluoromethane.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Suction Lines NPS 4 (DN 100) and Smaller for Conventional Air-Conditioning Applications: Copper, Type L (B), drawn-temper tubing and wrought-copper fittings with soldered joints.

B. Hot-Gas and Liquid Lines : Copper, Type L (B), drawn-temper tubing and wrought-copper fittings with soldered joints.

C. Safety-Relief-Valve Discharge Piping: Copper, Type L (B), drawn-temper tubing and wrought-copper fittings with soldered joints.

3.2 VALVE AND SPECIALTY APPLICATIONS

A. Install diaphragm packless valves in suction and discharge lines of compressor.

B. Install service valves for gage taps at inlet and outlet of hot-gas bypass valves and strainers if they are not an integral part of valves and strainers.

C. Install a check valve at the compressor discharge and a liquid accumulator at the compressor suction connection.

D. Except as otherwise indicated, install diaphragm packless valves on inlet and outlet side of filter dryers.

E. Install a full-sized, three-valve bypass around filter dryers.

F. Install solenoid valves upstream from each expansion valve and hot-gas bypass valve. Install solenoid valves in horizontal lines with coil at top.

G. Install thermostatic expansion valves as close as possible to distributors on evaporators.

1. Install valve so diaphragm case is warmer than bulb.

2. Secure bulb to clean, straight, horizontal section of suction line using two bulb straps. Do not mount bulb in a trap or at bottom of the line.

3. If external equalizer lines are required, make connection where it will reflect suction-line pressure at bulb location.

H. Install safety relief valves where required by ASME Boiler and Pressure Vessel Code. Pipe safety-relief-valve discharge line to outside according to ASHRAE 15.

I. Install moisture/liquid indicators in liquid line at the inlet of the thermostatic expansion valve or at the inlet of the evaporator coil capillary tube.

J. Install strainers upstream from and adjacent to the following unless they are furnished as an integral assembly for device being protected:

1. Solenoid valves.

2. Thermostatic expansion valves.

3. Hot-gas bypass valves.

4. Compressor.

K. Install filter dryers in liquid line between compressor and thermostatic expansion valve, and in the suction line at the compressor.

L. Install receivers sized to accommodate pump-down charge.

M. Install flexible connectors at compressors.

3.3 PIPING INSTALLATION

A. Install piping after the shop drawing layouts are approved..

B. Install refrigerant piping according to ASHRAE 15.

C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping adjacent to machines to allow service and maintenance.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Select system components with pressure rating equal to or greater than system operating pressure.

J. Refer to Section 23 09 00 – HVAC Instrumentation and Control for solenoid valve controllers, control wiring, and drawings for sequence of operation.

K. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.

L. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels as specified in Division 08 Section "Access Doors and Frames" if valves or equipment requiring maintenance is concealed behind finished surfaces.

M. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.

N. Slope refrigerant piping as follows:

1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.

2. Install horizontal suction lines with a uniform slope downward to compressor.

3. Install traps and double risers to entrain oil in vertical runs.

4. Liquid lines may be installed level.

O. When brazing or soldering, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.

P. Install pipe sleeves at penetrations in exterior walls and floor assemblies.

Q. Seal penetrations through fire and smoke barriers according to Section 07 84 13 – Penetration Firestopping.

R. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.

S. Install sleeves through floors, walls, or ceilings, sized to permit installation of full-thickness insulation.

T. Seal pipe penetrations through exterior walls according to Section 07 92 00 – Joint Sealants for materials and methods.

U. Identify refrigerant piping and valves according to Section 23 05 53 – Identification for HVAC Piping and Equipment.

3.4 PIPE JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Fill pipe and fittings with an inert gas (nitrogen or carbon dioxide), during brazing or welding, to prevent scale formation.

D. Soldered Joints: Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook."

E. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.5 HANGERS AND SUPPORTS

A. Hanger, support, and anchor products are specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment."

B. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet long.

2. Copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.

C. Install hangers for copper tubing with the following maximum spacing and minimum rod sizes:

1. NPS 1/2: Maximum span, 60 inches; minimum rod size, 1/4 inch.

2. NPS 5/8: Maximum span, 60 inches; minimum rod size, 1/4 inch.

3. NPS 1: Maximum span, 72 inches; minimum rod size, 1/4 inch.

4. NPS 1-1/4: Maximum span, 96 inches; minimum rod size, 3/8 inch.

5. NPS 1-1/2: Maximum span, 96 inches; minimum rod size, 3/8 inch.

D. Support multifloor vertical runs at least at each floor.

3.6 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:

1. Comply with ASME B31.5, Chapter VI.

2. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.

3. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in Section 1.03 Performance Requirements.

    a. Fill system with nitrogen to the required test pressure.

    b. System shall maintain test pressure at the manifold gage throughout duration of test.

    c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.

    d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.

3.7 SYSTEM CHARGING

A. Charge system using the following procedures:

1. Install core in filter dryers after leak test but before evacuation.

2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers. If vacuum holds for 12 hours, system is ready for charging.

3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig.

4. Charge system with a new filter-dryer core in charging line.

3.8 ADJUSTING

A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.

B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.

C. Adjust set-point temperature of air-conditioning controllers to the system design temperature.

D. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:

1. Open shutoff valves in condenser water circuit.

2. Verify that compressor oil level is correct.

3. Open compressor suction and discharge valves.

4. Open refrigerant valves except bypass valves that are used for other purposes.

5. Check open compressor-motor alignment and verify lubrication for motors and bearings.

E. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

END OF SECTION 23 23 00 - 12

SECTION 23 31 13 - METAL DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Single-wall rectangular ducts and fittings.
2. Single-wall round ducts and fittings.
3. Sheet metal materials.
4. Duct liner.
5. Sealants and gaskets.
6. Hangers and supports.

B. Related Requirements:
1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article.

B. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible".

C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.

1.4 SUBMITTALS

A. Product Data: For each type of the following products:

1. Liners and adhesives.

2. Sealants and gaskets.

B. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Duct installation in all spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.

2. Suspended ceiling components.

3. Structural members to which duct will be attached.

4. Size and location of initial access modules for acoustical tile.

5. Penetrations of smoke barriers and fire-rated construction.

6. Items penetrating finished ceiling including the following:

a. Lighting fixtures.

b. Air outlets and inlets.

c. Access panels.

C. Welding certificates.

D. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.

B. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.

C. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2004, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-Up."

D. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004, Section 6.4.4 - "HVAC System Construction and Insulation."

PART 2 - PRODUCTS

2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-4, "Transverse (Girth) Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-5, "Longitudinal Seams - Rectangular Ducts," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 2, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 SINGLE-WALL ROUND DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Lindab Inc.

b. McGill AirFlow LLC.

c. SEMCO Incorporated.

d. Sheet Metal Connectors, Inc.

e. Spiral Manufacturing Co., Inc.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Transverse Joints - Round Duct," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Transverse Joints in Ducts Larger Than [60 Inches (1524 mm)] <Insert dimension> in Diameter: Flanged.

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Seams - Round Duct and Fittings," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 SHEET METAL MATERIALS

A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G90 (Z275).

2. Finishes for Surfaces Exposed to View: Mill phosphatized.

C. Factory- or Shop-Applied Antimicrobial Coating:

1. Apply to the surface of sheet metal that will form the interior surface of the duct. An untreated clear coating shall be applied to the exterior surface.

2. Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.

3. Coating containing the antimicrobial compound shall have a hardness of 2H, minimum, when tested according to ASTM D 3363.

4. Surface-Burning Characteristics: Maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

5. Shop-Applied Coating Color: Black.

6. Antimicrobial coating on sheet metal is not required for duct containing liner treated with antimicrobial coating.

D. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.

E. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for lengths 36 inches (900 mm) or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.4 DUCT LINER

A. Flexible Elastomeric Duct Liner: Preformed, cellular, closed-cell, sheet materials complying with ASTM C 534, Type II, Grade 1; and with NFPA 90A or NFPA 90B.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Aeroflex USA Inc.

b. Armacell LLC.

c. Rubatex International, LLC

2. Surface-Burning Characteristics: Maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

3. Liner Adhesive: As recommended by insulation manufacturer and complying with NFPA 90A or NFPA 90B.

a. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Insulation Pins and Washers:

1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- (2.6-mm-) diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch (38-mm) galvanized carbon-steel washer.

2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- (0.41-mm-) thick galvanized steel; with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches (38 mm) in diameter.

C. Shop Application of Duct Liner: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-19, "Flexible Duct Liner Installation."

1. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.

2. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.

3. Butt transverse joints without gaps, and coat joint with adhesive.

4. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.

5. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and dimensions of standard liner make longitudinal joints necessary.

6. Apply adhesive coating on longitudinal seams in ducts with air velocity of 2500 fpm (12.7 m/s).

7. Secure liner with mechanical fasteners 4 inches (100 mm) from corners and at intervals not exceeding 12 inches (300 mm) transversely; at 3 inches (75 mm) from transverse joints and at intervals not exceeding 18 inches (450 mm) longitudinally.

8. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall. Fabricate edge facings at the following locations:

a. Fan discharges.

b. Intervals of lined duct preceding unlined duct.

c. Upstream edges of transverse joints in ducts where air velocities are higher than 2500 fpm (12.7 m/s) or where indicated.

9. Secure insulation between perforated sheet metal inner duct of same thickness as specified for outer shell. Use mechanical fasteners that maintain inner duct at uniform distance from outer shell without compressing insulation.

a. Sheet Metal Inner Duct Perforations: 3/32-inch (2.4-mm) diameter, with an overall open area of 23 percent.

2.5 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

B. Water-Based Joint and Seam Sealant:

1. Application Method: Brush on.

2. Solids Content: Minimum 65 percent.

3. Shore A Hardness: Minimum 20.

4. Water resistant.

5. Mold and mildew resistant.

6. VOC: Maximum 75 g/L (less water).

7. Maximum Static-Pressure Class: 10-inch wg (2500 Pa), positive and negative.

8. Service: Indoor or outdoor.

9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

C. Flanged Joint Sealant: Comply with ASTM C 920.

1. General: Single-component, acid-curing, silicone, elastomeric.

2. Type: S.

3. Grade: NS.

4. Class: 25.

5. Use: O.

6. For indoor applications, use sealant that has a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

D. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

E. Round Duct Joint O-Ring Seals:

1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg (0.14 L/s per sq. m at 250 Pa) and shall be rated for 10-inch wg (2500-Pa) static-pressure class, positive or negative.

2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.

3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.6 HANGERS AND SUPPORTS

A. Hanger Rods for Corrosive Environments: All hanger rods shall be electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

B. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1 (Table 4-1M), "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct."

C. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.

D. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

E. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

F. Trapeze and Riser Supports:

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.

2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.

B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

C. Install round ducts in maximum practical lengths.

D. Install ducts with fewest possible joints.

E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.

F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

H. Install ducts with a clearance of 1 inch (25 mm), plus allowance for insulation thickness.

I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.

J. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "Duct Cleanliness for New Construction Guidelines."

3.2 INSTALLATION OF EXPOSED DUCTWORK

A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.

B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.

C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.

D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.

E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3 DUCT SEALING

A. All ducts except transfer ducts are to be sealed and leak tested to Class A SMACNA Standards regardless of the recommendations or requirements by SMACNA.

3.4 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Hangers and Supports."

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

1. Where practical, install concrete inserts before placing concrete.

2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.

3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches (100 mm) thick.

4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches (100 mm) thick.

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1 (Table 4-1M), "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches (610 mm) of each elbow and within 48 inches (1200 mm) of each branch intersection.

D. Hangers Exposed to View: Threaded rod and angle or channel supports.

E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet (5 m).

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.5 CONNECTIONS

A. Make connections to equipment with flexible connectors complying with Section 23 33 00 – Air Duct Accessories.

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.6 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Leakage Tests:

1. Comply with SMACNA's "HVAC Air Duct Leakage Test Manual." Submit a test report for each test.
2. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
3. All ducts except transfer ducts are to be sealed and leak tested to Class A SMACNA Standards regardless of the recommendations or requirements by SMACNA.
4. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If static-pressure classes are not indicated, test system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure.

5. Give seven days' advance notice for testing.
6. All ductwork except transfer ducts are to be leak tested regardless of the requirements or recommendations by SMACNA. All of the ductwork leak testing is to be witness by the TAB contractor and documented by the TAB contractor. See specification section 230800 for additional requirements.

C. Duct System Cleanliness Tests:

1. Visually inspect duct system to ensure that no visible contaminants are present.

2. Test sections of metal duct system, chosen randomly by Owner, for cleanliness according to "Vacuum Test" in NADCA ACR, "Assessment, Cleaning and Restoration of HVAC Systems."

a. Acceptable Cleanliness Level: Net weight of debris collected on the filter media shall not exceed 0.75 mg/100 sq. cm.

D. Duct system will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.7 START UP

A. Air Balance: Comply with requirements in Section 23 05 93 – Testing, Adjusting, and Balancing for HVAC.

3.8 DUCT SCHEDULE

A. Fabricate ducts with galvanized sheet steel except as otherwise indicated and as follows:

1. Ducts carrying air from Exhaust Fans: stainless steel with no insulation.

B. Supply, Outdoor, and Return Ducts:

1. Ducts Connected to Constant-Volume Air-Handling Units :

a. Pressure Class: Positive 2-inch wg (500 Pa).

b. Minimum SMACNA Seal Class: A.

c. SMACNA Leakage Class for Rectangular: 12.

d. SMACNA Leakage Class for Round and Flat Oval: 6.

C. Exhaust Ducts:

1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:

a. Pressure Class: Negative 2-inch wg (500 Pa).

b. Minimum SMACNA Seal Class: A.

c. SMACNA Leakage Class for Rectangular: 12 .

d. SMACNA Leakage Class for Round and Flat Oval: 6.

D. Intermediate Reinforcement:

1. Galvanized-Steel Ducts: Galvanized steel.

2. Stainless-Steel Ducts:

a. Exposed to Airstream: Match duct material.

b. Not Exposed to Airstream: Galvanized.

E. Liner:

1. Supply and return Air Ducts: Flexible elastomeric 1 inch (25 mm) thick.

F. Elbow Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Elbows."

    a. Velocity 1000 fpm (5 m/s) or Lower:

        1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.

        2) Mitered Type RE 4 without vanes.

    b. Velocity 1000 to 1500 fpm (5 to 7.6 m/s):

        1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.

        2) Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.

        3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."

    c. Velocity 1500 fpm (7.6 m/s) or Higher:

        1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.

        2) Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.

        3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."

2. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Elbows."

    a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.

    b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.

    c. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."

3. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-3, "Round Duct Elbows."

    a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.

        1) Velocity 1000 fpm (5 m/s) or Lower: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.

        2) Velocity 1000 to 1500 fpm (5 to 7.6 m/s): 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.

3) Velocity 1500 fpm (7.6 m/s) or Higher: 1.5 radius-to-diameter ratio and five segments for 90-degree elbow.

4) Radius-to Diameter Ratio: 1.5.

b. Round Elbows, 12 Inches (305 mm) and Smaller in Diameter: Stamped or pleated.

c. Round Elbows, 14 Inches (356 mm) and Larger in Diameter: Standing seam.

G. Branch Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-6, "Branch Connections."

a. Rectangular Main to Rectangular Branch: 45-degree entry.

b. Rectangular Main to Round Branch: Spin in.

2. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees." Saddle taps are permitted in existing duct.

a. Velocity 1000 fpm (5 m/s) or Lower: 90-degree tap.

b. Velocity 1000 to 1500 fpm (5 to 7.6 m/s): Conical tap.

c. Velocity 1500 fpm (7.6 m/s) or Higher: 45-degree lateral.

END OF SECTION 23 31 13

SECTION 23 33 00 - AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Backdraft dampers.
2. Manual volume dampers.
3. Control dampers.
4. Flange connectors.
5. Turning vanes.
6. Duct-mounted access doors.
7. Flexible connectors.
8. Flexible ducts
9. Duct accessory hardware.
10. Fire Dampers.

B. Related Requirements:
1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Source quality-control reports.

C. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

1.4 QUALITY ASSURANCE

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

B. Comply with AMCA 500-D testing for damper rating.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G90 (Z275).

2. Exposed-Surface Finish: Mill phosphatized.

C. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

D. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for lengths 36 inches (900 mm) or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.2 BACKDRAFT DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Air Balance Inc.; a division of Mestek, Inc.

2. American Warming and Ventilating; a division of Mestek, Inc.

3. Cesco Products; a division of Mestek, Inc.

4. Duro Dyne Inc.

5. Greenheck Fan Corporation.

6. Lloyd Industries, Inc.

7. Nailor Industries Inc.

8. NCA Manufacturing, Inc.

9. Pottorff; a division of PCI Industries, Inc.

10. Ruskin Company.

11. SEMCO Incorporated.

12. Vent Products Company, Inc.

B. Description: Gravity balanced.

C. Maximum Air Velocity: 2000 fpm (10 m/s) .

D. Maximum System Pressure: 2-inch wg (0.5 kPa).

E. Frame: 0.052-inch- (1.3-mm-) thick, galvanized sheet steel, with welded corners and mounting flange.

F. Blades: Multiple single-piece blades, center-pivoted, maximum 6-inch (150-mm) width, 0.025-inch- (0.6-mm-) thick, roll-formed aluminum with sealed edges.

G. Blade Action: Parallel.

H. Blade Seals: Neoprene, mechanically locked.

I. Blade Axles:

1. Material: Galvanized steel.

2. Diameter: 0.20 inch (5 mm) .

J. Tie Bars and Brackets: Galvanized steel.

K. Return Spring: Adjustable tension.

L. Bearings: Steel ball or synthetic pivot bushings.

M. Accessories:

1. Adjustment device to permit setting for varying differential static pressure.

2. Counterweights and spring-assist kits for vertical airflow installations.

3. Screen Mounting: Front mounted in sleeve.

a. Sleeve Thickness: 20-gage (1.0-mm) minimum.

b. Sleeve Length: 6 inches (152 mm) minimum.

4. Screen Mounting: Rear mounted.

5. Screen Material: Galvanized steel.

6. Screen Type: Bird.

7. 90-degree stops.

2.3 MANUAL VOLUME DAMPERS

A. Standard, Steel, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Air Balance Inc.; a division of Mestek, Inc.

b. American Warming and Ventilating; a division of Mestek, Inc.

c. Flexmaster U.S.A., Inc.

d. McGill AirFlow LLC.

e. METALAIRE, Inc.

f. Nailor Industries Inc.

g. Pottorff; a division of PCI Industries, Inc.

h. Ruskin Company.

i. Trox USA Inc.

j. Vent Products Company, Inc.

2. Standard leakage rating, with linkage outside airstream.

3. Suitable for horizontal or vertical applications.

4. Frames:

a. Hat-shaped, galvanized-steel channels, 0.064-inch (1.62-mm) minimum thickness.

b. Mitered and welded corners.

c. Flanges for attaching to walls and flangeless frames for installing in ducts.

5. Blades:

a. Multiple or single blade.

b. Parallel- or opposed-blade design.

c. Stiffen damper blades for stability.

d. Galvanized-steel, 0.064 inch (1.62 mm) thick.

6. Blade Axles: Galvanized steel.

7. Bearings:

a. Stainless-steel sleeve.

b. Dampers in ducts with pressure classes of 3-inch wg (750 Pa) or less shall have axles full length of damper blades and bearings at both ends of operating shaft.

8. Tie Bars and Brackets: Galvanized steel.

2.4 CONTROL DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. American Warming and Ventilating; a division of Mestek, Inc.
2. Arrow United Industries; a division of Mestek, Inc.
3. Cesco Products; a division of Mestek, Inc.
4. Duro Dyne Inc.
5. Flexmaster U.S.A., Inc.
6. Greenheck Fan Corporation.
7. Lloyd Industries, Inc.
8. M&I Air Systems Engineering; Division of M&I Heat Transfer Products Ltd.
9. McGill AirFlow LLC.
10. METALAIRE, Inc.
11. Metal Form Manufacturing, Inc.
12. Nailor Industries Inc.
13. NCA Manufacturing, Inc.
14. Ruskin Company.
15. Vent Products Company, Inc.
16. Young Regulator Company.

B. Low-leakage rating, with linkage outside airstream, and bearing AMCA's Certified Ratings Seal for both air performance and air leakage.

C. Frames:

1. Hat shaped.
2. Galvanized-steel channels, 0.064 inch (1.62 mm) thick.
3. Mitered and welded corners.

D. Blades:

1. Multiple blade with maximum blade width of 8 inches (200 mm).
2. Opposed-blade design.

3. Galvanized steel.

4. 0.064 inch (1.62 mm) thick.

5. Blade Edging: Closed-cell neoprene edging.

6. Blade Edging: Inflatable seal blade edging, or replaceable rubber seals.

E. Blade Axles: 1/2-inch- (13-mm-) diameter; galvanized steel; blade-linkage hardware of zinc-plated steel and brass; ends sealed against blade bearings.

1. Operating Temperature Range: From minus 40 to plus 200 deg F (minus 40 to plus 93 deg C).

F. Bearings:

1. Molded synthetic.

2. Dampers in ducts with pressure classes of 3-inch wg (750 Pa) or less shall have axles full length of damper blades and bearings at both ends of operating shaft.

3. Thrust bearings at each end of every blade.

2.5 FLANGE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ductmate Industries, Inc.

2. Nexus PDQ; Division of Shilco Holdings Inc.

3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Description: Add-on, factory-fabricated, slide-on transverse flange connectors, gaskets, and components.

C. Material: Galvanized steel.

D. Gage and Shape: Match connecting ductwork.

2.6 TURNING VANES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ductmate Industries, Inc.

2. Duro Dyne Inc.

3. METALAIRE, Inc.

4. SEMCO Incorporated.

5. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

C. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-3, "Vanes and Vane Runners," and 2-4, "Vane Support in Elbows."

D. Vane Construction: Single wall for ducts up to 48 inches (1200 mm) wide and double wall for larger dimensions.

2.7 DUCT-MOUNTED ACCESS DOORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. American Warming and Ventilating; a division of Mestek, Inc.

2. Cesco Products; a division of Mestek, Inc.

3. Ductmate Industries, Inc.

4. Flexmaster U.S.A., Inc.

5. Greenheck Fan Corporation.

6. McGill AirFlow LLC.

7. Nailor Industries Inc.

8. Pottorff; a division of PCI Industries, Inc.

9. Ventfabrics, Inc.

10. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-10, "Duct Access Doors and Panels," and 2-11, "Access Panels - Round Duct."

1. Door:

a. Double wall, rectangular.

b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.

c. Vision panel.

d. Hinges and Latches: 1-by-1-inch (25-by-25-mm) butt or piano hinge and cam latches.

e. Fabricate doors airtight and suitable for duct pressure class.

2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.

3. Number of Hinges and Locks:

a. Access Doors Less than 12 Inches (300 mm) Square: No hinges and two sash locks.

b. Access Doors up to 18 Inches (460 mm) Square: Two hinges and two sash locks.

c. Access Doors up to 24 by 48 Inches (600 by 1200 mm): Three hinges and two compression latches with outside and inside handles.

d. Access Doors Larger than 24 by 48 Inches (600 by 1200 mm): Four hinges and two compression latches with outside and inside handles.

C. Pressure Relief Access Door:

1. Door and Frame Material: Galvanized sheet steel.

2. Door: Double wall with insulation fill with metal thickness applicable for duct pressure class.

3. Operation: Open outward for positive-pressure ducts and inward for negative-pressure ducts.

4. Factory set at 10-inch wg (2500 Pa) .

5. Doors close when pressures are within set-point range.

6. Hinge: Continuous piano.

7. Latches: Cam.

8. Seal: Neoprene or foam rubber.

9. Insulation Fill: 1-inch- (25-mm-) thick, fibrous-glass or polystyrene-foam board.

2.8 DUCT ACCESS PANEL ASSEMBLIES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ductmate Industries, Inc.

2. Flame Gard, Inc.

3. 3M.

B. Labeled according to UL 1978 by an NRTL.

C. Panel and Frame: Minimum thickness 0.0528-inch (1.3-mm) carbon steel.

D. Fasteners: Carbon steel. Panel fasteners shall not penetrate duct wall.

E. Gasket: Comply with NFPA 96; grease-tight, high-temperature ceramic fiber, rated for minimum 2000 deg F (1093 deg C).

F. Minimum Pressure Rating: 10-inch wg (2500 Pa), positive or negative.

2.9 FLEXIBLE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ductmate Industries, Inc.

2. Duro Dyne Inc.

3. Ventfabrics, Inc.

4. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Materials: Flame-retardant or noncombustible fabrics.

C. Coatings and Adhesives: Comply with UL 181, Class 1.

D. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches (89 mm) wide attached to 2 strips of 2-3/4-inch- (70-mm-) wide, 0.028-inch- (0.7-mm-) thick, galvanized sheet steel. Provide metal compatible with connected ducts.

E. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.

1. Minimum Weight: 26 oz./sq. yd. (880 g/sq. m).

2. Tensile Strength: 480 lbf/inch (84 N/mm) in the warp and 360 lbf/inch (63 N/mm) in the filling.

3. Service Temperature: Minus 40 to plus 200 deg F (Minus 40 to plus 93 deg C).

F. Thrust Limits: Combination coil spring and elastomeric insert with spring and insert in compression, and with a load stop. Include rod and angle-iron brackets for attaching to fan discharge and duct.

1. Frame: Steel, fabricated for connection to threaded rods and to allow for a maximum of 30 degrees of angular rod misalignment without binding or reducing isolation efficiency.

2. Outdoor Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.

3. Minimum Additional Travel: 50 percent of the required deflection at rated load.

4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.

5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.

7. Coil Spring: Factory set and field adjustable for a maximum of 1/4-inch (6-mm) movement at start and stop.

2.10 FLEXIBLE DUCTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Flexmaster U.S.A., Inc.

2. McGill AirFlow LLC.

3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Insulated, Flexible Duct: UL 181, Class 1, 2-ply vinyl film supported by helically wound, spring-steel wire; fibrous-glass insulation; aluminized vapor-barrier film.

1. Pressure Rating: 10-inch wg (2500 Pa) positive and 1.0-inch wg (250 Pa) negative.

2. Maximum Air Velocity: 4000 fpm (20 m/s).

3. Temperature Range: Minus 10 to plus 160 deg F (Minus 23 to plus 71 deg C).

4. Insulation R-value: Comply with ASHRAE/IESNA 90.1-2004 .

C. Flexible Duct Connectors:

1. Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action in sizes 3 through 18 inches, to suit duct size.

2.11 DUCT ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.

B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

2.12 FIRE DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following :

1. Greenheck Fan Corporation.

2. METALAIRE, Inc.

3. Ruskin Company.

B. Type: Static and dynamic; rated and labeled according to UL 555 by an NRTL.

C. Closing rating in ducts up to 4-inch wg (1-kPa) static pressure class and minimum 4000-fpm (20-m/s) velocity.

D. Fire Rating: 2 hours.

E. Frame: Curtain type with blades outside air stream; fabricated with roll-formed, 0.034-inch- (0.85-mm-) thick galvanized steel; with mitered and interlocking corners.

F. Mounting Sleeve: Factory- or field-installed, galvanized sheet steel.

1. Minimum Thickness: 0.052 or 0.138 inch (1.3 or 3.5 mm) thick, as indicated, and of length to suit application.

2. Exception: Omit sleeve where damper-frame width permits direct attachment of perimeter mounting angles on each side of wall or floor; thickness of damper frame must comply with sleeve requirements.

G. Mounting Orientation: Vertical or horizontal as indicated.

H. Access Doors: As required.

I. Blades: Roll-formed, interlocking, 0.034-inch- (0.85-mm-) thick, galvanized sheet steel. In place of interlocking blades, use full-length, 0.034-inch- (0.85-mm-) thick, galvanized-steel blade connectors.

J. Horizontal Dampers: Include blade lock and stainless-steel closure spring.

K. Heat-Responsive Device: Electric resettable link and switch package, factory installed, 165 deg F (74 deg C) rated.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts.

B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and stainless-steel accessories in stainless-steel ducts.

C. Install backdraft dampers at inlet of exhaust fans or exhaust ducts and as shown on contract drawings and as close as possible to exhaust fan unless otherwise indicated.

D. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.

1. Install steel volume dampers in steel ducts.

2. Install duct mounted manual volume dampers at each duct branch, riser take off, tap, air device, grille, diffuser, register, equipment/device connection, open ended duct, etc.

E. Set dampers to fully open position before testing, adjusting, and balancing.

F. Install test holes at fan inlets and outlets and elsewhere as indicated.

G. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:

1. On both sides of duct coils.

2. At outdoor-air intakes and mixed-air plenums.

3. At drain pans and seals.

4. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.

5. Adjacent to and close enough to fire dampers, to reset or reinstall fusible links. Access doors for access to fire dampers having fusible links shall be pressure relief access doors and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.

6. At each change in direction and at maximum 50-foot (15-m) spacing.

7. Upstream and downstream from turning vanes.

8. Control devices requiring inspection.

9. Elsewhere as indicated.

H. Install access doors with swing against duct static pressure.

I. Access Door Sizes:

1. One-Hand or Inspection Access: 8 by 5 inches (200 by 125 mm).

2. Two-Hand Access: 12 by 6 inches (300 by 150 mm).

3. Head and Hand Access: 18 by 10 inches (460 by 250 mm).

4. Head and Shoulders Access: 21 by 14 inches (530 by 355 mm).

5. Body Access: 25 by 14 inches (635 by 355 mm).

6. Body plus Ladder Access: 25 by 17 inches (635 by 430 mm).

J. Label access doors according to Division 23 Section "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.

K. Install flexible connectors to connect ducts to equipment.

L. For fans developing static pressures of 5-inch wg. (1250 Pa) and more, cover flexible connectors with loaded vinyl sheet held in place with metal straps.

M. Connect flexible ducts to metal ducts with adhesive plus sheet metal screws.

N. Install duct test holes where required for testing and balancing purposes.

O. Where two units are tied to one supply duct, install gravity back draft dampers to protect back feeding in case one unit is not working.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Operate dampers to verify full range of movement.

2. Inspect locations of access doors and verify that purpose of access door can be performed.

3. Inspect turning vanes for proper and secure installation.

4. Operate remote damper operators to verify full range of movement of operator and damper.

END OF SECTION 23 33 00

SECTION 23 34 16 - CENTRIFUGAL HVAC FANS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes: For each
   1. Backward-inclined centrifugal fans.

B. Related Requirements:
   1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
   2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 ACTION SUBMITTALS

A. Product Data:

   1. Include rated capacities, furnished specialties, and accessories for each fan.
   2. Certified fan performance curves with system operating conditions indicated.
   3. Certified fan sound-power ratings.
   4. Motor ratings and electrical characteristics, plus motor and electrical accessories.
   5. Material thickness and finishes, including color charts.

B. Shop Drawings:

   1. Include plans, elevations, sections, and attachment details.
   2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   3. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Show fan room layout and relationships between components and adjacent structural and mechanical elements. Show support locations, type of support, and weight on each support. Indicate and certify field measurements.

B. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For centrifugal fans to include in emergency, operation, and maintenance manuals.

1.6 MAINTENANCE SPARE PARTS

A. Belts: Two sets for each belt-driven unit.

B. Other spare parts: Manufacturer's recommended quantity, but not less than 10% of all replacement parts, with a minimum quantity of one each.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of centrifugal fans that fail in materials or workmanship for not less than a period of two years.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. AMCA Compliance:

1. Comply with AMCA performance requirements and bear the AMCA-Certified Ratings Seal.
2. Operating Limits: Classify according to AMCA 99.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 BACKWARD-INCLINED CENTRIFUGAL FANS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Greenheck Fan Corporation.
2. Howden Buffalo Inc.
3. Howden Buffalo Inc.; New Philadelphia Division.
4. Loren Cook Company

B. Description:

1. Factory-fabricated, -assembled, -tested, and -finished, belt-driven centrifugal fans consisting of housing, wheel, fan shaft, bearings, motor, drive assembly, and support structure.
2. Deliver fans as factory-assembled units, to the extent allowable by shipping limitations.
3. Factory-installed and -wired disconnect switch.
4. Variable Frequency Drive capability.

C. Housings:

1. Formed panels to make curved-scroll housings with shaped cutoff.
2. Panel Bracing: Steel angle- or channel-iron member supports for mounting and supporting fan scroll, wheel, motor, and accessories.
3. Horizontally split, bolted-flange housing.
4. Spun inlet cone with flange.
5. Outlet flange.

D. Backward-Inclined Wheels:

1. Single-width-single-inlet and double-width-double-inlet construction with curved inlet flange, backplate, backward-inclined blades, and fastened to shaft with set screws.
2. Welded or riveted to flange and backplate; cast-iron or cast-steel hub riveted to backplate.

E. Shafts:

1. Statically and dynamically balanced and selected for continuous operation at maximum rated fan speed and motor horsepower, with adjustable alignment and belt tensioning.
2. Turned, ground, and polished hot-rolled steel with keyway. Ship with protective coating of lubricating oil.
3. Designed to operate at no more than 70 percent of first critical speed at top of fan's speed range.

F. Prelubricated and Sealed Shaft Bearings:

1. Self-aligning, pillow-block-type ball bearings.
2. Ball-Bearing Rating Life: ABMA 9, Ll0 at 100,000.
3. Roller-Bearing Rating Life: ABMA 11, Ll0 at 100,000.

G. Belt Drives:

1. Factory mounted, with adjustable alignment and belt tensioning.
2. Service Factor Based on Fan Motor Size: 1.5.
3. Fan Pulleys: Cast iron or cast steel with split, tapered bushing; dynamically balanced at factory.
4. Motor Pulleys: Adjustable pitch for use with motors through 5 hp; fixed pitch for use with larger motors. Select pulley so pitch adjustment is at the middle of adjustment range at fan design conditions.
5. Belts: Oil resistant, nonsparking, and nonstatic; matched sets for multiple belt drives.
6. Belt Guards: Fabricate to comply with OSHA and SMACNA requirements of diamond-mesh wire screen welded to steel angle frame or equivalent, prime coated. Secure to fan or fan supports without short circuiting vibration isolation. Include provisions for adjustment of belt tension, lubrication, and use of tachometer with guard in place.
7. Motor Mount: Adjustable for belt tensioning.

H. Accessories:

1. Access for Inspection, Cleaning, and Maintenance: Comply with requirements in ASHRAE 62.1.
2. Companion Flanges: Rolled flanges for duct connections of same material as housing.
3. Shaft Cooler: Metal disk between bearings and fan wheel, designed to dissipate heat from shaft.
4. Shaft Seals: Airtight seals installed around shaft on drive side of single-width fans.

2.3 MOTORS

A. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."

2.4 SOURCE QUALITY CONTROL

A. Sound-Power Level Ratings: Comply with AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.

B. Fan Performance Ratings: Establish flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests and ratings according to AMCA 210/ASHRAE 51, "Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install centrifugal fans level and plumb.

B. Disassemble and reassemble units, as required for moving to the final location, according to manufacturer's written instructions.

C. Lift and support units with manufacturer's designated lifting or supporting points.

D. Equipment Mounting:

1. Install centrifugal fans on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."
2. Comply with requirements for vibration isolation and seismic control devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."

E. Unit Support: Install centrifugal fans level on structural supports. Coordinate wall penetrations and flashing with wall construction. Secure units to structural support with anchor bolts.

F. Install units with clearances for service and maintenance.

G. Label fans according to requirements specified in Section 230553 "Identification for HVAC Piping and Equipment."

3.2 CONNECTIONS

A. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Section 233300 "Air Duct Accessories."

B. Install ducts adjacent to fans to allow service and maintenance.

C. Install piping from scroll drain connection, with trap with seal equal to 1.5 times specified static pressure, to nearest floor drain with pipe sizes matching the drain connection.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Verify that shipping, blocking, and bracing are removed.
2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
3. Verify that cleaning and adjusting are complete.
4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
5. Adjust belt tension.
6. Adjust damper linkages for proper damper operation.
7. Verify lubrication for bearings and other moving parts.
8. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
9. See Section 230593 "Testing, Adjusting, and Balancing For HVAC" for testing, adjusting, and balancing procedures.
10. Remove and replace malfunctioning units and retest as specified above.

C. Test and adjust controls and safeties. Controls and equipment will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

3.4 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Adjust belt tension.

C. Lubricate bearing

END OF SECTION 233416

SECTION 23 34 23 - HVAC POWER VENTILATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Utility set fans.
2. Centrifugal roof ventilators.
3. Ceiling-mounted ventilators.
4. In-line fans.
5. Louvered Roof Supply fans.

B. Related Requirements:
1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 PERFORMANCE REQUIREMENTS

A. Project Altitude: Base fan-performance ratings on sea level.

B. Operating Limits: Classify according to AMCA 99.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Also include the following:

1. Certified fan performance curves with system operating conditions indicated.
2. Certified fan sound-power ratings.
3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
4. Material thickness and finishes, including color charts.
5. Dampers, including housings, linkages, and operators.
6. Roof curbs.
7. Fan speed controllers.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

2. Wiring Diagrams: For power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:

1. Roof framing and support members relative to duct penetrations.
2. Ceiling suspension assembly members.
3. Size and location of initial access modules for acoustical tile.
4. Ceiling-mounted items including light fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.

B. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For power ventilators to include in emergency, operation, and maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Belts: Two sets for each belt-driven unit.

B. Other spare parts: Manufacturer's recommended quantity, but not less than 10% of all replacement parts, with a minimum quantity of one each.

1.8 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. AMCA Compliance: Fans shall have AMCA-Certified performance ratings and shall bear the AMCA-Certified Ratings Seal.

C. UL Standards: Power ventilators shall comply with UL 705. Power ventilators for use for kitchen exhaust shall also comply with UL 762.

1.9 COORDINATION

A. Coordinate size and location of structural-steel support members.

B. Coordinate sizes and locations of concrete bases with actual equipment provided.

C. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

PART 2 - PRODUCTS

2.1 UTILITY SET FANS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Carnes Company HVAC.
   2. Hartzell Fan, Inc.
   3. Industrial Air; a division of Lau Industries, Inc.
   4. Loren Cook Company.
   5. New York Blower Company (The).
   6. Penn Ventilation.
   7. Greenheck Fan Corporation.

B. Housing: Fabricated of steel with side sheets fastened with a deep lock seam or welded to scroll sheets.

   1. Housing Discharge Arrangement: Adjustable to eight standard positions.

C. Fan Wheels: Single-width, single inlet; welded to cast-iron or cast-steel hub and spun-steel inlet cone, with hub keyed to shaft.

   1. Blade Materials: Steel.
   2. Blade Type: Forward curved.
   3. Spark-Resistant Construction: AMCA 99, Type A.

D. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.

E. Shaft Bearings: Prelubricated and sealed, self-aligning, pillow-block-type ball bearings with ABMA 9, L_{50} of 200,000 hours.

   1. Extend grease fitting to accessible location outside of unit.

F. Belt Drives:

   1. Factory mounted, with final alignment and belt adjustment made after installation
   2. Service Factor Based on Fan Motor Size: 1.5.
   3. Motor Pulleys: Adjustable pitch for use with motors through 5 hp; fixed pitch for use with larger motors. Select pulley so pitch adjustment is at the middle of adjustment range at fan design conditions.
   4. Belts: Oil resistant, nonsparking, and nonstatic; matched sets for multiple belt drives.
   5. Belt Guards: Fabricate of steel for motors mounted on outside of fan cabinet.

G. Accessories:

   1. Inlet and Outlet: Flanged.
   2. Companion Flanges: Rolled flanges for duct connections of same material as housing.
   3. Backdraft Dampers: Gravity actuated with counterweight and interlocking aluminum blades with felt edges in steel frame installed on fan discharge.
   4. Access Door: Gasketed door in scroll with latch-type handles.
   5. Scroll Dampers: Single-blade damper installed at fan scroll top with adjustable linkage.
   6. Inlet Screens: Removable wire mesh.
   7. Drain Connections: NPS 3/4 threaded coupling drain connection installed at lowest point of housing.

8. Weather Hoods: Weather resistant with stamped vents over motor and drive compartment.
9. Discharge Dampers: Assembly with opposed blades constructed of two plates formed around and to shaft, channel frame, sealed ball bearings, with blades linked outside of airstream to single control lever of same material as housing.
10. Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.

H. Capacities and Characteristics: As indicated on Drawings.

1. Vibration Isolators:

a. Type: Spring isolators.

2. Spark Arrestance Class: A.

2.2 CENTRIFUGAL ROOF VENTILATORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Carnes Company HVAC.
2. Hartzell Fan, Inc.
3. Industrial Air; a division of Lau Industries, Inc.
4. Loren Cook Company.
5. New York Blower Company (The).
6. Penn Ventilation.
7. Greenheck Fan Corporation.

B. Housing: Removable, spun-aluminum, dome top and outlet baffle; square, one-piece, aluminum base with venturi inlet cone.

1. Upblast Units: Provide spun-aluminum discharge baffle to direct discharge air upward, with rain and snow drains and grease collector.
2. Hinged Subbase: Galvanized-steel hinged arrangement permitting service and maintenance.

C. Fan Wheels: Aluminum hub and wheel with backward-inclined blades.

D. Belt Drives:

1. Resiliently mounted to housing.
2. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
3. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.
4. Pulleys: Cast-iron, adjustable-pitch motor pulley.
5. Fan and motor isolated from exhaust airstream.

E. Accessories:

1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
2. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted inside fan housing, factory wired through an internal aluminum conduit.
3. Bird Screens: Removable, 1/2-inch mesh, aluminum or brass wire.
4. Dampers: Counterbalanced, parallel-blade, backdraft dampers mounted in curb base; factory set to close when fan stops.

5. Motorized Dampers: Parallel-blade dampers mounted in curb base with electric actuator; wired to close when fan stops.

F. Roof Curbs: Galvanized steel; mitered and welded corners; 1-1/2-inch- thick, rigid, fiberglass insulation adhered to inside walls; and 1-1/2-inch wood nailer. Size as required to suit roof opening and fan base.

1. Configuration: Built-in cant and mounting flange.
2. Overall Height: 18 inches.
3. Sound Curb: Curb with sound-absorbing insulation.
4. Pitch Mounting: Manufacture curb for roof slope.
5. Metal Liner: Galvanized steel.
6. Burglar Bars: 1/2-inch- thick steel bars welded in place to form 6-inch squares.

G. Capacities and Characteristics: As indicated on drawings.

2.3 CEILING-MOUNTED VENTILATORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Carnes Company HVAC.
2. Hartzell Fan, Inc.
3. Industrial Air; a division of Lau Industries, Inc.
4. Loren Cook Company.
5. New York Blower Company (The).
6. Penn Ventilation.
7. Greenheck Fan Corporation.

B. Housing: Steel, lined with acoustical insulation .

C. Fan Wheel: Centrifugal wheels directly mounted on motor shaft. Fan shrouds, motor, and fan wheel shall be removable for service.

D. Grille: Aluminum, louvered grille with flange on intake and thumbscrew attachment to fan housing.

E. Electrical Requirements: Junction box for electrical connection on housing and receptacle for motor plug-in.

F. Accessories:

1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
2. Manual Starter Switch: Single-pole rocker switch assembly with cover and pilot light.
3. Isolation: Rubber-in-shear vibration isolators.
4. Manufacturer's standard roof jack or wall cap, and transition fittings.

G. Capacities and Characteristics: As indicated on Drawings.

2.4 IN-LINE FANS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Carnes Company HVAC.
2. Hartzell Fan, Inc.
3. Industrial Air; a division of Lau Industries, Inc.
4. Loren Cook Company.
5. New York Blower Company (The).
6. Penn Ventilation.
7. Greenheck Fan Corporation.

B. Housing: Steel, lined with acoustical insulation with inlet and outlet flange for duct connections.

C. Fan Wheel: Centrifugal wheels directly mounted on motor shaft. Fan shrouds, motor, and fan wheel shall be removable for service.

D. Belt Drives:

1. Resiliently mounted to housing.
2. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
3. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.
4. Pulleys: Cast-iron, adjustable-pitch motor pulley.
5. Fan and motor isolated from exhaust airstream.

E. Motor: permanently lubricated

F. Electrical Requirements: Junction box for electrical connection on housing and receptacle for motor plug-in.

G. Accessories:

1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
2. Manual Starter Switch: Single-pole rocker switch assembly with cover and pilot light.
3. Isolation: Rubber-in-shear vibration isolators.
4. Manufacturer's standard roof jack or wall cap, and transition fittings.

H. Capacities and Characteristics: As indicated on Drawings.

2.5 LOUVERED ROOF SUPPLY FANS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Carnes Company HVAC.
2. Hartzell Fan, Inc.
3. Industrial Air; a division of Lau Industries, Inc.
4. Loren Cook Company.
5. New York Blower Company (The).
6. Penn Ventilation.
7. Greenheck Fan Corporation.

B. Hood: Louvered penthouse, extruded aluminum louvers, with insulated hinged aluminum cover.

C. Filter: Permanent 2 inch.

D. Fan Wheel: Flat blade, backward inclined, double width, double inlet centrifugal wheels, statically and dynamically balanced.

E. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.

F. Shaft Bearings: Prelubricated and sealed, self-aligning, pillow-block-type ball bearings with ABMA 9, L_{50} of 200,000 hours.

G. Belt Drives:

1. Factory mounted, with final alignment and belt adjustment made after installation
2. Service Factor Based on Fan Motor Size: 1.5.
3. Motor Pulleys: Adjustable pitch for use with motors through 5 hp; fixed pitch for use with larger motors. Select pulley so pitch adjustment is at the middle of adjustment range at fan design conditions.
4. Belts: Oil resistant, nonsparking, and nonstatic; matched sets for multiple belt drives.

H. Accessories:

1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.

I. Capacities and Characteristics: As indicated on Drawings.

2.6 MOTORS

A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."

1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

B. Enclosure Type: Totally enclosed, fan cooled.

2.7 SOURCE QUALITY CONTROL

A. Certify sound-power level ratings according to AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.

B. Certify fan performance ratings, including flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests according to AMCA 210, "Laboratory Methods of Testing Fans for Aerodynamic Performance Rating." Label fans with the AMCA-Certified Ratings Seal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install power ventilators level and plumb.

B. Equipment Mounting:

1. Install power ventilators on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."
2. Comply with requirements for vibration isolation and seismic control devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."

C. Secure roof-mounted fans to roof curbs with cadmium-plated hardware and vandal proof screws. See Section 077200 "Roof Accessories" for installation of roof curbs.

D. Ceiling Units: Suspend units from structure; use steel wire or metal straps.

E. Support suspended units from structure using threaded steel rods and elastomeric hangers having a static deflection of 1 inch . Vibration-control devices are specified in Section 230548 "Vibration and Seismic Controls for HVAC."

F. Install units with clearances for service and maintenance.

G. Label units according to requirements specified in Section 230553 "Identification for HVAC Piping and Equipment."

3.2 CONNECTIONS

A. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Section 233300 "Air Duct Accessories."

B. Install ducts adjacent to power ventilators to allow service and maintenance.

C. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:

1. Verify that shipping, blocking, and bracing are removed.
2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
3. Verify that cleaning and adjusting are complete.
4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
5. Adjust belt tension.

6. Adjust damper linkages for proper damper operation.
7. Verify lubrication for bearings and other moving parts.
8. Verify that manual and automatic volume control and fire dampers in connected ductwork systems are in fully open position.
9. Disable automatic temperature-control operators, energize motor and adjust fan to indicated rpm, and measure and record motor voltage and amperage.
10. Shut unit down and reconnect automatic temperature-control operators.
11. Remove and replace malfunctioning units and retest as specified above.

C. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Prepare test and inspection reports.

3.4 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Adjust belt tension.

C. Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.

D. Replace fan and motor pulleys as required to achieve design airflow.

E. Lubricate bearings.

3.5 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain HVAC power ventilators.

B. Refer Division 01 for administrative and procedural requirements for demonstration and training.

END OF SECTION 233423

SECTION 23 36 00 – AIR TERMINAL UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Shutoff, single-duct air terminal units.

B. Related Requirements:
   1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
   2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 SUBMITTALS

A. Product Data: For each type of the following products, including rated capacities, furnished specialties, sound-power ratings, and accessories.

   1. Air terminal units.
   2. Liners and adhesives.
   3. Sealants and gaskets.

B. Shop Drawings: For air terminal units. Include plans, elevations, sections, details, and attachments to other work.

   1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   2. Wiring Diagrams: For power, signal, and control wiring.
   3. Hangers and supports, including methods for duct and building attachment and vibration isolation.

C. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:

   1. Ceiling suspension assembly members.
   2. Size and location of initial access modules for acoustic tile.
   3. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.

D. Field quality-control reports.

E. Operation and Maintenance Data: For air terminal units to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Instructions for resetting minimum and maximum air volumes.
2. Instructions for adjusting software set points.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2004, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-Up."

1.5 MAINTENANCE SPARE PARTS

A. Spare parts: Manufacturer's recommended quantity, but not less than 10% of all replacement parts, with a minimum quantity of one each.

PART 2 - PRODUCTS

2.1 SHUTOFF, SINGLE-DUCT AIR TERMINAL UNITS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Carnes.
2. METALAIRE, Inc.
3. Titus.
4. Trane; a business of American Standard Companies.

B. Configuration: Volume-damper assembly inside unit casing with control components inside a protective metal shroud.

C. Casing: 0.034-inch (0.85-mm) steel, single wall.

1. Casing Lining: Adhesive attached, 1-inch- (25-mm-) thick, coated, fibrous-glass duct liner complying with ASTM C 1071, and having a maximum flame-spread index of 25 and a maximum smoke-developed index of 50, for both insulation and adhesive, when tested according to ASTM E 84.
2. Air Inlet: Round stub connection or S-slip and drive connections for duct attachment.
3. Air Outlet: S-slip and drive connections.
4. Access: Removable panels for access to parts requiring service, adjustment, or maintenance; with airtight gasket.
5. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.

D. Regulator Assembly: System-air-powered bellows section incorporating polypropylene bellows for volume regulation and thermostatic control. Bellows shall operate at temperatures from 0 to

140 deg F (minus 18 to plus 60 deg C), shall be impervious to moisture and fungus, shall be suitable for 10-inch wg (2500-Pa) static pressure, and shall be factory tested for leaks.

E. Volume Damper: Galvanized steel with peripheral gasket and self-lubricating bearings.

1. Maximum Damper Leakage: ARI 880 rated, 3 percent of nominal airflow at 3-inch wg (750-Pa) inlet static pressure.
2. Damper Position: Normally closed.

A. Electric-Resistance Heating Coils: Nickel-chromium heating wire, free of expansion noise and hum, mounted in ceramic inserts in a galvanized-steel housing; with primary automatic, and secondary manual, reset thermal cutouts. Terminate elements in stainless-steel, machine-staked terminals secured with stainless-steel hardware.
1. SCR controlled.
2. Access door interlocked disconnect switch.
3. Downstream air temperature sensor with local connection to override discharge-air temperature to not exceed a maximum temperature set point (adjustable).
4. Nickel chrome 80/20 heating elements.
5. Airflow switch for proof of airflow.
6. Fuses in terminal box for overcurrent protection (for coils more than 48 A).
7. Mercury contactors.
8. Pneumatic-electric switches and relays.
9. Magnetic contactor for each step of control (for three-phase coils).

B. Direct Digital Controls: Single-package unitary controller and actuator specified in Division 23 Section "Instrumentation and Control for HVAC."
1. Factory mount controls provided by controls contractor.
2. Electric Damper Actuator: 24 V, powered open, spring return.
3. Terminal Unit Controller: Pressure-independent, variable-air-volume (VAV) controller with electronic airflow transducer with multipoint velocity sensor at air inlet, factory calibrated to minimum and maximum air volumes, and having the following features:

a. Occupied and unoccupied operating mode.
b. Remote reset of airflow or temperature set points.
c. Adjusting and monitoring with portable terminal.
d. Communication with temperature-control system specified in Section 230900 "Direct Digital Control (DDC) System for HVAC.
e. Pressure switch.
f. Temperature sensor.

2.2 SOURCE QUALITY CONTROL

A. Factory Tests: Test assembled air terminal units according to ARI 880.

1. Label each air terminal unit with plan number, nominal airflow, maximum and minimum factory-set airflows, coil type, and ARI certification seal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install air terminal units according to NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems."

B. Install air terminal units level and plumb. Maintain sufficient clearance for normal service and maintenance.

C. Install wall-mounted thermostats.

3.2 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Hangers and Supports."

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

1. Where practical, install concrete inserts before placing concrete.
2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes and for slabs more than 4 inches (100 mm) thick.
4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes and for slabs less than 4 inches (100 mm) thick.
5. Do not use powder-actuated concrete fasteners for seismic restraints.

C. Hangers Exposed to View: Threaded rod and angle or channel supports.

D. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.3 CONNECTIONS

A. Connect ducts to air terminal units according to Division 23 Section "Metal Ducts."

B. Make connections to air terminal units with flexible connectors complying with requirements in Division 23 Section "Air Duct Accessories."

3.4 IDENTIFICATION

A. Label each air terminal unit with plan number, nominal airflow, and maximum and minimum factory-set airflows. Comply with requirements in Division 23 Section "Identification for HVAC Piping and Equipment" for equipment labels and warning signs and labels.

3.5 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

B. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

C. Tests and Inspections:

1. After installing air terminal units and after electrical circuitry has been energized, test for compliance with requirements.
2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Air terminal unit will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.6 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. Verify that inlet duct connections are as recommended by air terminal unit manufacturer to achieve proper performance.
3. Verify that controls and control enclosure are accessible.
4. Verify that control connections are complete.
5. Verify that nameplate and identification tag are visible.
6. Verify that controls respond to inputs as specified.

3.7 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain air terminal units.

B. Refer Division 01 for administrative and procedural requirements for demonstration and training.

END OF SECTION 23 36 00

SECTION 23 37 13 - DIFFUSERS, REGISTERS, AND GRILLES.

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Adjustable bar registers and grilles.
2. Fixed face registers and grilles.
3. Security registers and grilles.

B. Related Requirements:
1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated, include the following:

1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.

2. Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

B. Samples for Initial Selection: For diffusers, registers, and grilles with factory-applied color finishes.

C. Samples for Verification: For diffusers, registers, and grilles, in manufacturer's standard sizes to verify color selected.

D. Source quality-control reports.

PART 2 - PRODUCTS

2.1 REGISTERS AND GRILLES

A. Adjustable Bar Grille :

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. A-J Manufacturing Co., Inc.

b. Anemostat Products; a Mestek company.

c. Carnes.

d. Dayus Register & Grille Inc.

e. Hart & Cooley Inc.

f. Krueger.

g. METALAIRE, Inc.

h. Nailor Industries Inc.

i. Price Industries.

j. Titus.

k. Tuttle & Bailey.

2. Material: Steel or as indicated on contract drawings.

3. Finish: Baked enamel, white.

4. Face Blade Arrangement: Horizontal 3/4 inch (19 mm) apart.

5. Core Construction: Integral.

6. Frame: 1-1/4 inches (32 mm) wide.

7. Mounting: Countersunk screw.

B. Security Register:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. A-J Manufacturing Co., Inc.
   b. Anemostat Products; a Mestek company.
   c. Carnes.
   d. Dayus Register & Grille Inc.
   e. Hart & Cooley Inc.
   f. Krueger.
   g. METALAIRE, Inc.
   h. Nailor Industries Inc.
   i. Price Industries.
   j. Titus.
   k. Tuttle & Bailey.
2. Security Level: Medium.
3. Application: Ducted return.
4. Material: Steel.
5. Material Thickness: 0.19 inch.
6. Finish: Baked enamel, color selected by Architect.
7. Face Arrangement:

   a. Shape: Square or Rectangular as indicated
   b. Design: Perforated.

c. Frame: Yes.
d. Deflection: Zero degrees.
e. Core: None.
f. 3/16-inch- thick, perforated faceplate with 5/16-inch- diameter holes spaced 7/16 inch o.c., staggered at 60 degrees.

8. Damper Operation: Rear operated.
9. Damper Type: Adjustable opposed blade.
10. Wall Sleeve: 3/16 inch welded to face.
11. Mounting: 1-by-1-by-3/16-inch retaining angle frame.

C. Security Grille:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. A-J Manufacturing Co., Inc.
   b. Anemostat Products; a Mestek company.
   c. Carnes.
   d. Dayus Register & Grille Inc.
   e. Hart & Cooley Inc.
   f. Krueger.
   g. METALAIRE, Inc.
   h. Nailor Industries Inc.
   i. Price Industries.
   j. Titus.
   k. Tuttle & Bailey.
2. Security Level: Medium.
3. Application: Ducted return.
4. Material: Steel.
5. Material Thickness: 0.19 inch.
6. Finish: Baked enamel, color selected by Architect.
7. Face Arrangement:

   a. Shape: Square or Rectangular as indicated
   b. Design: Perforated.
   c. Frame: Yes.
   d. Deflection: Zero degrees.
   e. Core: None.
   f. 3/16-inch- thick, perforated faceplate with 5/16-inch- diameter holes spaced 7/16 inch o.c., staggered at 60 degrees.
8. Wall Sleeve: 3/16 inch welded to face.
9. Mounting: 1-by-1-by-3/16-inch retaining angle frame.

D. Fixed Face Register:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. A-J Manufacturing Co., Inc.
   b. Anemostat Products; a Mestek company.
   c. Carnes.
   d. Dayus Register & Grille Inc.
   e. Hart & Cooley Inc.
   f. Krueger.
   g. METALAIRE, Inc.
   h. Nailor Industries Inc.
   i. Price Industries.

j. Titus.
k. Tuttle & Bailey.

2. Material: Steel.
3. Finish: Baked enamel, color selected by Architect.
4. Face Arrangement: 1/2-by-1/2-by-1/2-inch grid or Perforated core as indicated.
5. Core Construction: Integral.
6. Frame: 1-1/4 inches wide.
7. Mounting: Countersunk screw.
8. Damper Type: Adjustable opposed blade.

E. Fixed Face Grille:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. A-J Manufacturing Co., Inc.
   b. Anemostat Products; a Mestek company.
   c. Carnes.
   d. Dayus Register & Grille Inc.
   e. Hart & Cooley Inc.
   f. Krueger.
   g. METALAIRE, Inc.
   h. Nailor Industries Inc.
   i. Price Industries.
   j. Titus.
   k. Tuttle & Bailey.
2. Material: Steel.
3. Finish: Baked enamel, color selected by Architect.
4. Face Arrangement: 1/2-by-1/2-by-1/2-inch grid or Perforated core as indicated.
5. Core Construction: Integral.
6. Frame: 1-1/4 inches wide.
7. Mounting: Countersunk screw.

2.2 SOURCE QUALITY CONTROL

A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install diffusers, registers, and grilles level and plumb.

B. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.3 ADJUSTING

A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 23 37 13

SECTION 23 37 23 - HVAC GRAVITY VENTILATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Roof hoods.

B. Related Requirements:
   1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
   2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Ventilators shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of ventilator components, noise or metal fatigue caused by ventilator blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act normal to the face of the building.
   1. Wind Loads: Determine loads based on a uniform pressure of 20 lbf/sq. ft., acting inward or outward.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes, without buckling, opening of joints, overstressing of components, failure of connections, or other detrimental effects.

   1. Temperature Change (Range): 120 deg F , material surfaces.

C. Water Entrainment: Limit water penetration through unit to comply with ASHRAE 62.1.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated

B. LEED Submittals:

   1. Product Data for Prerequisite IEQ 1: Documentation indicating that units comply with ASHRAE 62.1, Section 5 - "Systems and Equipment."

C. Shop Drawings: For gravity ventilators. Include plans, elevations, sections, details, ventilator attachments to curbs, and curb attachments to roof structure.

1. Show weep paths, gaskets, flashing, sealant, and other means of preventing water intrusion.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Roof framing plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

1. Structural members to which roof curbs and ventilators will be attached.
2. Sizes and locations of roof openings.

B. Welding certificates.

1.6 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
2. AWS D1.3, "Structural Welding Code - Sheet Steel."

1.7 COORDINATION

A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminum Sheet: ASTM B 209, Alloy 3003 or 5005 with temper as required for forming or as otherwise recommended by metal producer for required finish.

B. Fasteners: Same basic metal and alloy as fastened metal or 300 Series stainless steel unless otherwise indicated. Do not use metals that are incompatible with joined materials.

1. Use types and sizes to suit unit installation conditions.
2. Use vandal proof screws for exposed fasteners unless otherwise indicated.

C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.2 FABRICATION, GENERAL

A. Factory fabricate gravity ventilators to minimize field splicing and assembly. Disassemble units to the minimum extent as necessary for shipping and handling. Clearly mark units for reassembly and coordinated installation.

B. Fabricate frames, including integral bases, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.

C. Fabricate units with closely fitted joints and exposed connections accurately located and secured.

D. Fabricate supports, anchorages, and accessories required for complete assembly.

E. Perform shop welding by AWS-certified procedures and personnel.

2.3 ROOF HOODS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Acme Engineering and Manufacturing Co..
2. Carnes Co.
3. Loren Cook Company.
4. Greenheck Fan Corporation.

B. Factory or shop fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figures 6-6 and 6-7.

C. Materials: Aluminum sheet, minimum 0.063-inch- thick base and 0.050-inch- thick hood; suitably reinforced.

D. Roof Curbs: Galvanized-steel sheet; with mitered and welded corners; 1-1/2-inch- thick, rigid fiberglass insulation adhered to inside walls; and 1-1/2-inch wood nailer. Size as required to fit roof opening and ventilator base.

1. Configuration: Built-in cant and mounting flange.
2. Overall Height: 12 inches.

E. Bird Screening: Aluminum, 1/2-inch- square mesh, 0.063-inch wire.

F. Capacities and Characteristics: As indicated on drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install gravity ventilators level, plumb, and at indicated alignment with adjacent work.

B. Install gravity ventilators with clearances for service and maintenance.

C. Install perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

D. Install concealed gaskets, flashings, joint fillers, and insulation as installation progresses. Comply with Division 7 Section " Security Joint Sealants" for sealants applied during installation.

E. Label gravity ventilators according to requirements specified in Section 230553 "Identification for HVAC Piping and Equipment."

F. Repair finishes damaged by cutting, welding, soldering, and grinding. Restore finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, make required alterations, and refinish entire unit or provide new units.

3.2 CONNECTIONS

A. Duct installation and connection requirements are specified in Section 233113 "Metal Ducts". Drawings indicate general arrangement of ducts and duct accessories.

3.3 ADJUSTING

A. Adjust damper linkages for proper damper operation.

END OF SECTION 233723

SECTION 23 51 13.16 - VENT DAMPERS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Barometric dampers.
   2. Vent dampers.

B. Related Requirements:
   1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
   2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
B. Shop Drawings: For each type of product.
   1. Include plans, elevations, sections, and attachment details.
   2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   3. Detail fabrication and assembly of hangers and seismic restraints.
   4. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For draft control devices to include in emergency, operation, and maintenance manuals.

1.6 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of vent and barometric dampers that fail in materials or workmanship within specified warranty period.

   1. Failure includes failure due to corrosion.

   2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 BAROMETRIC DAMPER

A. Damper Construction: High-temperature-enamel-painted steel damper and housing with galvanized-steel breeching connection. Adjustable counterweight with lock. Include knife-edge bearings that do not require lubrication.

2.2 VENT DAMPERS

A. Damper Construction: Stainless-steel damper blade, shaft, and vent pipe with metal, prelubricated bearings.
   1. Electric motor sized to power damper open and closed in approximately 15 seconds in each direction. Power is off when damper is at rest.
   2. Comply with ANSI Z21.66.

B. Controls:
   1. Control transformer.
   2. Keyed wiring harness.
   3. Damper end switch to prove damper is open.
   4. Interlock with exhaust fan to permit operation when damper is open.

2.3 MOTORS

A. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 23 05 13 – Common Motor Requirements for HVAC Equipment.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install listed components in compliance with the listing.

B. Secure barometric dampers to breechings with hardware compatible with connected materials.

C. Locate barometric and motorized vent dampers as close to draft hood collar as possible.

D. Secure barometric and motorized vent dampers to appliances, breechings, or chimneys with hardware compatible with connected materials.

3.2 CONNECTIONS

A. Ground equipment according to Section 26 05 26 – Grounding and Bonding for Electrical Systems.

B. Connect wiring according to Section 26 05 19 – Low- Voltage Electrical Power Conductors and Cables.

END OF SECTION 23 51 13.16

SECTION 23 51 23 - GAS VENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Listed double-wall vents.

B. Related Requirements:
1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for product.

B. Shop Drawings: For vents.
1. Include plans, elevations, sections, and attachment details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Detail fabrication and assembly of hangers and seismic restraints.

1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.
B. Sample Warranty: For special warranty.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
2. AWS D9.1/D9.1M, "Sheet Metal Welding Code," for shop and field welding of joints and seams in vents.

B. Certified Sizing Calculations: Manufacturer shall certify venting system sizing calculations.

PART 2 - PRODUCTS

2.01 LISTED TYPE B AND BW VENTS

A. Description: Double-wall metal vents tested according to UL 441 and rated for 480 deg. F continuously for Type B or 550 deg. F continuously for Type BW; with neutral or negative flue pressure complying with NFPA 211.

B. Construction: Inner shell and outer jacket separated by at least a 1/4-inch airspace.

C. Outer Jacket: Galvanized steel.

D. Accessories: Tees, elbows, increasers, draft-hood connectors, terminations, adjustable roof flashings, storm collars, support assemblies, thimbles, firestop spacers, and fasteners; fabricated from similar materials and designs as vent-pipe straight sections; all listed for same assembly.

1. Termination: Round chimney top designed to exclude minimum 98 percent of rainfall.

2.02 EXAMINATION

A. Examine areas and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

2.03 APPLICATION

A. Listed Type B and BW Vents: Vents for certified gas appliances.

2.04 INSTALLATION OF LISTED VENTS

A. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Section 07 72 00 – Roof Accessories.

B. Comply with minimum clearances from combustibles and minimum termination heights according to product listing or NFPA 211, whichever is most stringent.

C. Seal between sections of positive-pressure vents according to manufacturer's written installation instructions, using sealants recommended by manufacturer.

D. Support vents at intervals recommended by manufacturer to support weight of vents and all accessories, without exceeding appliance loading.

E. Lap joints in direction of flow.

2.05 CLEANING

A. After completing system installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris, and repair damaged finishes.

2.06 EXECUTION

A. Installation of double wall connectors, breechings, and vents:

1. Install all steel, positive pressure, double wall gas vents in accordance with manufacturer's written instructions.

2. Installation instructions and UL listing. Maintain minimum clearances from combustibles specified in UL listing.

3. Seal joints between sections of positive pressure vents in accordance with manufacturer.

4. Installation instructions, and using only sealants recommended by manufacturer.

5. Support vents at intervals recommended by the manufacturer to support the weight of the vent and all accessories, without exceeding loading of appliances.

B. Protection:

1. Temporary Closure: At ends of breechings and chimneys which are not completed or connected to equipment, provide temporary closure which will prevent entrance of dust and debris until installations are completed.

END OF SECTION 23 51 23

SECTION 23 62 00 - PACKAGED COMPRESSOR AND CONDENSER UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes packaged, refrigerant compressor and condenser units.

B. Related Requirements:
   1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
   2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 ACTION SUBMITTALS

A. Product Data: For each compressor and condenser unit. Include rated capacities, operating characteristics, and furnished specialties and accessories. Include equipment dimensions, weights and structural loads, required clearances, method of field assembly, components, and location and size of each field connection.

B. LEED Submittals:

   1. Product Data for Prerequisite EA 2: Documentation indicating that units comply with applicable requirements in ASHRAE/IESNA 90.1.
   2. Product Data for Credit EA 4: Documentation indicating that compressor and condenser units and refrigerants comply.

C. Shop Drawings: For compressor and condenser units. Include plans, elevations, sections, details, and attachments to other work.

   1. Wiring Diagrams: For power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

   1. Structural members to which compressor and condenser units will be attached.
   2. Liquid and vapor pipe sizes.
   3. Refrigerant specialties.
   4. Piping including connections, oil traps, and double risers.
   5. Compressors.
   6. Evaporators.

B. Field quality-control reports.

C. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For compressor and condenser units to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Fabricate and label refrigeration system according to ASHRAE 15, "Safety Standard for Refrigeration Systems."

C. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6, "Heating, Ventilating, and Air-Conditioning."

D. ASME Compliance: Fabricate and label water-cooled compressor and condenser units to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

1.7 COORDINATION

A. Coordinate sizes and locations of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Section 033000 "Cast-In-Place Concrete" and Section 033053 "Miscellaneous Cast-In-Place Concrete."

B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Section 077200 "Roof Accessories."

C. Coordinate location of piping and electrical rough-ins.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of compressor and condenser units that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

    a. Compressor failure.
    b. Condenser coil leak.
2. Warranty Period (Compressor Only): 10 years from date of Substantial Completion.
3. Warranty Period (Components Other Than Compressor): Five years from date of Substantial Completion.
4. Warranty Period (Condenser Coil Only): Five years from date of Substantial Completion.

1.9 MAINTENANCE SPARE PARTS

A. Spare parts: Manufacturer's recommended quantity, but not less than 10% of all replacement parts, with a minimum quantity of one each.

PART 2 - PRODUCTS

2.1 COMPRESSOR AND CONDENSER UNITS, AIR COOLED, 1 TO 5 TONS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

1. Carrier Corporation; Carrier Air Conditioning Div.
2. Lennox Industries Inc.
3. McQuay International.
4. Trane Co. (The); Worldwide Applied Systems Group.
5. York International Corp.

B. Description: Factory assembled and tested; consisting of compressor, condenser coil, fan, motors, refrigerant reservoir, and operating controls.

C. Compressor: Scroll, hermetically sealed, with rubber vibration isolators.

1. Motor: Single speed, and includes thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.
2. Two-Speed Compressor: Include manual-reset, high-pressure switch and automatic-reset, low-pressure switch.
3. Accumulator: Suction tube.

D. Refrigerant: R-410A.

E. Condenser Coil: Seamless copper-tube, aluminum-fin coil; circuited for integral liquid subcooler, with removable drain pan and brass service valves with service ports.

F. Condenser Fan: Direct-drive, aluminum propeller fan; with permanently lubricated, totally enclosed fan motor with thermal-overload protection and ball bearings.

G. Accessories:
1. Crankcase heater.
2. Cycle Protector: Automatic-reset timer to prevent rapid compressor cycling.
3. Filter-dryer.
4. High-Pressure Switch: Automatic-reset switch cycles compressor off on high refrigerant pressure.
5. Liquid-line solenoid.
6. Low-Ambient Controller: Cycles condenser fan to permit operation down to 30 deg F with time-delay relay to bypass low-pressure switch.
7. Low-Pressure Switch: Automatic-reset switch cycles compressor off on low refrigerant pressure.
8. PE mounting base.

9. Precharged and insulated suction and liquid tubing.
10. Sound Hood: Wraps around sound attenuation cover for compressor.
11. Thermostatic expansion valve.
12. Time-Delay Relay: Continues operation of evaporator fan after compressor shuts off.
13. Reversing valve.

H. Unit Casing: Galvanized steel, finished with baked enamel; with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Mount service valves, fittings, and gage ports on exterior of casing.

I. Capacities and Characteristics:

1. Compressor and Condenser Unit: As indicated on Drawings.

2.2 MOTORS

A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."

1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

2.3 SOURCE QUALITY CONTROL

A. Verification of Performance: Rate compressor and condenser units according to ARI 206/110].

B. Energy Efficiency: Equal to or greater than prescribed by ASHRAE/IESNA 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings," Section 6, "Heating, Ventilating, and Air-Conditioning."

C. Test and inspect shell and tube condensers according to ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

D. Testing Requirements: Factory test sound-power-level ratings according to ARI 270].

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of compressor and condenser units.

B. Examine roughing-in for refrigerant piping systems to verify actual locations of piping connections before equipment installation.

C. Examine floors, and roofs for suitable conditions where compressor and condenser units will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install units level and plumb, firmly anchored in locations indicated.

B. Install roof-mounting units on equipment supports specified in Section 077200 "Roof Accessories."

C. Equipment Mounting:

1. Install compressor and condenser units on cast-in-place concrete equipment bases. Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete." .
2. Comply with requirements for vibration isolation and seismic control devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."

D. Maintain manufacturer's recommended clearances for service and maintenance.

E. Loose Components: Install electrical components, devices, and accessories that are not factory mounted.

3.3 CONNECTIONS

A. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

B. Connect precharged refrigerant tubing to unit's quick-connect fittings. Install tubing so it does not interfere with access to unit. Install furnished accessories.

C. Connect refrigerant piping to air-cooled compressor and condenser units; maintain required access to unit. Install furnished field-mounted accessories. Refrigerant piping and specialties are specified in Section 232300 "Refrigerant Piping."

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Verify that vibration isolation and flexible connections properly dampen vibration transmission to structure.

C. Compressor and condenser units will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

3.5 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

B. Lubricate bearings on fan motors.

C. Verify that fan wheel is rotating in the correct direction and is not vibrating or binding.

D. Adjust fan belts to proper alignment and tension.

E. Start unit according to manufacturer's written instructions and complete manufacturer's startup checklist.

F. Measure and record airflow and air temperature rise over coils.

G. Verify proper operation of condenser capacity control device.

H. Verify that vibration isolation and flexible connections properly dampen vibration transmission to structure.

I. After startup and performance test, lubricate bearings.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain compressor and condenser units.

B. Refer Division 01 for administrative and procedural requirements for demonstration and training.

END OF SECTION 236200

SECTION 23 63 13 - AIR-COOLED REFRIGERANT CONDENSERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes packaged, air-cooled condensers for indoor installation.

B. Related Requirements:
1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 SUBMITTALS

A. Product Data: For each air-cooled condenser, include rated capacities, operating characteristics, furnished specialties, and accessories. Include equipment dimensions, weights and structural loads, required clearances, method of field assembly, components, and location and size of each field connection.

B. Operation and Maintenance Data: For air-cooled condensers to include in emergency, operation, and maintenance manuals.

1.4 QUALITY ASSURANCE

A. Fabricate and label refrigeration system according to ASHRAE 15, "Safety Code for Mechanical Refrigeration."

B. ASHRAE/IESNA 90.1-2004 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004, Section 6 - "Heating, Ventilating, and Air-Conditioning."

1.5 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

B. Coordinate location of refrigerant piping and electrical rough-ins.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of condenser units that fail in materials or workmanship for not less than a period of two years.

1.7 MAINTENANCE SPARE PARTS

A. Spare parts: Manufacturer's recommended quantity, but not less than 10% of all replacement parts, with a minimum quantity of one each.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. McQuay International.

2. Trane Co. (The); Worldwide Applied Systems Group.

3. York International Corp.

4. Dectron Inc.

5. Data Aire Inc.

6. Or approved equal.

2.2 MANUFACTURED UNITS

A. Description: Factory assembled and tested; consisting of casing, condenser coils, condenser fans, motors, and unit controls.

B. Condenser Coil: Seamless copper-tube, finned coil; factory tested at 425 psig (2930 kPa).

1. Coil Fin: Aluminum.

2. Circuit: To match compressors with liquid subcooling coil.

3. Refrigerant Accessories: Provide receiver, pressure control, and solenoid valve for each circuit.

C. Condenser Fans and Drives: Propeller fans with aluminum fan blades, for vertical air discharge; directly driven with permanently lubricated ball bearing motors with integral current- and thermal-overload protection.

D. Unit Casings: Galvanized steel treated and finished with manufacturer's standard paint coating, designed for indoor/ outdoor installation, and with the following:

1. Removable panels for access to controls, condenser fans, motors, and drives.

2. Lifting eyes.

E. Unit control circuit shall contain 24-V transformer for unit controls. Operating and Safety Controls: Include condenser fan motor thermal and overload cutouts; 115-V control transformer, if required; magnetic contactors for condenser fan motors and a non fused factory-mounted and -wired disconnect switch for single external electrical power connection.

2.3 MOTORS

A. General requirements for motors are specified in Section 23 05 13 – Common Motor Requirements for HVAC Equipment.

1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

2. Controllers, Electrical Devices, and Wiring: Electrical devices and connections are specified in Division 26 Sections.

2.4 SOURCE QUALITY CONTROL

A. Verification of Performance: Rate air-cooled condensers according to ARI 460.

B. Testing Requirements: Factory test sound-power-level ratings according to ARI 270.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of air-cooled condensers.

B. Examine roughing-in for refrigerant piping systems to verify actual locations of piping connections before equipment installation.

C. Examine walls, floors, and roofs for suitable conditions where air-cooled condensers will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install units level and plumb, firmly anchored in locations indicated; maintain manufacturer's recommended clearances.

B. Install air-cooled condensers on concrete base. Concrete base is specified in Section 23 05 00 – Common Work Results for HVAC, and concrete materials and installation requirements are specified in Division 03.

C. Concrete Bases:

1. Install dowel rods to connect concrete base to concrete slab. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around full perimeter of the base.

2. For equipment supported on structural slab, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.

3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

4. Install anchor bolts to elevations required for proper attachment to supported equipment.

5. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

D. Vibration Isolation: Mount air-cooled condensers spring isolators. Retain one of first two paragraphs and associated subparagraph below for suspended units.

E. Maintain manufacturer's recommended clearances for service and maintenance.

F. Loose Components: Install electrical components, devices, and accessories that are not factory mounted.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to machine to allow service and maintenance.

C. Refrigerant Piping: Connect piping to unit with pressure relief, service valve, filter-dryer, and moisture indicator on each refrigerant-circuit liquid line. Refrigerant piping and specialties are specified in Section 23 23 00 – Refrigerant Piping.

3.4 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. Perform electrical test and visual and mechanical inspection.

2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.

3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation. Complete manufacturer's starting checklist.

4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

5. Verify proper airflow over coils.

B. Verify that vibration isolation and flexible connections properly dampen vibration transmission to structure.

C. Remove and replace malfunctioning air-cooled condensers and retest as specified above.

3.5 STARTUP SERVICE

A. Complete installation and startup checks according to manufacturer's written instructions and perform the following:

1. Inspect for physical damage to unit casing.

2. Verify that access doors move freely and are weather tight.

3. Clean units and inspect for construction debris.

4. Verify that all bolts and screws are tight.

5. Adjust vibration isolation and flexible connections.

6. Verify that controls are connected and operational.

B. Lubricate bearings on fans.

C. Verify that fan wheel is rotating in the correct direction and is not vibrating or binding.

D. Start unit according to manufacturer's written instructions and complete manufacturer's startup checklist.

E. Measure and record airflow over coils.

F. Verify proper operation of capacity control device.

G. Verify that vibration isolation and flexible connections properly dampen vibration transmission to structure.

H. After startup and performance test, lubricate bearings.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train maintenance personnel to adjust, operate, and maintain units..

B. Refer Division 01 for administrative and procedural requirements for demonstration and training.

END OF SECTION 23 63 13

SECTION 23 73 13 - MODULAR INDOOR CENTRAL-STATION AIR-HANDLING UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Constant-air-volume, single-zone air-handling units.

2. Variable-air-volume, single-zone air-handling units.

B. Related Requirements:
1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Casing panels shall be self-supporting and capable of withstanding 133 percent of internal static pressures indicated, without panel joints exceeding a deflection of L/200 where "L" is the unsupported span length within completed casings.

1.4 ACTION SUBMITTALS

A. Product Data: For each air-handling unit indicated.

1. Unit dimensions and weight.

2. Cabinet material, metal thickness, finishes, insulation, and accessories.

3. Fans:

a. Certified fan-performance curves with system operating conditions indicated.

b. Certified fan-sound power ratings.

c. Fan construction and accessories.

d. Motor ratings, electrical characteristics, and motor accessories.

4. Certified coil-performance ratings with system operating conditions indicated.

5. Dampers, including housings, linkages, and operators.

6. Filters with performance characteristics.

B. LEED Submittals:

1. Product Data for Prerequisite IEQ 1: Documentation indicating that units comply with ASHRAE 62.1, Section 5 - "Systems and Equipment."

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Floor plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Mechanical-room layout and relationships between components and adjacent structural and mechanical elements.

2. Support location, type, and weight.

3. Field measurements.

B. Source quality-control reports.

C. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For air-handling units to include in emergency, operation, and maintenance manuals.

1.7 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. NFPA Compliance: Comply with NFPA 90A for design, fabrication, and installation of air-handling units and components.

C. ARI Certification: Air-handling units and their components shall be factory tested according to ARI 430, "Central-Station Air-Handling Units," and shall be listed and labeled by ARI.

D. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

E. Comply with NFPA 70.

1.8 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

B. Coordinate sizes and locations of structural-steel support members, if any, with actual equipment provided.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of air handling units that fail in materials or workmanship for not less than a period of two years.

1.10 MAINTENANCE SPARE PARTS

A. Belts: Two sets for each belt-driven unit.

B. Filters: Two sets for each unit.

C. Other spare parts: Manufacturer's recommended quantity, but not less than 10% of all replacement parts, with a minimum quantity of one each.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. McQuay International

2. Trane; American Standard Inc.

3. YORK International Corporation.

4. Or Engineer approved equal.

2.2 UNIT CASINGS

A. General Fabrication Requirements for Casings:

1. Type: Double wall.

2. Forming: Form walls, roofs, and floors with at least two breaks at each joint.

3. Casing Joints: Sheet metal screws or pop rivets.

4. Sealing: Seal all joints with water-resistant sealant.

5. Casing Coating: Hot-dip galvanized.

6. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

B. Casing Insulation and Adhesive:

1. Materials: ASTM C 1071.

2. Location and Application: Encased between outside and inside casing.

C. Inspection and Access Panels and Access Doors:

1. Panel and Door Fabrication: Formed and reinforced, double-wall and insulated panels of same materials and thicknesses as casing.

2. Inspection and Access Panels:

   a. Fasteners: Two or more camlock type for panel lift-out operation. Arrangement shall allow panels to be opened against air-pressure differential.

   b. Gasket: Neoprene, applied around entire perimeters of panel frames.

   c. Size: Large enough to allow inspection and maintenance of air-handling unit's internal components.

3. Access Doors:

   a. Hinges: A minimum of two ball-bearing hinges or stainless-steel piano hinge and two wedge-lever-type latches, operable from inside and outside. Arrange doors to be opened against air-pressure differential.

   b. Gasket: Neoprene, applied around entire perimeters of panel frames.

   c. Size: At least 18 inches (450 mm) wide by full height of unit casing up to a maximum height of 72 inches (1800 mm).

4. Locations and Applications:

   a. Fan Section: Doors.

   b. Access Section: Doors.

   c. Coil Section: Inspection and access panel.

   d. Damper Section: Doors.

   e. Filter Section: Doors large enough to allow periodic removal and installation of filters.

   f. Mixing Section: Doors.

5. Service Light: 100-W vaporproof fixture with switched junction box located outside adjacent to door.

   a. Locations: Each section accessed with door.

   b. Units: AHU-1 and AHU-2.

D. Condensate Drain Pans:

1. Fabricated with slope in at least two planes to collect condensate from cooling coils (including coil piping connections, coil headers, and return bends) and from humidifiers and to direct water toward drain connection.

   a. Length: Extend drain pan downstream from leaving face to comply with ASHRAE 62.1.

   b. Depth: A minimum of 2 inches (50 mm) deep.

2. Double-wall, stainless-steel sheet with space between walls filled with foam insulation and moisture-tight seal.

3. Drain Connection: Located at lowest point of pan and sized to prevent overflow. Terminate with threaded nipple on one end of pan.

   a. Minimum Connection Size: NPS 1 (DN 25).

4. Units with stacked coils shall have an intermediate drain pan to collect condensate from top coil.

E. Air-Handling-Unit Mounting Frame: Formed galvanized-steel channel or structural channel supports, designed for low deflection, welded with integral lifting lugs.

2.3 FAN, DRIVE, AND MOTOR SECTION

A. Fan and Drive Assemblies: Statically and dynamically balanced and designed for continuous operation at maximum-rated fan speed and motor horsepower. Fan performance shall be certified to complying with AHRI standard 430.

1. Shafts: Designed for continuous operation at maximum-rated fan speed and motor horsepower, and with field-adjustable alignment.

   a. Turned, ground, and polished hot-rolled steel with keyway. Ship with a protective coating of lubricating oil.

   b. Designed to operate at no more than 70 percent of first critical speed at top of fan's speed range.

B. Centrifugal Fan Housings: Formed- and reinforced-steel panels to form curved scroll housings with shaped cutoff and spun-metal inlet bell.

1. Bracing: Steel angle or channel supports for mounting and supporting fan scroll, wheel, motor, and accessories.

2. Housing for Supply Fan: Attach housing to fan-section casing with metal-edged flexible duct connector.

3. Flexible Connector: Factory fabricated with a fabric strip 3-1/2 inches (89 mm) wide attached to 2 strips of 2-3/4-inch- (70-mm-) wide, 0.028-inch- (0.7-mm-) thick, galvanized-steel sheet or 0.032-inch- (0.8-mm-) thick aluminum sheets; select metal compatible with casing.

   a. Flexible Connector Fabric: Glass fabric, double coated with neoprene. Fabrics, coatings, and adhesives shall comply with UL 181, Class 1.

      1) Fabric Minimum Weight: 26 oz./sq. yd. (880 g/sq. m).

      2) Fabric Tensile Strength: 480 lbf/inch (84 N/mm) in the warp and 360 lbf/inch (63 N/mm) in the filling.

      3) Fabric Service Temperature: Minus 40 to plus 200 deg F (Minus 40 to plus 93 deg C).

C. Plenum Fan Housings: Steel frame and panel; fabricated without fan scroll and volute housing.

D. Backward-Inclined, Centrifugal Fan Wheels: Single-width-single-inlet and double-width-double-inlet construction with curved inlet flange, backplate, backward-inclined blades welded or riveted to flange and backplate; cast-iron or cast-steel hub riveted to backplate and fastened to shaft with set screws.

E. Forward-Curved, Centrifugal Fan Wheels: Inlet flange, backplate, and shallow blades with inlet and tip curved forward in direction of airflow and mechanically fastened to flange and backplate; cast-steel hub swaged to backplate and fastened to shaft with set screws.

F. Fan Shaft Bearings:

1. Prelubricated and Sealed, Ball Bearings: Self-aligning, pillow-block type with a rated life of 120,000 hours according to ABMA 9.

2. Grease-Lubricated, Tapered-Roller Bearings: Self-aligning, pillow-block type with double-locking collars and 2-piece, cast-iron housing with grease lines extended to outside unit and a rated life of 120,000 hours according to ABMA 11.

3. Grease-Lubricated Bearings: Self-aligning, pillow-block-type, ball or roller bearings with adapter mount and two-piece, cast-iron housing with grease lines extended to outside unit.

G. Belt Drives: Factory mounted, with adjustable alignment and belt tensioning, and with 1.5 service factor based on fan motor.

1. Pulleys: Cast iron or cast steel with split, tapered bushing; dynamically balanced at factory.

2. Motor Pulleys: Adjustable pitch for use with 5-hp motors and smaller; fixed pitch for use with motors larger than 5 hp. Select pulley size so pitch adjustment is at the middle of adjustment range at fan design conditions.

3. Belts: Oil resistant, nonsparking, and nonstatic; in matched sets for multiple-belt drives.

4. Belt Guards: Comply with requirements specified by OSHA and fabricate according to SMACNA's "HVAC Duct Construction Standards"; 0.1046-inch- (2.7-mm-) thick, 3/4-inch (20-mm) diamond-mesh wire screen, welded to steel angle frame; prime coated.

H. Internal Vibration Isolation: Fans shall be factory mounted with manufacturer's standard vibration isolation mounting devices having a minimum static deflection of 2 inches (50 mm).

I. Motor: Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."

1. Enclosure Type: Totally enclosed, fan cooled.

2. NEMA Premium (TM) efficient motors as defined in NEMA MG 1.

3. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

4. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in electrical Sections.

2.4 COIL SECTION

A. General Requirements for Coil Section:

1. Comply with ARI 410.

2. Fabricate coil section to allow removal and replacement of coil for maintenance and to allow in-place access for service and maintenance of coil(s).

3. Coils shall not act as structural component of unit.

B. Water Coils

1. Water coils shall have ¼ inch plugged vent or drain tap on each connection.

2. Water coils shall be proof tested to 300 psi and leak tested under water to 200 psi.

3. Coil shall be have aluminum fins and seamless copper tubes. Coil casing shall be galvanized steel, and headers shall be constructed of copper pipe.

4. Coil fins shall have collars, drawn, belled and firmly bended to tubes.

5. Low limit switch: Factory installed double pole low limit switch with push button reset shall be provided for each coil.

2.5 AIR FILTRATION SECTION

A. General Requirements for Air Filtration Section:

1. Comply with NFPA 90A.

2. Provide minimum arrestance according to ASHRAE 52.1, and a minimum efficiency reporting value (MERV) according to ASHRAE 52.2.

3. Provide filter holding frames arranged for flat or angular orientation, with access doors on both sides of unit. Filters shall be removable from one side or lifted out from access plenum.

B. Extended-Surface, Disposable Panel Filters:

1. Factory-fabricated, dry, extended-surface type.

2. Thickness: 2 inches (50 mm).

3. Merv (ASHRAE 52.2): 8.

4. Media: Fibrous material formed into deep-V-shaped pleats and held by self-supporting wire grid.

5. Media-Grid Frame: Nonflammable cardboard.

6. Mounting Frames: Welded, galvanized steel, with gaskets and fasteners, suitable for bolting together into built-up filter banks.

C. Filter Gage:

1. 2-inch- (50-mm-) diameter, diaphragm-actuated dial in metal case.

2. Vent valves.

3. Black figures on white background.

4. Front recalibration adjustment.

5. 2 percent of full-scale accuracy.

6. Range: 0- to 1.0-inch wg (0 to 250 Pa).

7. Accessories: Static-pressure tips with integral compression fittings, 1/4-inch (6-mm) aluminum tubing, and 2- or 3-way vent valves.

2.6 DAMPERS

A. General Requirements for Dampers: Leakage rate, according to AMCA 500, "Laboratory Methods for Testing Dampers for Rating," shall not exceed 2 percent of air quantity at 2000-fpm (10-m/s) face velocity through damper and 4-inch wg (1000-Pa) pressure differential.

B. Damper Operators: Comply with requirements in Section 23 09 00 – HVAC Instrumentation and Controls.

C. Outdoor- and Return-Air Mixing Dampers: Parallel-blade, aluminum dampers mechanically fastened to steel operating rod in reinforced cabinet. Connect operating rods with common linkage and interconnect linkages so dampers operate simultaneously.

D. Mixing Section: Multiple-blade, air-mixer assembly located immediately downstream of mixing section.

E. Combination Filter and Mixing Section:

1. Cabinet support members shall hold 2-inch- (50-mm-) thick, pleated, flat, permanent or throwaway filters.

2. Multiple-blade, air-mixer assembly shall mix air to prevent stratification, located immediately downstream of mixing box.

2.7 AIRFLOW MEASURING STATIONS

A. Airflow monitoring stations shall provide an electric signal that corresponds to airflow for controlling and documenting airflow. Stations shall be compatible with DDC control system. Refer to Section 23 09 00 – HVAC Instrumentation and Controls.

2.8 SOURCE QUALITY CONTROL

A. Fan Sound-Power Level Ratings: Comply with AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Test fans according to AMCA 300, "Reverberant

Room Method for Sound Testing of Fans." Fans shall bear AMCA-certified sound ratings seal.

B. Fan Performance Rating: Factory test fan performance for airflow, pressure, power, air density, rotation speed, and efficiency. Rate performance according to AMCA 210, "Laboratory Methods of Testing Fans for Aerodynamic Performance Rating."

C. Water Coils: Factory tested to 300 psig (2070 kPa) according to ARI 410 and ASHRAE 33.

PART 3 - EXECUTION

3.1 CONSTRUCTION

A. If permanently installed air handlers are used during construction, filtration media with a Minimum Efficiency Reporting Value (MERV) of 8 shall be used at each return air grille, as determined by ASHRAE 52.2-1999. Replace all filtration media immediately prior to occupancy.

3.2 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine casing insulation materials and filter media before air-handling unit installation. Reject insulation materials and filter media that are wet, moisture damaged, or mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION

A. Equipment Mounting: Install air-handling units on concrete bases. Secure units to anchor bolts installed in concrete bases.

1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of concrete base.

2. Install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.

3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

4. Install anchor bolts to elevations required for proper attachment to supported equipment.

B. Arrange installation of units to provide access space around air-handling units for service and maintenance.

C. Do not operate fan system until filters (temporary or permanent) are in place. Replace temporary filters used during construction and testing, with new, clean filters.

D. Install filter-gage, static-pressure taps upstream and downstream of filters. Mount filter gages on outside of filter housing or filter plenum in accessible position. Provide filter gages on filter banks, installed with separate static-pressure taps upstream and downstream of filters.

3.4 CONNECTIONS

A. Comply with requirements for piping specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to air-handling unit to allow service and maintenance.

C. Connect piping to air-handling units mounted on vibration isolators with flexible connectors.

D. Connect duct to air-handling units with flexible connections. Comply with requirements in Section 23 33 00 – Air Duct Accessories.

3.5 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

B. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

C. Tests and Inspections:

1. Leak Test: After installation, fill water and steam coils with water, and test coils and connections for leaks.

2. Charge refrigerant coils with refrigerant and test for leaks.

3. Fan Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.

4. Automatic-Roll-Filter Operational Test: Operate filters to demonstrate compliance with requirements. Test for leakage of unfiltered air while system is operating.

5. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Air-handling unit or components will be considered defective if unit or components do not pass tests and inspections.

E. Prepare test and inspection reports.

3.6 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.

2. Verify that shipping, blocking, and bracing are removed.

3. Verify that unit is secure on mountings and supporting devices and that connections to piping, ducts, and electrical systems are complete. Verify that proper thermal-overload protection is installed in motors, controllers, and switches.

4. Verify proper motor rotation direction, free fan wheel rotation, and smooth bearing operations. Reconnect fan drive system, align belts, and install belt guards.

5. Verify that bearings, pulleys, belts, and other moving parts are lubricated with factory-recommended lubricants.

6. Verify that zone dampers fully open and close for each zone.

7. Verify that face-and-bypass dampers provide full face flow.

8. Verify that outdoor- and return-air mixing dampers open and close, and maintain minimum outdoor-air setting.

9. Comb coil fins for parallel orientation.

10. Verify that proper thermal-overload protection is installed for electric coils.

11. Install new, clean filters.

12. Verify that manual and automatic volume control and fire and smoke dampers in connected duct systems are in fully open position.

B. Starting procedures for air-handling units include the following:

1. Energize motor; verify proper operation of motor, drive system, and fan wheel. Adjust fan to indicated rpm. Replace fan and motor pulleys as required to achieve design conditions.

2. Measure and record motor electrical values for voltage and amperage.

3. Manually operate dampers from fully closed to fully open position and record fan performance.

3.7 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Comply with requirements in Section 23 05 93 – Testing, Adjusting, and Balancing for HVAC, for air-handling system testing, adjusting, and balancing.

3.8 CLEANING

A. After completing system installation and testing, adjusting, and balancing air-handling unit and air-distribution systems and after completing startup service, clean air-handling units internally to remove foreign material and construction dirt and dust. Clean fan wheels, cabinets, dampers, coils, and filter housings, and install new, clean filters.

3.9 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain air-handling units.

B. Refer Division 01 for administrative and procedural requirements for demonstration and training

END OF SECTION 23 73 13

SECTION 23 73 14 - CONDENSING UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes air- cooled condensing units.

B. Related Requirements:
1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 SUBMITTALS

A. Product Data: For each condensing unit, include rated capacities, operating characteristics, furnished specialties, and accessories. Include equipment dimensions, weights and structural loads, required clearances, method of field assembly, components, and location and size of each field connection.

B. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

1. Liquid and vapor pipe sizes.

2. Refrigerant specialties.

3. Piping including connections, oil traps, and double risers.

4. Evaporators.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For condensing units to include in emergency, operation, and maintenance manuals.

E. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, and dimensional requirements of condensing units and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Fabricate and label refrigeration system according to ASHRAE 15, "Safety Code for Mechanical Refrigeration."

1. Units shall be designed to operate with HCFC-free refrigerants.

D. ASME Compliance: Fabricate and label water-cooled condensing units to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

1.5 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.

B. Coordinate location of piping and electrical rough-ins.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of condensing units that fail in materials or workmanship for not less than a period of two years.

1. Failures include, but are not limited to, the following:

a. Compressor failure.

b. Condenser coil leak.

1.7 MAINTENANCE SPARE PARTS

A. Spare parts: Manufacturer’s recommended quantity, but not less than 10% of all replacement parts, with a minimum quantity of one each.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 sections where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 CONDENSING UNITS, AIR COOLED

A. Manufacturers:

1. Aaon.

2. Carrier Corporation; Carrier Air Conditioning Div.

3. Continental Products.

4. Engineered Air.

5. Lennox Industries Inc.

6. McQuay International.

7. Rheem Manufacturing Air Conditioning Div.

8. Trane Co. (The); Worldwide Applied Systems Group.

9. York International Corp.

B. Description: Factory assembled and tested, air cooled; consisting of casing, compressors, condenser coils, condenser fans and motors, piping, wiring and unit controls in a weather proof cabinet.

C. Compressor: Two commercial duty sealed hermetic scroll type compressors, piped in separate refrigeration circuits, internal over current and over temperature protection, mounted on external rubber isolators, and crankcase heater.

D. Condenser Coil: Seamless copper-tube, aluminum-fin coil, including sub-cooling circuit, exterior service port connection. Factory pressure test coils, then dehydrate by drawing a vacuum and fill with a holding charge of nitrogen or refrigerant.

E. Refrigeration Circuit: Field installed sealed solid core filter-dryer in liquid line, and service valves in suction and liquid line.

F. Refrigerant: R 410A.

G. Condenser Fans: Propeller-type vertical discharge; direct driven. Include the following:

1. Totally enclosed, internally overload protected, permanently lubricated ball-bearing motors.

2. Separate motor for each fan.

3. Dynamically balanced, aluminum blade, fan assemblies.

H. Operating and safety controls include the following:

1. Manual-reset, high-pressure cutout switches.

2. Automatic-reset, low-pressure cutout switches.

3. Low oil pressure cutout switch.

4. Compressor-winding thermostat cutout switch.

5. Three-leg, compressor-overload protection.

6. Control transformer.

7. Magnetic contactors for compressor and condenser fan motors.

8. Timer to prevent excessive compressor cycling.

9. Loss of charge protection.

10. Evaporator defrost control.

I. Accessories:

1. Refrigeration distributer.

2. Thermal expansion valves.

3. Gage Panel: Package with refrigerant circuit suction and discharge gages.

4. Liquid line sight glass.

5. Coil guard on condenser coil.

6. Suction line accumulator for refrigerating lines exceeding 100 feet.

J. Unit Casings: Designed for outdoor installation with weather protection for components and controls and with removable panels for required access to compressors, controls, condenser fans, motors, and drives. Additional features include the following:

1. Steel, galvanized or zinc coated, for exposed casing surfaces; treated and finished with manufacturer's standard paint coating.

2. Perimeter base rail with forklift slots and lifting holes to facilitate rigging.

3. Gasketed control panel door.

4. Condenser coil grille to protect coil from physical damage.

2.3 MOTORS

A. General requirements for motors are specified in 23 05 13 Common Motor Requirements for HVAC

1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

2. Controllers, Electrical Devices, and Wiring: Electrical devices and connections are specified in Division 26 Sections.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of condensing units.

B. Examine roughing-in for refrigerant piping systems to verify actual locations of piping connections before equipment installation.

C. Examine walls, and exterior locations for suitable conditions where condensing units will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install units level and plumb, firmly anchored in locations indicated; maintain manufacturer's recommended clearances.

B. Vibration Isolation: Mount condensing units on rubber pads with a minimum deflection of 1/4 inch (6.35 mm). Vibration isolation devices and installation requirements are specified in Section 23 05 48 – Vibration and Seismic Controls for HVAC Piping and Equipment.

C. Maintain manufacturer's recommended clearances for service and maintenance.

D. Loose Components: Install electrical components, devices, and accessories that are not factory mounted.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to machine to allow service and maintenance.

C. Connect pre-charged refrigerant tubing to unit's quick-connect fittings. Install tubing so it does not interfere with access to unit. Install furnished accessories.

D. Connect refrigerant piping to air-cooled condensing units; maintain required access to unit. Install furnished field-mounted accessories. Refrigerant piping and specialties are specified in Section 23 23 00 – Refrigerant Piping.

E. Ground equipment according to Division 26 Section "Grounding and Bonding."

F. Connect wiring according to Division 26 Section "Conductors and Cables."

3.4 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. Perform electrical test and visual and mechanical inspection.

2. Leak Test: After installation, charge systems with refrigerant and oil and test for leaks. Repair leaks, replace lost refrigerant and oil, and retest until no leaks exist.

3. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation, product capability, and compliance with requirements.

4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

5. Verify proper airflow over coils.

B. Verify that vibration isolation and flexible connections properly dampen vibration transmission to structure.

C. Remove and replace malfunctioning condensing units and retest as specified above.

3.5 STARTUP SERVICE

A. Complete installation and startup checks according to manufacturer's written instructions and perform the following:

1. Inspect for physical damage to unit casing.

2. Verify that access doors move freely and are weather tight.

3. Clean units and inspect for construction debris.

4. Verify that all bolts and screws are tight.

5. Adjust vibration isolation and flexible connections.

6. Verify that controls are connected and operational.

B. Lubricate bearings on fans.

C. Verify that fan wheel is rotating in the correct direction and is not vibrating or binding.

D. Start unit according to manufacturer's written instructions and complete manufacturer's startup checklist.

E. Measure and record airflow over coils.

F. Verify proper operation of condenser capacity control device.

G. Verify that vibration isolation and flexible connections properly dampen vibration transmission to structure.

H. After startup and performance test, lubricate bearings.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain condensing units. 01 78 00 Closeout Submittals.

B. Refer Division 01 for administrative and procedural requirements for demonstration and training

END OF SECTION 23 73 14

SECTION 23 74 13 - PACKAGED, OUTDOOR, CENTRAL-STATION AIR-HANDLING UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes packaged, outdoor, central-station air-handling units (rooftop units) with the following components and accessories:

1. Direct-expansion cooling.
2. Hot-gas reheat.
3. Gas furnace.
4. Economizer outdoor- and return-air damper section.
5. Roof curbs.

B. Related Sections include the following:

1. Section 237333.16 "Indoor, Indirect, Gas-Fired Heating and Ventilating Units" for outdoor units providing 100 percent tempered outdoor air with heat exchangers.
2. Section 237339 "Indoor, Direct-Fired Heating and Ventilating Units" for outdoor units providing 100 percent tempered outdoor air without heat exchangers.
3. Section 237433 "Dedicated Outdoor-Air Units" for outdoor equipment air conditioning 100 percent outdoor air to replace air exhausted from a building.
4. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
5. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 DEFINITIONS

A. DDC: Direct-digital controls.

B. ECM: Electrically commutated motor.

C. Outdoor-Air Refrigerant Coil: Refrigerant coil in the outdoor-air stream to reject heat during cooling operations and to absorb heat during heating operations. "Outdoor air" is defined as the air outside the building or taken from outdoors and not previously circulated through the system.

D. Outdoor-Air Refrigerant-Coil Fan: The outdoor-air refrigerant-coil fan in RTUs. "Outdoor air" is defined as the air outside the building or taken from outdoors and not previously circulated through the system.

E. RTU: Rooftop unit. As used in this Section, this abbreviation means packaged, outdoor, central-station air-handling units. This abbreviation is used regardless of whether the unit is mounted on the roof or on a concrete base on ground.

F. Supply-Air Fan: The fan providing supply air to conditioned space. "Supply air" is defined as the air entering a space from air-conditioning, heating, or ventilating apparatus.

G. Supply-Air Refrigerant Coil: Refrigerant coil in the supply-air stream to absorb heat (provide cooling) during cooling operations and to reject heat (provide heating) during heating operations. "Supply air" is defined as the air entering a space from air-conditioning, heating, or ventilating apparatus.

H. VVT: Variable-air volume and temperature.

1.4 ACTION SUBMITTALS

A. Product Data: Include manufacturer's technical data for each RTU, including rated capacities, dimensions, required clearances, characteristics, furnished specialties, and accessories.

B. LEED Submittals:

1. Product Data for Credit EA 4: Documentation indicating that equipment and refrigerants comply.
2. Product Data for Prerequisite IEQ 1: Documentation indicating that units comply with ASHRAE 62.1, Section 5 - "Systems and Equipment."

C. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Wiring Diagrams: Power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Structural members to which RTUs will be attached.
2. Roof openings
3. Roof curbs and flashing.

B. Field quality-control test reports.

C. Warranty: Special warranty specified in this Section.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For RTUs to include in emergency, operation, and maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fan Belts: Two sets for each belt-driven fan.
2. Filters: Two sets of filters for each unit.

B. Other spare parts: Manufacturer's recommended quantity, but not less than 10% of all replacement parts, with a minimum quantity of one each.

1.8 QUALITY ASSURANCE

A. ARI Compliance:

1. Comply with ARI 203/110 and ARI 303/110 for testing and rating energy efficiencies for RTUs.
2. Comply with ARI 270 for testing and rating sound performance for RTUs.

B. ASHRAE Compliance:

1. Comply with ASHRAE 15 for refrigeration system safety.
2. Comply with ASHRAE 33 for methods of testing cooling and heating coils.
3. Comply with applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

C. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

D. NFPA Compliance: Comply with NFPA 90A and NFPA 90B.

E. UL Compliance: Comply with UL 1995.

F. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to replace components of RTUs that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Compressors: Not less than 10 years from date of Substantial Completion.
2. Warranty Period for Gas Furnace Heat Exchangers: Not less than 10 years from date of Substantial Completion.
3. Warranty Period for Solid-State Ignition Modules: Manufacturer's standard, but not less than three years from date of Substantial Completion.
4. Warranty Period for Control Boards: Manufacturer's standard, but not less than three years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. AAON
   2. Carrier Corporation
   3. Trane
   4. York

2.2 CASING

A. General Fabrication Requirements for Casings: Formed and reinforced double-wall insulated panels, fabricated to allow removal for access to internal parts and components, with joints between sections sealed.

B. Exterior Casing Material: Galvanized steel with factory-painted finish, with pitched roof panels and knockouts with grommet seals for electrical and piping connections and lifting lugs.

   1. Exterior Casing Thickness: 0.052 inch thick.

C. Inner Casing Fabrication Requirements:

   1. Inside Casing: Galvanized steel, 0.034 inch thick.

D. Casing Insulation and Adhesive: Comply with NFPA 90A or NFPA 90B.

   1. Materials: ASTM C 1071, Type I.
   2. Thickness: 1/2 inch.
   3. Liner materials shall have air-stream surface coated with an erosion- and temperature-resistant coating or faced with a plain or coated fibrous mat or fabric.
   4. Liner Adhesive: Comply with ASTM C 916, Type I.

E. Condensate Drain Pans: Formed sections of stainless-steel sheet, a minimum of 2 inches deep, and complying with ASHRAE 62.1.

   1. Double-Wall Construction: Fill space between walls with foam insulation and seal moisture tight.
   2. Drain Connections: Threaded nipple both sides of drain pan.
   3. Pan-Top Surface Coating: Corrosion-resistant compound.

F. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

2.3 FANS

A. Direct-Driven Supply-Air Fans: Double width, backward inclined, centrifugal; with permanently lubricated, ECM motor resiliently mounted in the fan inlet. Aluminum or painted-steel wheels, and galvanized- or painted-steel fan scrolls.

B. Belt-Driven Supply-Air Fans: Double width, forward curved, centrifugal; with permanently lubricated, single-speed motor installed on an adjustable fan base resiliently mounted in the casing. Aluminum or painted-steel wheels, and galvanized- or painted-steel fan scrolls.

C. Condenser-Coil Fan: Propeller, mounted on shaft of permanently lubricated motor.

D. Relief-Air Fan: Propeller, shaft mounted on permanently lubricated motor.

E. Fan Motor: Comply with requirements in Section 230513 "Common Motor Requirements for HVAC Equipment."

2.4 COILS

A. Supply-Air Refrigerant Coil:

1. Aluminum-plate fin and seamless copper tube in steel casing with equalizing-type vertical distributor.
2. Polymer strip shall prevent all copper coil from contacting steel coil frame or condensate pan.
3. Coil Split: Interlaced.
4. Condensate Drain Pan: Stainless steel]formed with pitch and drain connections complying with ASHRAE 62.1.

B. Outdoor-Air Refrigerant Coil:

1. Aluminum-plate fin and seamless internally grooved copper tube in steel casing with equalizing-type vertical distributor.
2. Polymer strip shall prevent all copper coil from contacting steel coil frame or condensate pan.

C. Hot-Gas Reheat Refrigerant Coil:

1. Aluminum-plate fin and seamless internally grooved copper tube in steel casing with equalizing-type vertical distributor.
2. Polymer strip shall prevent all copper coil from contacting steel coil frame or condensate pan.

2.5 REFRIGERANT CIRCUIT COMPONENTS

A. Number of Refrigerant Circuits: As indicated on drawings.

B. Compressor: Hermetic, scroll, mounted on vibration isolators; with internal overcurrent and high-temperature protection, internal pressure relief, and crankcase heater.

C. Refrigeration Specialties:

1. Refrigerant: R-410A.
2. Expansion valve with replaceable thermostatic element.
3. Refrigerant filter/dryer.
4. Manual-reset high-pressure safety switch.
5. Automatic-reset low-pressure safety switch.
6. Minimum off-time relay.
7. Automatic-reset compressor motor thermal overload.

8. Brass service valves installed in compressor suction and liquid lines.
9. Low-ambient kit high-pressure sensor.
10. Hot-gas reheat solenoid valve with a replaceable magnetic coil.
11. Hot-gas bypass solenoid valve with a replaceable magnetic coil.
12. Four-way reversing valve with a replaceable magnetic coil, thermostatic expansion valves with bypass check valves, and a suction line accumulator.

2.6 AIR FILTRATION

A. Minimum arrestance according to ASHRAE 52.1, and a minimum efficiency reporting value (MERV) according to ASHRAE 52.2.

1. Glass Fiber: Minimum 80 percent arrestance, and MERV 5.

2.7 GAS FURNACE

A. Description: Factory assembled, piped, and wired; complying with ANSI Z21.47 and NFPA 54.

1. CSA Approval: Designed and certified by and bearing label of CSA.

B. Burners: Stainless steel.

1. Fuel: Natural gas.
2. Ignition: Electronically controlled electric spark or hot-surface igniter with flame sensor.

C. Heat-Exchanger and Drain Pan: Stainless steel.

D. Power Vent: Integral, motorized centrifugal fan interlocked with gas valve with vertical extension.

E. Safety Controls:

1. Gas Control Valve: Modulating.
2. Gas Train: Single-body, regulated, redundant, 24-V ac gas valve assembly containing pilot solenoid valve, pilot filter, pressure regulator, pilot shutoff, and manual shutoff.

2.8 DAMPERS

A. Outdoor-Air Damper: Linked damper blades, for 0 to 100 percent outdoor air, with motorized damper filter.

B. Outdoor- and Return-Air Mixing Dampers: Parallel- or opposed-blade galvanized-steel dampers mechanically fastened to cadmium plated for galvanized-steel operating rod in reinforced cabinet. Connect operating rods with common linkage and interconnect linkages so dampers operate simultaneously.

1. Damper Motor: Modulating with adjustable minimum position.
2. Relief-Air Damper: Gravity actuated or motorized, as required by ASHRAE/IESNA 90.1, with bird screen and hood.

2.9 ELECTRICAL POWER CONNECTION

A. Provide for single connection of power to unit with unit-mounted disconnect switch accessible from outside unit and control-circuit transformer with built-in overcurrent protection.

2.10 CONTROLS

A. Control equipment are specified in Section 230923 "Direct Digital Control (DDC) System for HVAC" and sequence of operation are specified on drawings.

B. DDC Controller:

1. Controller shall have volatile-memory backup.
2. Safety Control Operation:

    a. Smoke Detectors: Stop fan and close outdoor-air damper if smoke is detected. Provide additional contacts for alarm interface to fire alarm control panel.
    b. Firestats: Stop fan and close outdoor-air damper if air greater than 130 deg F enters unit. Provide additional contacts for alarm interface to fire alarm control panel.
    c. Fire Alarm Control Panel Interface: Provide control interface to coordinate with operating sequence described in Section 283111 "Digital, Addressable Fire-Alarm System"
    d. Low-Discharge Temperature: Stop fan and close outdoor-air damper if supply air temperature is less than 40 deg F.
    e. Defrost Control for Condenser Coil: Pressure differential switch to initiate defrost sequence.

C. Interface Requirements for HVAC Instrumentation and Control System:

1. Interface relay for scheduled operation.
2. Interface relay to provide indication of fault at the central workstation and diagnostic code storage.
3. Provide BACnet or LonWorks compatible interface for central HVAC control workstation for the following:

    a. Adjusting set points.
    b. Monitoring supply fan start, stop, and operation.
    c. Inquiring data to include outdoor-air damper position, supply- and room-air temperature and humidity.
    d. Monitoring occupied and unoccupied operations.
    e. Monitoring constant and variable motor loads.
    f. Monitoring variable-frequency drive operation.
    g. Monitoring cooling load.
    h. Monitoring economizer cycles.
    i. Monitoring air-distribution static pressure and ventilation air volume.

2.11 ACCESSORIES

A. Electric heater with integral thermostat maintains minimum 50 deg F temperature in gas burner compartment.

B. Duplex, 115-V, ground-fault-interrupter outlet with 15-A overcurrent protection. Include transformer if required. Outlet shall be energized even if the unit main disconnect is open.

C. Low-ambient kit using staged condenser fans for operation down to 35 deg F.

D. Filter differential pressure switch with sensor tubing on either side of filter. Set for final filter pressure loss.

E. Coil guards of painted, galvanized-steel wire.

F. Hail guards of galvanized steel, painted to match casing.

G. Concentric diffuser with white louvers and polished aluminum return grilles, insulated diffuser box with mounting flanges, and interior transition.

2.12 ROOF CURBS

A. Materials: Galvanized steel with corrosion-protection coating, watertight gaskets, and factory-installed wood nailer; complying with NRCA standards.

1. Curb Insulation and Adhesive: Comply with NFPA 90A or NFPA 90B.

a. Materials: ASTM C 1071, Type I or II.
b. Thickness: 1 inch.

2. Application: Factory applied with adhesive and mechanical fasteners to the internal surface of curb.

a. Liner Adhesive: Comply with ASTM C 916, Type I.
b. Mechanical Fasteners: Galvanized steel, suitable for adhesive attachment, mechanical attachment, or welding attachment to duct without damaging liner when applied as recommended by manufacturer and without causing leakage in cabinet.
c. Liner materials applied in this location shall have air-stream surface coated with a temperature-resistant coating or faced with a plain or coated fibrous mat or fabric depending on service air velocity.
d. Liner Adhesive: Comply with ASTM C 916, Type I.

B. Curb Height: 14 inches.

2.13 CAPACITIES AND CHARACTERISTICS

A. Capacities and characteristics: As shown on drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of RTUs.

B. Examine roughing-in for RTUs to verify actual locations of piping and duct connections before equipment installation.

C. Examine roofs for suitable conditions where RTUs will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Roof Curb: Install on roof structure level and secure, according to NRCA's "Low-Slope Membrane Roofing Construction Details Manual," Illustration "Raised Curb Detail for Rooftop Air Handling Units and Ducts." Install RTUs on curbs and coordinate roof penetrations and flashing with roof construction specified in Section 077200 "Roof Accessories." Secure RTUs to upper curb rail, and secure curb base to roof framing or concrete base with anchor bolts.

3.3 CONNECTIONS

A. Install condensate drain, minimum connection size, with trap and indirect connection to nearest roof drain or area drain.

B. Install piping adjacent to RTUs to allow service and maintenance.

1. Gas Piping: Comply with applicable requirements in Section 231123 "Facility Natural-Gas Piping." Connect gas piping to burner, full size of gas train inlet, and connect with union and shutoff valve with sufficient clearance for burner removal and service.

C. Duct installation requirements are specified in other HVAC Sections. Drawings indicate the general arrangement of ducts. The following are specific connection requirements:

1. Install ducts to termination at top of roof curb.
2. Remove roof decking only as required for passage of ducts. Do not cut out decking under entire roof curb.
3. Connect supply ducts to RTUs with flexible duct connectors specified in Section 233300 "Air Duct Accessories."
4. Install return-air duct continuously through roof structure.
5. Install normal-weight, 3000-psi, compressive strength (28-day) concrete mix inside roof curb, 4 inches thick. Concrete, formwork, and reinforcement are specified with concrete.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing.

B. Perform tests and inspections and prepare test reports.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing. Report results in writing.

C. Tests and Inspections:

1. After installing RTUs and after electrical circuitry has been energized, test units for compliance with requirements.
2. Inspect for and remove shipping bolts, blocks, and tie-down straps.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Remove and replace malfunctioning units and retest as specified above.

3.5 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

B. Complete installation and startup checks according to manufacturer's written instructions and do the following:

1. Inspect for visible damage to unit casing.
2. Inspect for visible damage to furnace combustion chamber.
3. Inspect for visible damage to compressor, coils, and fans.
4. Inspect internal insulation.
5. Verify that labels are clearly visible.
6. Verify that clearances have been provided for servicing.
7. Verify that controls are connected and operable.
8. Verify that filters are installed.
9. Clean condenser coil and inspect for construction debris.
10. Clean furnace flue and inspect for construction debris.
11. Connect and purge gas line.
12. Remove packing from vibration isolators.
13. Inspect operation of barometric relief dampers.
14. Verify lubrication on fan and motor bearings.
15. Inspect fan-wheel rotation for movement in correct direction without vibration and binding.
16. Adjust fan belts to proper alignment and tension.
17. Start unit according to manufacturer's written instructions.

    a. Start refrigeration system.
    b. Do not operate below recommended low-ambient temperature.
    c. Complete startup sheets and attach copy with Contractor's startup report.

18. Inspect and record performance of interlocks and protective devices; verify sequences.
19. Operate unit for an initial period as recommended or required by manufacturer.
20. Perform the following operations for both minimum and maximum firing. Adjust burner for peak efficiency.

    a. Measure gas pressure on manifold.
    b. Inspect operation of power vents.
    c. Measure combustion-air temperature at inlet to combustion chamber.
    d. Measure flue-gas temperature at furnace discharge.
    e. Perform flue-gas analysis. Measure and record flue-gas carbon dioxide and oxygen concentration.
    f. Measure supply-air temperature and volume when burner is at maximum firing rate and when burner is off. Calculate useful heat to supply air.

21. Calibrate thermostats.

22. Adjust and inspect high-temperature limits.
23. Inspect outdoor-air dampers for proper stroke and interlock with return-air dampers.
24. Start refrigeration system and measure and record the following when ambient is a minimum of 15 deg F above return-air temperature:

    a. Coil leaving-air, dry- and wet-bulb temperatures.
    b. Coil entering-air, dry- and wet-bulb temperatures.
    c. Outdoor-air, dry-bulb temperature.
    d. Outdoor-air-coil, discharge-air, dry-bulb temperature.

25. Inspect controls for correct sequencing of heating, mixing dampers, refrigeration, and normal and emergency shutdown.
26. Measure and record the following minimum and maximum airflows. Plot fan volumes on fan curve.

    a. Supply-air volume.
    b. Return-air volume.
    c. Relief-air volume.
    d. Outdoor-air intake volume.

27. Simulate maximum cooling demand and inspect the following:

    a. Compressor refrigerant suction and hot-gas pressures.
    b. Short circuiting of air through condenser coil or from condenser fans to outdoor-air intake.

28. Verify operation of remote panel including pilot-light operation and failure modes. Inspect the following:

    a. High-temperature limit on gas-fired heat exchanger.
    b. Low-temperature safety operation.
    c. Filter high-pressure differential alarm.
    d. Economizer to minimum outdoor-air changeover.
    e. Relief-air fan operation.
    f. Smoke and firestat alarms.

29. After startup and performance testing and prior to Substantial Completion, replace existing filters with new filters.

3.6 CLEANING AND ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to site during other-than-normal occupancy hours for this purpose.

B. After completing system installation and testing, adjusting, and balancing RTU and air-distribution systems, clean filter housings and install new filters.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain RTUs.

B. Refer Division 01 for administrative and procedural requirements for demonstration and training

END OF SECTION 23 74 13

SECTION 23 74 23.16 - PACKAGED, INDIRECT-FIRED, OUTDOOR, HEATING-ONLY MAKEUP-AIR UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes indirect-fired makeup-air units.

B. Related Requirements:
1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 DEFINITIONS

A. DDC: Direct digital control.

1.4 ACTION SUBMITTALS

A. Product Data: For each type and configuration of outdoor, indirect-fired makeup-air unit.

1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. LEED Submittals:

1. Product Data for Prerequisite IEQ 1: Documentation indicating that units comply with ASHRAE 62.1, Section 5 - "Systems and Equipment."

C. Shop Drawings: For each type and configuration of outdoor, indirect-fired heating and ventilating unit.

1. Signed, sealed, and prepared by or under the supervision of a qualified professional engineer.
2. Include plans, elevations, sections, and mounting details.
3. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
4. Detail fabrication and assembly of gas-fired heating and ventilating units, as well as procedures and diagrams.
5. Include diagrams for power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Startup service reports.

B. Sample Warranty: For manufacturer's special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For indirect-fired makeup-air units to include in emergency, operation, and maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Filters: Two sets for each unit.
2. Fan Belts: Two sets for each unit.

B. Other spare parts: Manufacturer’s recommended quantity, but not less than 10% of all replacement parts, with a minimum quantity of one each.

1.8 QUALITY ASSURANCE

A. Comply with NFPA 70.

B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

C. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of indirect-fired heating and ventilating units that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Heat Exchangers: Manufacturer's standard, but not less than 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Captive Air Systems

2. Engineered Air

3. Greenheck Fan Corporation.

4. Or approved equal.

2.2 SYSTEM DESCRIPTION

A. Factory-assembled, prewired, self-contained unit consisting of cabinet, supply fan, controls, filters, and indirect-fired gas burner to be installed exterior to the building.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.3 UNIT CASINGS

A. General Fabrication Requirements for Casings:

1. Forming: Form walls, roofs, and floors with at least two breaks at each joint.
2. Casing Joints: Sheet metal screws or pop rivets, factory sealed with water-resistant sealant.
3. Factory Finish for Galvanized-Steel Casings: Apply manufacturer's standard primer immediately after cleaning and pretreating.
4. Air-Handling-Unit Mounting Frame: Formed galvanized-steel channel or structural channel supports, designed for low deflection, welded with integral lifting lugs.

5. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

B. Configuration: Horizontal unit with bottom discharge for roof-mounting installation.

C. Cabinet: Galvanized-steel panels, formed to ensure rigidity and supported by galvanized-steel channels or structural channel supports with lifting lugs. Duct flanges at inlet and outlet. Pitched roof panels and knockouts with grommet seals for electrical and piping connections and lifting lugs.

D. Inner Casing:

1. Burner Section Inner Casing: 0.0299-inch- thick steel.

2. Internal Insulation: Fibrous-glass duct lining, neoprene coated, comply with ASTM C 1071, Type II, applied on burner and fan sections only.

a. Thickness: 1 inch.
b. Insulation Adhesive: Comply with ASTM C 916, Type I.
c. Density: 1.5 lb/cu. ft..
d. Mechanical Fasteners: Galvanized steel suitable for adhesive, mechanical, or welding attachment to casing without damaging liner when applied as recommended by manufacturer and without causing air leakage.

E. Inspection and Access Panels and Access Doors:
1. Inspection and Access Panels:

a. Fasteners: Two or more camlock type for panel lift-out operation. Arrangement shall allow panels to be opened against air-pressure differential.
b. Gasket: Neoprene, applied around entire perimeters of panel frames.
c. Size: Large enough to allow inspection and maintenance of air-handling unit's internal components.

2. Locations and Applications:

a. Fan Section: Inspection and access panels.
b. Access Section: Doors.
c. Coil Section: Inspection and access panels.
d. Damper Section: Inspection and access panels.
e. Filter Section: Inspection and access panels large enough to allow periodic removal and installation of filters.
f. Mixing Section: Doors.

2.4 ACCESSORIES

A. Duplex, 115-V, ground-fault-interrupter outlet with 15-A overcurrent protection. Include transformer if required. Outlet shall be energized even if the unit main disconnect is open.

B. Filter differential pressure switch with sensor tubing on either side of filter. Set for final filter pressure loss.

C. Coil guards of painted, galvanized-steel wire.

D. Hail guards of galvanized steel, painted to match casing.

2.5 OUTDOOR-AIR INTAKE HOOD

A. Type: Manufacturer's standard hood or louver.

B. Materials: Match cabinet.

C. Bird Screen: Comply with requirements in ASHRAE 62.1.

D. Filter: Aluminum, 1 inch cleanable.

E. Configuration: Designed to inhibit wind-driven rain and snow from entering unit.

2.6 ROOF CURBS

A. Materials: Galvanized steel with corrosion-protection coating, watertight gaskets, and factory-installed wood nailer; complying with NRCA standards.

B. Curb Height: 14 inches.

2.7 SUPPLY-AIR FAN

A. Fan Type: Double width, double inlet, centrifugal, rated according to AMCA 210; statically and dynamically balanced, galvanized steel; mounted on solid-steel shaft with heavy-duty[, self-aligning, permanently lubricated ball bearings. Bearing rating: L10 of 100,000 hours.

B. Drive: V-belt drive with matching fan pulley and adjustable motor sheaves and belt assembly.

C. Mounting: Fan wheel, motor, and drives shall be mounted in fan casing with spring isolators.

D. Fan-Shaft Lubrication Lines: Extended to a location outside the casing.

2.8 AIR FILTERS

A. Comply with NFPA 90A.

B. Cleanable Filters: Cleanable metal mesh.

1. Thickness: 1 inch.

2.9 DAMPERS

A. Outdoor-Air Damper: Galvanized-steel, opposed-blade dampers with vinyl blade seals and stainless-steel jamb seals, having a maximum leakage of 10 cfm/sq. ft. of damper area, at a differential pressure of 2-inch wg.

B. Damper Operator: Direct coupled, electronic with spring return or fully modulating as required by the control sequence.

2.10 INDIRECT-FIRED GAS BURNER

A. Description: Factory assembled, piped, and wired; and complying with ANSI Z21.47, "Gas-Fired Central Furnaces," and with NFPA 54, "National Fuel Gas Code."

1. CSA Approval: Designed and certified by and bearing label of CSA.
2. Burners: Stainless steel.

a. Gas Control Valve: Modulating.
b. Fuel: Natural gas.
c. Minimum Combustion Efficiency: 80 percent.
d. Ignition: Electronically controlled electric spark with flame sensor.

B. Venting: Power vented, with integral, motorized centrifugal fan interlocked with gas valve.

C. Combustion-Air Intake: Separate combustion-air intake and vent terminal assembly.

D. Heat Exchanger: Stainless steel.

E. Safety Controls:

1. Vent Flow Verification: Differential pressure switch to verify open vent.
2. Control Transformer: 24-V ac.

3. High Limit: Thermal switch or fuse to stop burner.
4. Gas Train: Regulated, redundant, 24-V ac gas valve assembly containing pilot solenoid valve, electronic-modulating temperature control valve, pilot filter, pressure regulator, pilot shutoff, and manual shutoff all in one body.
5. Purge-period timer shall automatically delay burner ignition and bypass low-limit control.
6. Gas Manifold: Safety switches and controls complying with ANSI standards.
7. Airflow Proving Switch: Differential pressure switch senses correct airflow before energizing pilot.
8. Automatic-Reset, High-Limit Control Device: Stops burner and closes main gas valve if high-limit temperature is exceeded.
9. Safety Lockout Switch: Locks out ignition sequence if burner fails to light after three tries. Controls are reset manually by turning the unit off and on.

2.11 UNIT CONTROL PANEL

A. Factory-wired, fuse-protected control transformer, connection for power supply and field-wired unit to remote control panel.

B. Control Panel: Recessed, with trim ring, remote panel, with engraved plastic cover and the following lights and switches:

1. On-off fan switch.
2. Heat-vent-off switch.
3. Supply-fan operation indicating light.
4. Heating operation indicating light.
5. Thermostat.
6. Damper position potentiometer.
7. Dirty-filter indicating light operated by unit-mounted differential pressure switch.
8. Safety-lockout indicating light.
9. Enclosure: NEMA 250, Type 1.

2.12 CONTROLS

A. Comply with requirements in Section 230923 "Direct Digital Control (DDC) System for HVAC" for control equipment, and drawings for sequence of operation.

B. Fan Control: Interlock fan to start with exhaust fan to which this heating and ventilating unit is associated for makeup air.

1. Smoke detectors, located in supply air, shall stop fans when the presence of smoke is detected.

C. Outdoor-Air Damper Control, 100 Percent Outdoor-Air Units: Outdoor-air damper shall open when supply fan starts, and close when fan stops.

D. Temperature Control:

1. Operates gas valve to maintain discharge-air temperature with factory-mounted sensor in blower outlet.
2. Burner Control: 20 to 100 percent modulation of the firing rate.

E. Interface with DDC System for HVAC: Factory-installed hardware and software to enable the DDC system for HVAC to monitor, control, and display status and alarms of heating and ventilating unit.

1. Hardwired Points:
   a. Discharge-air temperature.
   b. Burner operating.

2.13 MOTORS

A. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."

1. Enclosure: Totally enclosed, air over.
2. Enclosure Materials: Cast iron.
3. Motor Bearings: Heavy Duty, permanently lubricated.

4. Efficiency: Premium efficient.

2.14 CAPACITIES AND CHARACTERISTICS

A. Capacity and characteristics:

1. As indicated on drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for piping, ducts, and electrical systems to verify actual locations of connections before equipment installation.

C. Verify cleanliness of airflow path to include inner-casing surfaces, filters, coils, turning vanes, fan wheels, and other components.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Unit Support: Install heating and ventilating unit level on supplied roof curbs. Coordinate all roof penetrations and flashing with roof construction.

B. Install gas-fired units according to NFPA 54, "National Fuel Gas Code."

C. Install controls and equipment shipped by manufacturer for field installation with indirect-fired heating and ventilating units.

D. Roof Curb: Install on roof structure, level and secure, according to NRCA's "Low-Slope Membrane Roofing Construction Details Manual," Illustration "Raised Curb Detail for Rooftop Air Handling Units and Ducts." Secure units to upper curb rail, and secure curb base to roof framing or concrete base with anchor bolts.

3.3 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

1. Gas Piping: Comply with requirements in Section 231123 "Facility Natural-Gas Piping." Connect gas piping with shutoff valve and union, and with sufficient clearance for burner removal and service. Make final connections of gas piping to unit with corrugated, stainless-steel tubing flexible connectors complying with ANSI LC 1/CSA 6.26 equipment connections.

B. Duct Connections: Connect supply ducts to indirect-fired heating and ventilating units with flexible duct connectors. Comply with requirements in Section 233300 "Air Duct Accessories" for flexible duct connectors.

C. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

B. Perform tests and inspections with the assistance of a factory-authorized service representative.

C. Units will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

3.5 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

B. Complete installation according to manufacturer's written instructions and perform the following:

1. Inspect for visible damage to burner combustion chamber.
2. Inspect casing insulation for integrity, moisture content, and adhesion.
3. Verify that clearances have been provided for servicing.
4. Verify that controls are connected and operable.
5. Verify that filters are installed.
6. Purge gas line.
7. Inspect and adjust vibration isolators.
8. Verify bearing lubrication.
9. Inspect fan-wheel rotation for movement in correct direction without vibration and binding.
10. Adjust fan belts to proper alignment and tension.

3.6 ADJUSTING

A. Adjust initial temperature set points.

B. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

C. Occupancy Adjustments: When requested within 24 months from date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain heating and ventilating units.

B. Refer Division 01 for administrative and procedural requirements for demonstration and training.

END OF SECTION 23 74 23.16

SECTION 23 74 33 - DEDICATED OUTDOOR-AIR UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes factory-packaged units capable of supplying up to 100 percent outdoor air and providing cooling and heating.

B. Related Sections include the following:
   1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
   2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include rated capacities, operating characteristics, and furnished specialties and accessories.

B. LEED Submittals:

   1. Product Data for Prerequisite EA 2: Documentation indicating that units comply with applicable requirements in ASHRAE/IESNA 90.1.
   2. Product Data for Prerequisite EA 3: Documentation indicating that refrigerants comply.
   3. Product Data for Credit EA 4: Documentation indicating that equipment and refrigerants comply.
   4. Product Data for Prerequisite IEQ 1: Documentation indicating that units comply with ASHRAE 62.1, Section 5 - "Systems and Equipment."
   5. Product Data for Credit IEQ 1: Documentation indicating that units are equipped with a direct outdoor airflow-measuring device capable of measuring the minimum outdoor airflow with accuracy within 15 percent of the design minimum airflow rate, as defined by ASHRAE 62.1.
   6. Product Data for Credit IEQ 4.1: For solvent cements and adhesive primers, documentation including printed statement of VOC content.
   7. Laboratory Test Reports for Credit IEQ 4: For solvent cements and adhesive primers, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
   8. Product Data for Credit IEQ 5: Documentation indicating that units include MERV 13 filters rated according to ASHRAE 52.2.

C. Shop Drawings:

1. Include plans, elevations, sections, and attachment details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Roof-curb mounting details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Size and location of unit-mounted rails and anchor points and methods for anchoring units to roof curb.
2. Required roof penetrations for ducts, pipes, and electrical raceways, including size and location of each penetration.

B. Startup service reports.

C. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For units to include in emergency, operation, and maintenance manuals.

1.6 MAINTENANCE SPARE PARTS

A. Belts: Two sets for each belt-driven unit.

B. Filters: Two sets for each unit.

C. Other spare parts: Manufacturer's recommended quantity, but not less than 10% of all replacement parts, with a minimum quantity of one each.

1.7 WARRANTY

A. Special Warranty: Manufacturer agrees to replace components of units that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Compressors: Five years from date of Substantial Completion.
2. Warranty Period for Heat Exchangers: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. AAON

2. Carrier Corporation
3. Trane
4. York

2.2 PERFORMANCE REQUIREMENTS

A. General Fabrication Requirements: Comply with requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment," and Section 7 - "Construction and System Start-up."

B. Cabinet Thermal Performance:

1. Maximum Overall U-Value: Comply with requirements in ASHRAE/IESNA 90.1.

C. Cabinet Surface Condensation:

1. Cabinet shall have additional insulation and vapor seals if required to prevent condensation on the interior and exterior of the cabinet.
2. Portions of cabinet located downstream from the cooling coil shall have a thermal break at each thermal bridge between the exterior and interior casing to prevent condensation from occurring on the interior and exterior surfaces. The thermal break shall not compromise the structural integrity of the cabinet.

D. Maximum Cabinet Leakage: 0.5 percent of the total supply-air flow at a pressure rating equal to the fan shut-off pressure.

E. Cabinet Deflection Performance:

1. Walls and roof deflection shall be within 1/200 of the span at the design working pressure equal to the fan shut-off pressure. Deflection limits shall be measured at any point on the surface.
2. Floor deflections shall be within 1/240 of the span considering the worst-case condition caused by the following:

a. Service personnel.
b. Internal components.
c. Design working pressure defined for the walls and roof.

F. Electrical components, devices, and accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

G. Capacities and Characteristics: As shown on drawings.

2.3 CABINET

A. Construction: Double wall.

B. Exterior Casing Material: Galvanized steel with paint finish.

C. Interior Casing Material: Galvanized.

D. Lifting and Handling Provisions: Factory-installed shipping skids and lifting lugs.

E. Base Rails: Galvanized -steel rails for mounting on roof curb or pad as indicated.

F. Access for Inspection, Cleaning, and Maintenance: Comply with requirements in ASHRAE 62.1.

1. Service Doors: Hinged access doors with gaskets. Material and construction of doors shall match material and construction of cabinet in which doors are installed.

G. Roof: Standing seam or membrane; sloped to drain water.

H. Floor: Reinforced, metal surface; reinforced to limit deflection when walked on by service personnel. Insulation shall be below metal walking surface.

I. Cabinet Insulation:

1. Type: Foam insulation.
2. Thickness: 1 inch.
3. Insulation Adhesive: Comply with ASTM C 916, Type I.
4. Mechanical Fasteners: Suitable for adhesive, mechanical, or welding attachment to casing without damaging liner and without causing air leakage when applied as recommended by manufacturer.

J. Condensate Drain Pans:

1. Shape: Rectangular, with 2 percent slope in at least two planes to direct water toward drain connection.
2. Size: Large enough to collect condensate from cooling coils including coil piping connections, coil headers, and return bends.
    a. Length: Extend drain pan downstream from leaving face to comply with ASHRAE 62.1.
    b. Depth: A minimum of 2 inches deep.
3. Configuration: Double wall, with space between walls filled with foam insulation and moisture-tight seal.
4. Material: Stainless-steel sheet.
5. Drain Connection:
    a. Located on both ends of pan, at lowest point of pan.
    b. Terminated with threaded nipple.
    c. Minimum Connection Size: NPS 1.
6. Units with stacked coils shall have an intermediate drain pan to collect condensate from top coil.

K. Surfaces in Contact with Airstream: Comply with requirements in ASHRAE 62.1 for resistance to mold and erosion.

L. Roof Curb: Full-perimeter curb of sheet metal, minimum 12 inches high, with wood nailer, neoprene sealing strip, and welded Z-bar flashing.

1. Comply with requirements in "The NRCA Roofing Manual."

2.4 SUPPLY FAN

A. Plenum Fan Type: Direct drive, single width, non-overloading, with backward-inclined or airfoil blades.

1. Fan Wheel Material: Aluminum; attached directly to motor shaft.
2. Fan Wheel Drive and Arrangement: Direct drive, AMCA Arrangement 4.
3. Fan panel and frame Material: Powder-coated steel, stainless steel, or aluminum.
4. Fan Enclosure: Easily removable enclosure around rotating parts.
5. Fan Balance: Precision balance fan below 0.08 inch/s at design speed with filter in.

B. Motors:

1. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
2. Enclosure: Totally enclosed.
3. Enclosure Materials: Cast iron.
4. Motor Bearings: Rated for 200,000 hours with external lubrication connections.

5. Efficiency: Premium efficient.
6. Service Factor: 1.15.
7. Speed Control: Variable Frequency Drive

C. Mounting: Fan wheel, motor, and drives shall be mounted to fan casing with elastomeric isolators.

2.5 RETURN/EXHAUST FAN

A. Plenum Fan Type: Direct drive, single width, non-overloading, with backward-inclined or airfoil blades.

1. Fan Wheel Material: Aluminum; attached directly to motor shaft.
2. Fan Wheel Drive and Arrangement: Direct drive, AMCA Arrangement 4.
3. Fan panel and frame Material: Powder-coated steel, stainless steel, or aluminum.
4. Fan Enclosure: Easily removable enclosure around rotating parts.
5. Fan Balance: Precision balance fan below 0.08 inch/s at design speed with filter in.

B. Motors:

1. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
2. Enclosure: Totally enclosed.
3. Enclosure Materials: Cast iron .
4. Motor Bearings: Rated for 200,000 hours with external lubrication connections.

5. Efficiency: Premium efficient.
6. Service Factor: 1.15.
7. Speed Control: Variable Frequency Drive

C. Mounting: Fan wheel, motor, and drives shall be mounted to fan casing with elastomeric isolators.

2.6 COOLING COILS

A. Capacity Ratings: Comply with ASHRAE 33 and ARI 410 and coil bearing the ARI label.

B. Coil Casing Material: Galvanized steel.

C. Tube Material: Copper.

D. Tube Header Material: Copper.

E. Fin Material: Aluminum.

F. Fin and Tube Joints: Mechanical bond.

G. Leak Test: Coils shall be leak tested with air underwater.

H. Refrigerant Coil Capacity Reduction: Circuit coils for face control.

I. Refrigerant Coil Suction and Distributor Header Materials: Seamless copper tube with brazed joints.

J. Coating: Phenolic epoxy corrosion-protection coating after assembly.

2.7 REFRIGERATION SYSTEM

A. Comply with requirements in ASHRAE 15, "Safety Standard for Refrigeration Systems."

B. Refrigerant Charge: Factory charged with refrigerant and filled with oil.

C. Compressors: Variable capacity Scroll compressors with integral vibration isolators, internal overcurrent and overtemperature protection, internal pressure relief, and crankcase heater.

D. Refrigerant: R-410A.

1. Classified as Safety Group A1 according to ASHRAE 34.
2. Provide unit with operating charge of refrigerant.

E. Refrigeration System Specialties:

1. Expansion valve with replaceable thermostatic element.
2. Refrigerant dryer.
3. High-pressure switch.
4. Low-pressure switch.
5. Thermostat for coil freeze-up protection during low ambient temperature operation or loss of air.
6. Brass service valves installed in discharge and liquid lines.

F. Refrigerant condenser coils:

1. Capacity Ratings: Complying with ASHRAE 33 and ARI 410 and coil bearing the ARI label.
2. Tube Material: Copper.
3. Fin Material: Aluminum.

4. Fin and Tube Joint: Mechanical bond.
5. Leak Test: Coils shall be leak tested with air underwater.
6. Coating: Phenolic epoxy corrosion-protection coating after assembly.

G. Condenser Fan Assembly:

1. Fans: Direct-drive propeller type with statically and dynamically balanced fan blades.
2. Fan Motors:

   a. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
   b. Motor Enclosure: Totally enclosed non-ventilating (TENV) or totally enclosed air over (TEAO) enclosure.
   c. Enclosure Materials: Cast iron .
   d. Motor Bearings: Permanently lubricated bearings.
   e. Built-in overcurrent and thermal-overload protection.
   f. Efficiency: Premium efficient.
   g. Service Factor: 1.15.
   h. Speed control: Variable frequency drive.

3. Fan Safety Guards: Steel with corrosion-resistant coating.

H. Safety Controls:

1. Compressor motor and condenser coil fan motor low ambient lockout.
2. Overcurrent protection for compressor motor.

2.8 INDIRECT-FIRED GAS FURNACE HEATING

A. Furnace Assembly:

1. Factory assembled, piped, and wired.
2. Comply with requirements in NFPA 54, "National Fuel Gas Code," and ANSI Z21.47, "Gas-Fired Central Furnaces."
3. AGA Approval: Designed and certified by and bearing label of AGA.

B. Burners:

1. Heat-Exchanger Material: Aluminum with a minimum thermal efficiency of 80 percent.
2. Fuel: Natural gas.
3. Ignition: Electronically controlled electric spark with flame sensor.

C. Heat-Exchanger Drain Pan Material: Stainless steel.

D. Venting: Power vent with integral, motorized centrifugal fan interlocked with gas valve.

E. Safety Controls:

1. Gas Control Valve: Multi-Staging.
2. Gas Train: Single-body, regulated, redundant, 24-V ac gas valve assembly containing pilot solenoid valve, pilot filter, pressure regulator, pilot shutoff, and manual shutoff.

2.9 OUTDOOR-AIR INTAKE HOOD

A. Type: Manufacturer's standard hood or louver.

B. Materials: Match cabinet.

C. Bird Screen: Comply with requirements in ASHRAE 62.1.

D. Configuration: Designed to inhibit wind-driven rain and snow from entering unit.

2.10 FILTERS

A. Pre Filters: 2-inch- thick, fiberglass, pleated, throw away with ASHRAE 30% efficiency.

B. Extended-Surface, Disposable Panel Filters:

1. Comply with NFPA 90A.
2. Factory-fabricated, dry, extended-surface type.
3. Thickness: 4 inches.
4. Minimum Arrestance: 85, according to ASHRAE 52.1.
5. Minimum Merv: 13, according to ASHRAE 52.2.
6. Media: Fibrous material formed into deep-V-shaped pleats with antimicrobial agent
7. and held by self-supporting wire grid.

C. Mounting Frames:

1. Panel filters arranged for flat or angular orientation, with access doors on both sides of unit. Filters shall be removable from one side or from access plenum.
2. Extended surface filters arranged for flat orientation, removable from access plenum.
3. Galvanized or stainless steel with gaskets and fasteners, suitable for bolting together into built-up filter banks with space for prefilter.

2.11 ENERGY RECOVERY WHEEL

A. Frame: Rigid metal frame containing wheel drive motor, drive belt, wheel seals and bearings.

B. Energy wheel: Total energy heat wheel constructed of light weight polymer with permanent bonded desiccant coating.

C. Motor Bearings: Ball bearings with external lubrication connections.

2.12 ELECTRICAL POWER CONNECTIONS

A. General Electrical Power Connection Requirements: Factory-installed and -wired switches, motor controllers, transformers, and other necessary electrical devices shall provide a single-point field power connection to unit.

B. Enclosure: NEMA 250, mounted in unit with hinged access door in unit cabinet having a lock and key or padlock and key,

C. Wiring: Numbered and color-coded to match wiring diagram.

D. Wiring Location: Install factory wiring outside an enclosure in a raceway.

E. Power Interface: Field power interface shall be to NEMA KS 1, heavy-duty, nonfused disconnect switch.

F. Factory Wiring: Branch power circuit to each motor and to controls with one of the following disconnecting means:

1. NEMA KS 1, heavy-duty, fusible switch with rejection-type fuse clips rated for fuses. Select and size fuses to provide Type 2 protection according to IEC 60947-4-1.
2. NEMA KS 1, heavy-duty, nonfusible switch.
3. UL 489, motor-circuit protector (circuit breaker) with field-adjustable, short-circuit trip coordinated with motor locked-rotor amperes.

G. Factory-Mounted, Overcurrent-Protection Service: For each motor.

H. Transformer: Factory mounted with primary and secondary fuses and sized with enough capacity to operate electrical load plus spare capacity.

I. Controls: Factory wire unit-mounted controls where indicated.

J. Lights: Factory wire unit-mounted lights.

K. Receptacle: Factory wire unit-mounted, ground fault interrupt (GFI) duplex receptacle.

L. Control Relays: Auxiliary and adjustable time-delay relays.

2.13 CONTROLS

A. Control equipment are specified in Section 230923 "Direct Digital Control (DDC) System for HVAC" and sequence of operation are shown on drawings.

B. Control Wiring: Factory wire connection for controls' power supply.

C. Control Devices: Sensors, transmitters, relays, switches, detectors, operators, actuators, and valves shall be manufacturer's standard items to accomplish indicated control functions.

D. Control Dampers:

1. Damper Location: Factory installed inside unit for ease of blade axle and bushing service. Arrange dampers located in a mixing box to achieve convergent airflow to minimize stratification.
2. Damper Leakage: Comply with requirements in AMCA 500-D. Leakage shall not exceed 6.5 cfm per sq. ft. at a static-pressure differential of 4.0 inches water column when a torque of 5 inch pounds per sq. ft is applied to the damper jackshaft.
3. Damper Rating: Rated for close-off pressure equal to the fan shutoff pressure.
4. Damper Label: Bear the AMCA seal for both air leakage and performance.
5. Blade Configuration: Unless otherwise indicated, use parallel blade configuration for two-position control and equipment isolation service and use modulating control when mixing two airstreams. For other applications, use an opposed-blade configuration.
6. Damper Frame Material: Extruded aluminum.
7. Blade Type: Single-thickness metal reinforced with multiple V-grooves.
8. Blade Material: Extruded aluminum.

9. Maximum Blade Width: 6 inches.
10. Maximum Blade Length: 48 inches.
11. Blade Seals: Replaceable, continuous perimeter vinyl seals and jambs with stainless-steel compression-type seals.
12. Bearings: Thrust bearings for vertical blade axles.
13. Airflow Measurement:

    a. Monitoring System: Complete and functioning system of airflow monitoring as an integral part of the damper assembly where indicated.
    b. Remote Monitoring Signal: 0-10 volt or 4-20 mA scaled signal.
    c. Accuracy of flow measurement: Within 5 percent of the actual flow rate between the range of the scheduled minimum and maximum airflow. For units with a large range between minimum and maximum airflow, configure the damper sections and flow measurement assembly as necessary to comply with accuracy.
    d. Straightening Device: Integral to the flow measurement assembly if required to achieve the specified accuracy as installed.
    e. flow measuring device: Suitable for operation in untreated and unfiltered outdoor air. If necessary, include temperature and altitude compensation and correction to maintain the accuracy.

E. Damper Operators:

1. Factory-installed electric operator for each damper assembly with one operator for each damper assembly mounted to the damper frame.
2. Operator capable of shutoff against fan pressure and able to operate the damper with sufficient reserve power to achieve smooth modulating action and proper speed of response at the velocity and pressure conditions to which the damper is subjected.
3. Maximum Operating Time: Open or close damper 90 degrees in 60 seconds.
4. Adjustable Stops: For both maximum and minimum positions.
5. Position Indicator and Graduated Scale: Factory installed on each actuator with words "OPEN" and "CLOSED," or similar identification, at travel limits.
6. Spring-return operator to fail-safe; either closed or open as required by application.
7. Operator Type: Direct coupled, designed for minimum 60,000 full-stroke cycles at rated torque.
8. Position feedback Signal: For remote monitoring of damper position.
9. Coupling: V-bolt and V-shaped, toothed cradle.
10. Circuitry: Electronic overload or digital rotation-sensing circuitry.

F. Refrigeration System Controls:

1. Unit-mounted enthalpy controller shall lock out refrigerant system when outdoor-air enthalpy is less than 28 Btu/lb of dry air or outdoor-air temperature is less than 55 deg F .
2. Outdoor-air sensor de-energizes dehumidifier operation when outdoor-air temperature is less than 55 deg F.
3. Relative-humidity sensor energizes dehumidifier operation when relative humidity is more than 50 percent.

G. Furnace Controls:
1. Staged Burner Control: Four steps of control.
2. Electronic Burner Control: 20 to 100 percent modulation of the firing rate; 10 to 100 percent with dual-furnace units.

H. Damper Controls: Space pressure sensor modulates outdoor- and return-air dampers to maintain a positive pressure in space at a minimum of 0.05 inch wg with respect to outdoor reference.

I. Integral Smoke Alarm: Smoke detector installed in supply and return air.

J. DDC Temperature Control: Standalone control module for link between unit controls and DDC temperature-control system. Control module shall be compatible with control system specified in Section 230923 "Direct Digital Control (DDC) System for HVAC." Links shall include the following:

1. Start/stop interface relay, and relay to notify DDC temperature-control system alarm condition.
2. Hardware interface or additional sensors for the following:

a. Room temperature.
b. Discharge-air temperature.
c. Refrigeration system operating.
d. Furnace operating.
e. Constant and variable motor loads.
f. Variable-frequency-controller operation.
g. Cooling load.
h. Economizer cycles.
i. Air-distribution static pressure and ventilation-air volumes.

K. Interface with DDC System for HVAC: Factory-installed hardware and software to enable the DDC system for HVAC to monitor, control, and display unit status and alarms.

1. Hardwired Points: As indicated on drawings.

2. ASHRAE 135 (BACnet or other Industry-accepted, open-protocol communication interface with the DDC system for HVAC shall enable the DDC system for HVAC operator to remotely control and monitor the unit from an operator workstation. Control features and monitoring points displayed locally at unit control panel shall be available through the DDC system for HVAC.

2.14 ACCESSORIES

A. Service Lights and Switch: Factory installed in fan and coil sections with weatherproof cover. Factory wire lights to a single-point field connection.

B. Duplex Receptacle: Factory mounted in unit supply-fan section and refrigeration section, with 20 amp 120 V GFI duplex receptacle and weatherproof cover.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for piping, ducts, and electrical systems to verify actual locations of connections before equipment installation.

C. Examine roof curbs and equipment supports for suitable conditions where units will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's rigging and installation instructions for unloading units and moving to final locations.

B. Curb Support: Install roof curb on roof structure according to "The NRCA Roofing Manual."

1. Install and secure units on curbs and coordinate roof penetrations and flashing with roof construction.
2. Coordinate size, installation, and structural capacity of roof curbs, equipment supports, and roof penetrations. These items are specified in Section 077200 "Roof Accessories."
3. Coordinate size, location, and installation of unit manufacturer's roof curbs and equipment supports with roof Installer.

C. Restrained Curb Support: Install restrained vibration isolation roof-curb rails on roof structure according to "The NRCA Roofing Manual."

D. Install 3000-psi, compressive-strength (28-day) concrete base inside roof curb, 4 inches thick. Concrete and reinforcement are specified with concrete.

E. Comply with requirements for gas-fired furnace installation in NFPA 54, "National Fuel Gas Code."

F. Install separate devices furnished by manufacturer and not factory installed.

G. Install new filters at completion of equipment installation and before testing, adjusting, and balancing.

H. Install drain pipes from unit drain pans to sanitary drain.

1. Drain Piping: Drawn-temper copper water tubing complying with ASTM B 88, Type L, with soldered joints.

2. Pipe Size: Same size as condensate drain pan connection.

3.3 CONNECTIONS

A. Where installing piping adjacent to units, allow space for service and maintenance.

B. Gas Piping Connections:

1. Comply with requirements in Section 231123 "Facility Natural-Gas Piping."
2. Connect gas piping to furnace, full size of gas train inlet, and connect with union, pressure regulator, and shutoff valve with sufficient clearance for burner removal and service.

3. Install AGA-approved flexible connectors.

C. Duct Connections:

1. Comply with requirements in Section 233113 "Metal Ducts."
2. Drawings indicate the general arrangement of ducts.
3. Connect ducts to units with flexible duct connectors. Comply with requirements for flexible duct connectors in Section 233300 "Air Duct Accessories."

D. Electrical Connections: Comply with requirements for power wiring, switches, and motor controls in electrical Sections.

1. Install electrical devices furnished by unit manufacturer but not factory mounted.

3.4 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. Inspect units for visible damage to furnace combustion chamber.
3. Perform the following operations for both minimum and maximum firing and adjust burner for peak efficiency:

    a. Measure gas pressure at manifold.
    b. Measure combustion-air temperature at inlet to combustion chamber.
    c. Measure flue-gas temperature at furnace discharge.
    d. Perform flue-gas analysis. Measure and record flue-gas carbon dioxide and oxygen concentration.
    e. Measure supply-air temperature and volume when burner is at maximum firing rate and when burner is off. Calculate useful heat to supply air.

4. Verify operation of remote panel including pilot-light operation and failure modes. Inspect the following:

    a. High-limit heat exchanger.
    b. Alarms.

5. Inspect units for visible damage to refrigerant compressor, condenser and evaporator coils, and fans.
6. Start refrigeration system when outdoor-air temperature is within normal operating limits and measure and record the following:

    a. Cooling coil leaving-air, dry- and wet-bulb temperatures.
    b. Cooling coil entering-air, dry- and wet-bulb temperatures.
    c. Condenser coil entering-air dry-bulb temperature.
    d. Condenser coil leaving-air dry-bulb temperature.

7. Simulate maximum cooling demand and inspect the following:

    a. Compressor refrigerant suction and hot-gas pressures.
    b. Short-circuiting of air through outside coil or from outside coil to outdoor-air intake.

8. Inspect casing insulation for integrity, moisture content, and adhesion.

9. Verify that clearances have been provided for servicing.
10. Verify that controls are connected and operable.
11. Verify that filters are installed.
12. Clean coils and inspect for construction debris.
13. Clean furnace flue and inspect for construction debris.
14. Inspect operation of power vents.
15. Purge gas line.
16. Inspect and adjust vibration isolators and seismic restraints.
17. Verify bearing lubrication.
18. Clean fans and inspect fan-wheel rotation for movement in correct direction without vibration and binding.
19. Adjust fan belts to proper alignment and tension.
20. Start unit.
21. Inspect and record performance of interlocks and protective devices including response to smoke detectors by fan controls and fire alarm.
22. Operate unit for run-in period.
23. Calibrate controls.
24. Adjust and inspect high-temperature limits.
25. Inspect outdoor-air dampers for proper stroke and interlock with return-air dampers.
26. Verify operational sequence of controls.
27. Measure and record the following airflows. Plot fan volumes on fan curve.

    a. Supply-air volume.
    b. Return-air flow.
    c. Outdoor-air flow.

B. After startup, change filters, verify bearing lubrication, and adjust belt tension.

C. Remove and replace components that do not properly operate and repeat startup procedures as specified above.

D. Prepare written report of the results of startup services.

3.5 ADJUSTING

A. Adjust initial temperature and humidity set points.

B. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

C. Occupancy Adjustments: When requested within12 months from date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units.

B. Refer Division 01 for administrative and procedural requirements for demonstration and training

END OF SECTION 23 74 33

SECTION 23 81 26 - SPLIT-SYSTEM AIR-CONDITIONERS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes

1. Split-system air-conditioning units consisting of separate evaporator-fan and compressor-condenser components. Units are designed for exposed mounting.

2. Split-system air-conditioning units consisting of inbuilt evaporator-fan, compressor, separate condenser components. Indoor units are vertical discharge designed for floor mounting and remote condensers for high sensible loads.

B. Related Requirements:
1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 SUBMITTALS

A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For split-system air-conditioning units to include in emergency, operation, and maintenance manuals.

E. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, and dimensional requirements of split-system units and are based on the specific system indicated. Refer to Part 2 – Products.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2004, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

D. ASHRAE/IESNA 90.1-2004 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004, Section 6 - "Heating, Ventilating, and Air-Conditioning."

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of split-system air-conditioning units that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Three years from date of Substantial Completion.

1.6 MAINTENANCE SPARE PARTS

A. Filters: Two sets for each unit.

B. Other spare parts: Manufacturer’s recommended quantity, but not less than 10% of all replacement parts, with a minimum quantity of one each.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Carrier Air Conditioning; Div. of Carrier Corporation.
2. Lennox Industries Inc.
3. Mitsubishi Electric Sales Canada, Inc.
4. Mitsubishi Electronics America, Inc.; HVAC Division.
5. Data Aire Inc.
6. Sanyo Fisher (U.S.A.) Corp..
7. Trane Company (The); Unitary Products Group.
8. York International Corp.
9. Dectron Inc.

2.2 WALL/CEILING-MOUNT UNITS

A. Evaporator Cabinet: Enameled steel with removable panels on front and ends in color selected by City/ Engineer, and discharge drain pans with drain connection.

1. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.

2. Drain Pan and Drain Connection: Comply with ASHRAE 62.1-2004.

B. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with thermal-expansion valve.

C. Fan: Direct drive, centrifugal fan.

D. Fan Motors: Comply with requirements in Section 23 05 13 – Common Motor Requirements for HVAC Equipment.

1. Special Motor Features: Multitapped, multispeed with internal thermal protection and permanent lubrication.

E. Filters: Permanent, cleanable.

F. Electrical: Single point electrical connection with controls and disconnect.

G. Refrigerant charge: R-410A

H. Remote Air Cooled Condensing unit components

1. Compressor Casing: Steel, finished with baked enamel in color selected by City/ Engineer, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.

2. Compressor: Scroll, Hermetically sealed with crankcase heater and mounted on vibration isolation. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.

3. Two-speed compressor motor with manual-reset high-pressure switch and automatic-reset low-pressure switch.

4. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with liquid subcooler.

5. Fan: Aluminum-propeller type, directly connected to motor.

6. Motor: Permanently lubricated, with integral thermal-overload protection.

7. Low Ambient Kit: Permits operation down to 45 deg F (7 deg C).

8. Mounting Base: Polyethylene.

I. Minimum Energy Efficiency: Comply with ASHRAE/IESNA 90.1-2004, "Energy Standard for Buildings except Low-Rise Residential Buildings."

J. Accessories

1. Control equipment and sequence of operation are specified in Section 23 09 00 – HVAC Instrumentation and Control and sequence of operations for HVAC Controls.

2. Thermostat: Wireless infrared functioning to remotely control compressor and evaporator fan, with the following features:

3. Compressor time delay.

4. 24-hour time control of system stop and start.

5. Liquid-crystal display indicating temperature, set-point temperature, time setting, operating mode, and fan speed.

6. Fan-speed selection, including auto setting.

7. Automatic-reset timer to prevent rapid cycling of compressor.

K. Refrigerant Line Kits: Soft-annealed copper suction and liquid lines factory cleaned, dried, pressurized, and sealed; factory-insulated suction line with flared fittings at both ends.

1. Minimum Insulation Thickness: 1 inch.

2.3 FLOOR MOUNT SPLIT SYSTEM UNITS

A. Casing: 14 gauge welded tubular steel frame coated with corrosion inhibiting. Internal steel fans coated for protection against corrosion. Front and side insulated access steel doors with one inch (1"), 1-1/2 pound density fiberglass insulation coated with neoprene. Each door shall be provided with heavy duty hinges and sure close latches. The doors shall be painted to match or contrast with other equipment in the space. Bypass air shall be provided around the cooling and, stainless steel drain pan and drain connection to comply with ASHRAE 62.1-2004.

B. Supply Fan section: The fan section shall be belt driven, centrifugal type, double width, double inlet and shall be statically and dynamically balanced at the factory as a complete assembly. The fan wheel shall be supported on a heavy steel shaft having self-aligning ball bearings with a minimum life span of 100,000 hours driven by a motor mounted on an adjustable slide base. The drive package shall be belt driven with variable pitch sheave sized for 200% of the fan motor horsepower. The fan shall be located to draw air over the coil for maximum coil performance.

C. Air Filters: The filter chamber shall be an integral part of the system, designed within the frame and cabinet. The filter shall be two-inch (2") deep pleated design, rated not less than 30 percent efficient (based on ASHRAE Std. 52.1-1992).

D. Refrigeration system: The refrigeration system shall be split type with an indoor evaporator section and remote outdoor condenser. The indoor evaporator section shall include the cooling coil, compressor, humidifier, reheat, filter and controls. The cooling coil shall constructed with 1/2" O.D. copper tube with 12 fins per inch of corrugated aluminum with a maximum face velocity of 500 feet per minute. The expansion valve shall be of the adjustable thermostatic type with external equalization. The compressor shall be hermetic scroll type, with complete overload protection on all three power lines, internal thermostat for winding protection, anti-slug device, crankcase heater, sight-glass, and low pressure override timer for positive starting at low temperatures. The filter drier shall be of the flare fitting type for non-torch servicing. The circuit shall contain high and low pressure switches safety switches.

E. Control Panel: Microprocessor based panel including unit switching functions and 2 row, 80 character LCD display of normal functions, malfunctions, and service diagnostics. The panel shall allow recall and display of the high and low temperature for the last 24 hours, high and low humidity for the last 24 hours, current percent of capacity and average percent of capacity for the last hour of operation for cool 1, reheat, humidification, and dehumidification, component runtimes for fan motor, reheat, humidification, and dehumidification. Multilevel

password access programming accomplished entirely from the front of the unit. Battery back up to maintain historical data base. Automatic display of multiple messages. The control shall include temperature anticipation, moisture level humidity control and automatic coil flush cycles. Display, and annunciation of an audible alarm. Summary of remote alarms. Continuous display of alarm condition until the malfunction is corrected. Sequential display of multiple alarms in order of occurrence, with unacknowledged audible alarms continuing to sound. Automatic system start up self-test. User accessible diagnostic trouble shooting program displaying name of controlled item, output relay number, terminal plug and pin number for each controlled item on LCD screen.

F. Electric Reheat: The reheat shall be of the finned enclosed, sheath type, fabricated of stainless steel core sheath with plated fins to withstand moist conditions. The reheat shall be installed on the air discharge side of the cooling coil and shall have 3 stages.

G. Remote Air Cooled Condenser: As per Section 23 63 13 – Air Cooled Refrigerant Condensers. Air cooled condenser shall match indoor unit performance, and supplied by same manufacturer as the indoor unit and operating as one system complying with the sequence of operation.

H. Power Connection: Single point connection with non automatic disconnect switch.

2.4 MOTORS

A. Comply with requirements in Section 23 05 13 – Common Motor Requirements for HVAC.

2.5 SOURCE QUALITY CONTROL

A. Verification of Performance: According to ETL or CSA Certified.

PART 3- EXECUTION

3.1 INSTALLATION

A. Install units level and plumb.

B. Install floor mounted unit level and plumb on spring isolators on 4” concrete pad.

C. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.

D. Install floor-mounting, remote condensing unit/ condenser on 4-inch- thick, reinforced concrete base; 4 inches larger on each side than unit. Concrete, reinforcement, and formwork are specified in Division 03 Section "Cast-in-Place Concrete." Coordinate anchor installation with concrete base.

E. Install floor-mounting, compressor-condenser components on polyethylene mounting base.

F. Install compressor-condenser components on restrained, spring isolators.

G. Install and connect pre-charged refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit.

3.2 CONNECTIONS

A. Install piping adjacent to unit to allow service and maintenance.

B. Ground equipment according to Division 26 Section “Grounding and Bonding for Electrical Systems.”

C. Electrical Connections: Comply with requirements in Division 26 Sections for power wiring, switches, and motor controls.

3.3 FIELD QUALITY CONTROL

A. Manufacturer’s Field Service: Engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including connections. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.

2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.

3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Remove and replace malfunctioning units and retest as specified above.

3.4 CONNECTIONS

A. Install condensate drain, minimum connection size, with trap and indirect connection to nearest roof drain or area drain.

B. Duct installation requirements are specified in other Division 23 Sections. Drawings indicate the general arrangement of ducts. The following are specific connection requirements:

1. Connect supply and return ducts with flexible duct connectors specified in Section 23 33 00 – Air Duct Accessories.

3.5 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing.

B. Perform tests and inspections and prepare test reports.

C. Tests and Inspections:

1. After installing unit and after electrical circuitry has been energized, test units for compliance with requirements.

2. Inspect for and remove shipping bolts, blocks, and tie-down straps.

3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.

4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Remove and replace malfunctioning units and retest as specified above.

3.6 START-UP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

B. Complete installation and startup checks according to manufacturer's written instructions and do the following:

1. Inspect for visible damage to unit casing.
2. Inspect for visible damage to compressor, coils, and fans.
3. Inspect internal insulation.
4. Verify that labels are clearly visible.
5. Verify that clearances have been provided for servicing.
6. Verify that controls are connected and operable.
7. Verify that filters are installed.
8. Clean condenser coil and inspect for construction debris.
9. Remove packing from vibration isolators.
10. Verify lubrication on fan and motor bearings.
11. Inspect fan-wheel rotation for movement in correct direction without vibration and binding.
12. Adjust fan belts to proper alignment and tension.
13. Inspect controls for correct sequencing of heating, refrigeration, and normal and emergency shutdown.
14. After startup and performance testing and prior to Substantial Completion, replace existing filters with new filters.

3.7 CLEANING AND ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to site during other-than-normal occupancy hours for this purpose.

B. After completing system installation and testing, adjusting, and balancing the unit and air-distribution systems, clean filter housings and install new filters.

3.8 DEMONSTRATION

A. Engage a factory-authorized service representative to train Baltimore City maintenance personnel to adjust, operate, and maintain unit.

B. Refer Division 01 for administrative and procedural requirements for demonstration and training.

END OF SECTION 23 81 26

SECTION 23 81 30 – VARIABLE REFRIGERANT FLOW SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes Air Cooled Multi Zone, Variable Refrigerant Flow system consisting of inverter 3 pipe simultaneous heating and cooling. Each system/zone is based on one air cooled outdoor unit connected by a single refrigerant circuit consisting of suction, hot gas and liquid pipework. Both hot gas and liquid for cooling are apportioned through a series of refrigerant distribution controllers to multiple indoor units.

B. Related Requirements:
   1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
   2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.

B. LEED Submittals:

   1. Product Data for Credit EA 4: Documentation indicating that equipment and refrigerants comply.

C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

   1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   2. Wiring Diagrams: For power, signal, and control wiring.
   3. Refrigerant piping indicating sizes, routing and connections to indoor units, and distribution controllers, in coordination with other building structure and services.

D. Samples for Initial Selection: For units with factory-applied color finishes.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

B. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For Multi Zone, Variable Refrigerant Flow systems to include in emergency, operation, and maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Filters: Two sets for each indoor unit.

B. Other spare parts: Manufacturer’s recommended quantity, but not less than 10% of all replacement parts, with a minimum quantity of one each.

1.7 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ASHRAE Compliance:

1. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Standard for Refrigeration Systems."
2. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 4 - "Outdoor Air Quality," Section 5 - "Systems and Equipment," Section 6 - " Procedures," and Section 7 - "Construction and System Start-up."

C. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, and including Certification in the current AHRI Directory per AHRI Standard 1230..

1.8 COORDINATION

A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of Multi Zone, Variable Refrigerant Flow systems that fail in materials or workmanship within specified warranty period.

1. Warranty Period:

a. For Compressor: Manufacturer’s Ten years from date of Substantial Completion.
b. For Parts: Manufacturer’s Ten year from date of Substantial Completion.
c. For Labor: Two years from date of Substantial Completion.
d. Air Handlers: Manufacturer’s 10 years from date of substantial completion

e. Branch Selector Boxes: Manufacturer's 10 years from date of substantial completions
f. Zone Controllers: Manufacturer's 10 years from date of substantial completion
g. Centralized Controller: 1 Year from date of substantial completion

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Multi Zone, Variable Refrigerant Flow systems:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturer specified.
2.
a. Daikin.
b. Mitsubishi Electric Cooling and Heating.
c. Trane
d. Or approved equal.

2.2 INDOOR UNITS

A. Concealed Evaporator-Fan Components:

1. Chassis: Galvanized steel with flanged edges, removable panels for servicing, and insulation on back of panel.
2. Insulation: Faced, glass-fiber duct liner.
3. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and thermal-expansion valve. Comply with ARI 206/110.
4. Fan: Forward-curved, double-width wheel of galvanized steel; directly connected to motor.
5. Fan Motors:

a. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
b. DC ECM Motors, multitapped, multispeed with internal thermal protection and permanent lubrication.
c. Wiring Terminations: Connect motor to chassis wiring with plug connection.

6. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
7. Filters: Permanent, cleanable.
8. Condensate Drain Pans:

a. Fabricated with one percent slope in at least two planes to collect condensate from cooling coils (including coil piping connections, coil headers, and return bends) and humidifiers, and to direct water toward drain connection.

1) Length: Extend drain pan downstream from leaving face to comply with ASHRAE 62.1.
2) Depth: A minimum of 2 inches deep.
b. Double-wall, galvanized-steel sheet with space between walls filled with foam insulation and moisture-tight seal.

c. Drain Connection: Located at lowest point of pan and sized to prevent overflow. Terminate with threaded nipple on one end of pan.

1) Minimum Connection Size: NPS 1.

d. Pan-Top Surface Coating: Asphaltic waterproofing compound.
e. Units with stacked coils shall have an intermediate drain pan to collect condensate from top coil.

9. Controls:

a. Provide air and refrigerant temperature sensors, expansion valves, controlled by microprocessor control system, and integral return air temperature sensor.

B. Wall-Mounted, Evaporator-Fan Components:

1. Cabinet: Enameled steel with removable panels on front and ends in color selected by Architect, and discharge drain pans with drain connection.
2. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and thermal-expansion valve. Comply with ARI 206/110.
3. Fan: Direct drive, centrifugal.
4. Fan Motors:

a. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
b. Multitapped, multispeed with internal thermal protection and permanent lubrication.
c. Enclosure Type: Totally enclosed, fan cooled.
d. NEMA Premium (TM) efficient motors as defined in NEMA MG 1.
e. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in electrical Sections.
f. Mount unit-mounted disconnect switches on interior of unit.

5. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
6. Condensate Drain Pans:

a. Fabricated with one percent slope in at least two planes to collect condensate from cooling coils (including coil piping connections, coil headers, and return bends) and humidifiers, and to direct water toward drain connection.

1) Length: Extend drain pan downstream from leaving face to comply with ASHRAE 62.1.
2) Depth: A minimum of 1 inch deep.

b. Double-wall, galvanized-steel sheet with space between walls filled with foam insulation and moisture-tight seal.
c. Drain Connection: Located at lowest point of pan and sized to prevent overflow. Terminate with threaded nipple on one end of pan.

1) Minimum Connection Size: NPS 1.

d. Pan-Top Surface Coating: Asphaltic waterproofing compound.

7. Air Filtration Section:

a. General Requirements for Air Filtration Section:

1) Comply with NFPA 90A.
2) Minimum Arrestance: According to ASHRAE 52.1 and MERV according to ASHRAE 52.2.
3) Filter-Holding Frames: Arranged for flat or angular orientation, with access doors on both sides of unit. Filters shall be removable from one side or lifted out from access plenum.

b. Disposable Panel Filters:

1) Factory-fabricated, viscous-coated, flat-panel type.
2) Thickness: 1 inch.
3) Arrestance according to ASHRAE 52.1: 80.
4) MERV according to ASHRAE 52.2: 5.
5) Media: Interlaced glass fibers sprayed with nonflammable adhesive and antimicrobial agent.
6) Frame: Galvanized steel, with metal grid on outlet side, steel rod grid on inlet side, and hinged; with pull and retaining handles.

2.3 OUTDOOR UNITS

A. Air-Cooled, Outdoor unit Components:

1. Casing: Steel, finished with baked enamel in standard manufacturer's color with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.
2. Compressor: Hermetically sealed with crankcase heater and mounted on vibration isolation device. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.

a. Compressor Type: Inverter Scroll.
b. Variable speed compressor motor controlled by frequency inverter, high-pressure switch, and automatic-reset low-pressure switch.
c. Refrigerant Charge: R-410A.
d. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and liquid subcooler. Comply with ARI 206/110.

3. Fan: Propeller type, directly connected to motor.
4. Motor: Totally enclosed, multispeed, with integral thermal-overload protection.
5. Low Ambient Kit: Permits operation down to 45 deg F.
6. Mounting Base: Polyethylene.
7. Accessories: Expansion valves, oil separators, suction and liquid shutoff valves, strainers, liquid receivers and accumulators.

2.4 REFRIGERANT DISTRIBUTION CONTROLLERS

A. Distribution Controllers:

1. The controller casing shall be constructed of galvanized steel metal panels with insulated valve cavity. The controller shall divert either hot gas or liquid refrigerant to the connected indoor unit(s) depending on the cooling or heating requirements. The controller shall have single or multiple refrigerant outlets, each outlet having simultaneous independent selection of either heating or cooling.

2.5 ACCESSORIES

A. Sequence of operation are specified on drawings.

B. Individual temperature controller: Wireless infrared to remotely control individual indoor unit or a group of units with the following features:
1. 24-hour time control of system stop and start.
2. Liquid-crystal display indicating temperature, set-point temperature, time setting, operating mode, and fan speed.
3. Fan-speed selection including auto setting.
4. Temperature selection and adjustment.
5. Operation mode selection.
6. Filter cleaning identification.
7. Full fault diagnostics display.
8. Built-in temperature sensor.

C. Central controller: Capable of controlling network of indoor units, individually, in groups and unanimously with the following features for each series of indoor unit arrangements:
1. 24-hour time control of system stop and start.
2. Liquid-crystal display indicating temperature, set-point temperature, time setting, operating mode, and fan speed.
3. Fan-speed selection including auto setting.
4. Temperature selection and adjustment.
5. Operation mode selection.
6. Filter cleaning identification.
7. Full fault diagnostics display, identifying either an individual indoor unit or a series of indoor units.

D. Central controller shall have the capability to override the individual remote controller of any unit on the same network.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Installing contractor shall have completed all Manufacturer’s Installation and Commissioning classes (16 hours), Service & Troubleshooting Classes (16 hours) and Controls Application and Commissioning Classes (16 hours).

B. Installing contractor shall have successfully installed a minimum of (5) five VRF projects in excess of 50 TR each and provide testimonials for submittal.

C. Install units level and plumb.

D. Install indoor units using manufacturer's standard mounting devices securely fastened to building structure.

E. Install roof-mounted, outdoor units on equipment supports specified in Section 077200 "Roof Accessories." Anchor units to supports with removable, cadmium-plated fasteners.

F. Equipment Mounting:
1. Comply with requirements for vibration isolation devices specified in Section 230548.13 "Vibration Controls for HVAC."

G. Pipework: Refer to Section 23 23 00 “Refrigerant Piping” for additional requirements.

1. Size refrigerant pipework in accordance with manufacturer’s written instructions. Design pipework routes to maintain shortest possible distance, in coordination with building structure and other services, and complying with the maximum allowable distance limitations. Install pipework with minimum joints and insulate with close cell elastomeric insulation. Utilize only branch pipes and branch pipe kits supplied or recommended by the manufacturer. Reducing tees are not permitted. Make all brazed joints with dry nitrogen purge to ensure the prevention of oxidization to the internal surface of the copper pipes. Prevent moisture, dirt and any other contaminants to the interior of pipes and air conditioning units during installation. Pressure test pipework with dry nitrogen as recommended by the manufacturer after installation and prior to connection of the outdoor units, sealing of insulation joints and starting the outdoor unit. Evacuate entire system to vacuum pressure as recommended by the manufacturer once the outdoor units are connected. Fill the system with refrigerant in accordance with the requirements of the manufacturer after completion of the above process.

H. Wiring:

1. Furnish and install all control wiring, and associated accessories in accordance with manufacturer’s written instructions.

3.2 CONNECTIONS

A. Where piping is installed adjacent to unit, allow space for service and maintenance of unit.

B. Duct Connections: Duct installation requirements are specified in Section 233113 "Metal Ducts." Drawings indicate the general arrangement of ducts. Connect supply and return ducts to indoor units with flexible duct connectors. Flexible duct connectors are specified in Section 233300 "Air Duct Accessories."

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a locally qualified, factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

B. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

C. Tests and Inspections:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, start the systems to confirm proper operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Remove and replace malfunctioning units and retest as specified above.

E. Prepare test and inspection reports.

3.4 STARTUP SERVICE

A. Manufacturer's Representative must provide start-up and commissioning along with local hands-on training..

1. Complete installation and startup checks according to manufacturer's written instructions.

2. Manufacturer's Representative to conduct complete systems re-commissioning at one year of operation.

B. CONSTANT MONITORING SERVICE

C. All systems shall be maintained by equipment manufacturer's continual monitoring service.
1. Optimize system operation with Variable Refrigerant Temperature, in response to system loads and streaming local weather forecasting, calculating real time control strategy.
2. Constantly monitor at least 80 points within the systems' operation in 24/7 real time via OEM's Cloud service and analysis.
3. Provide predictive maintenance monitoring and alerts continually during operation.
4. Installation with first year quarterly reporting and analysis. Owner opts to subscribe for second year forward annual, semi-annual or quarterly reporting.

3.5 DEMONSTRATION

A. Manufacturer's representative shall support installing contractor by providing its own factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units on site and in local live equipment training laboratory.

B. Refer Division 01 for administrative and procedural requirements for demonstration and training.

END OF SECTION 238126

SECTION 23 81 30.11 – VARIABLE REFRIGERANT VOLUME (VRV) HVAC SYSTEM CONTROLS

PART 1 – GENERAL

1.1. Physical characteristics

A. General:
The local remote control shall be made from plastic materials with a neutral color. Each control shall have a LCD (Liquid Crystal Display) that shows set point, room temperature, mode of operation (on/off/cool/heat), and fan speed.

1.2. Electrical characteristics

A. General:
The each indoor unit control circuit board shall supply 16 volts DC to the local remote controller. The voltage may rise or fall in relation to the transmission packets that are sent and received.

B. Wiring:
The control wiring shall be terminated in a daisy chain design from outdoor unit, to branch selector, then daisy chaining to each indoor unit in the system and terminating at the farthest indoor unit. The remote control wiring shall run from the indoor unit control board terminal block to the remote controller connected with that indoor unit.

C. Wiring size:
Wiring shall be non-shielded, 2-conductor sheathed vinyl cord or cable, and 18 AWG stranded copper wire.

1.3. VRV Controls Network

The VRV Controls Network shall be made up of local remote controllers, multi-zone controllers, advanced multi-zone controllers, and open protocol software devices that transmit information via the high-speed communication bus and can also be controlled via a network PC. The VRV Controls Network supports operation monitoring, scheduling, error e-mail distribution, general user software, tenant billing, maintenance support, and integration with Building Management Systems (BMS) using open protocol via BACnet® or Lonworks® interfaces; all of which blend to provide the optimal control strategy for the best HVAC comfort solution.

PART 2 - PRODUCTS

2.1. Local Remote Controllers

VRV local remote controllers shall be compatible with all VRV indoor units. The remote controller wiring shall consist of a non-polar two-wire connection to the indoor unit. The local remote controllers may be wall-mounted and can be adjusted to maintain the optimal operation of the connected indoor unit(s). Set temperatures can be adjusted in increments of 1°F. In the cases where a system or unit error may occur, the VRV controllers will display a two-digit error code and the unit address. The local remote controllers do not require addressing.

A. Remote Controller

The Remote Controller shall provide control for all VRV indoor units. The remote controller wiring consist of a non-polar two-wire connection to the indoor unit at terminals P1/P2. The Remote Controller is wall mounted and can be adjusted to maintain the optimal operation of the connected indoor unit(s). The Remote Controller does not require addressing.

The Remote Controller can be used in conjunction with the BRC2A71 (Simplified Remote Controller) or another NAV Remote Controller to control the same indoor unit group. No more than 2 remote controllers can be placed in the same group.

1. Mounting:
   The Remote Controller shall be mounted into a standard 2" x 4" junction box.

2. Display Features:
   - The Remote Controller shall be approximately 4.75" x 4.75" in size with a backlit 2.75" x 1.75" LCD display.
   - Feature Backlit LCD Display with contrast adjustment and auto off after 30 seconds.
   - Display information shall be selectable from English, French, or Spanish.
   - Configurable display mode – Detailed, Standard, and Simple
     - Large 11/16" room temperature displayed in Simple display
   - The controller shall display Operation Mode, Setpoint, and Fan Speed.
     - Displayed items configurable
     - Configure "Off" to be displayed when unit is turned off (field setting required)
       - Prevents mode adjustment
     - Setpoint can be removed from display when unit is turned Off (field setting required)
       - Prevents setpoint adjustment
     - Fan speed display removable (field setting required)
       - Prevents fan speed adjustment
   - System Status icons.
   - The controller shall display temperature setpoint in one degree increments with a range of 60-90^{o}F (16-32^{o}C)
   - Detailed and Simple display will reflect room temperature (0-176^{o}F/-18-80^{o}C range in one degree increment).
     - Display of temperature information shall be configurable for Fahrenheit or Celsius
   - On/Off status shall be displayed with an LED.
   - Error codes will be displayed in the event of system abnormality/error with a two digit code.
     - A blinking LED will also signal system abnormality/error
   - The following system temperatures can be displayed to assist service personnel in troubleshooting:
     - Return Air Temperature
     - Liquid Line Temperature
     - Gas Line Temperature
     - Discharge Air Temperature (depending on unit),
     - Remote Controller Sensor Temperature
     - Temperature used for Indoor Unit Control

3. Basic Operation:
   - Capable of controlling a group of up to 16 indoor units.

- Controller shall control the following group operations:
  - On/Off, Operation Mode (Cool, Heat, Fan, Dry and Auto* (*with VRV Heat Recovery))
    - Configure only the essential modes to be selectable – remove unnecessary mode selection(s) from display
  - Independent Cooling and Heating setpoints in the occupied mode
    - Dual setpoints (individual Cool and Heat setpoints with minimum setpoint differential 0 – 8°F (0 – 4°C) default 2°F (1°C)) or Single setpoint
  - Independent Cooling Setup and Heating Setback setpoints in the unoccupied mode
  - Fan Speed
  - Airflow direction (dependent on indoor unit type).
  - The controller shall be able to limit the user adjustable setpoint ranges individually for cooling and heating in the occupied period
  - Function button lockout (On/Off, Mode, Fan Speed, Up/Down, Left, Right Arrows)
  - Indoor Unit group assignment
  - Clock (12/24 hour) and Day display
  - Automatic adjustment for Day Light Savings Time (DST)
    - Set changeover period (second Sunday in March / first Sunday in November)

4. Programmability:
   - Controller shall support schedule settings with selectable weekly pattern options.
     - 7-day
     - Weekday + Weekend
     - Weekday + Saturday + Sunday
     - Everyday
     - The schedule shall support unit On/Off
     - Independently settable Cooling and/or Heating setpoints when unit is on (occupied)
     - Setup (Cooling) and Setback (Heating) setpoints when unit is off (unoccupied)
     - A maximum of 5 operations can be schedulable per day
     - Time setting in 1-minute increments
   - The Controller shall support auto-changeover mode for both Heat Pump and Heat Recovery systems allowing the optimal room temperature to be maintained by automatically switching the indoor unit's mode between Cool and Heat according to the room temperature and temperature setpoint.
     - Changeover to cooling mode shall occur at cooling setpoint + 1°F (0.5°C) as the primary changeover deadband and takes the guard timer into consideration
       - Configurable from 1 – 4°F (0.5 – 2°C)
     - Changeover to cooling mode shall occur at the primary changeover deadband to cooling + 1°F (0.5°C) as the secondary changeover deadband.
       - Configurable from 1 – 4°F (0.5 – 2°C)
     - Changeover to heating mode shall occur at heating setpoint - 1°F (0.5°C) as the primary changeover deadband and takes the guard timer into consideration
       - Configurable from 1 – 4°F (0.5 – 2°C)

- Changeover to heating mode shall occur at the primary changeover deadband to heating - 1°F (0.5°C) as the secondary changeover deadband.
  - Configurable from 1 – 4°F (0.5 – 2°C)
- 1 hour guard timer
  - Upon changeover, guard timer will prevent another changeover during this period.
  - Guard timer is ignored by a change of setpoint manually from either the Multi-zone Controller, Remote Controller, or by schedule.
  - The Guard timer is also ignored if the space temperature reaches the secondary changeover deadband (configurable from 1 - 4°F (0.5 – 2°C)) from the primary changeover deadband, and the guard timer has been activated
  - 60 minutes as default, configurable to 15, 30, or 90 minutes

- The Controller shall support an Auto Off Timer for temporarily enabling indoor unit operation during the unoccupied period.
  - When the Off Timer is enabled and when the unit is manually turned on at the remote controller
  - The controller shall shut off the unit after a set time period
  - The time period shall be configurable in the controller menu with a range of 30-180 minutes in 10 minute increments
- The room temperature shall be capable of being sensed at either the NAV Remote Controller, the Indoor Unit return air temperature sensor (default), or Remote Temperature Sensor (KRCS01-1B) configured through the field settings.

B. Remote Temperature Sensor

The Remote Temperature Sensor shall provide temperature sensing for all VRV indoor units. The remote controller wiring consists of a non-polar two-wire connection to the indoor unit at terminals X13A. The Remote Temperature Sensor is wall mounted and is used to maintain the optimal operation of the connected indoor unit.

The Remote Temperature Sensor can be used in conjunction with the Navigation Remote Controller, Simplified Remote Controller, and the Wireless Remote Controller to sense space temperature outside of the indoor unit. No more than 2 remote controllers can be placed in the same group.

1. Mounting:
   - Sensor Box shall be 2.38” x 1.97” x 0.75” (H x W x D) in size.
   - Can be mounted on the wall in the provided sensor box.
   - Can be mounted in the Simplified Remote Controller (BRC2A71).
   - Can be mounted a button temperature sensor holder (field supplied).

2. Application:

   The location of the temperature sensor should provide a realistic sample of the space temperature in order to provide the optimum comfort level to the occupants.
   - Things that need to be considered are:
     - Indoor unit location
     - Will outside area be brought into the space and/or indoor unit
     - Ceiling heights
     - Control Scheme
     - Design and limitations due to architecture

- Plenum air return

3. Basic Operation:
   - Replaces indoor unit return air temperature sensor.
     - Senses room temperature for only one indoor unit

2.2. Advanced Multi-zone Controllers

The VRV advanced multi-zone controllers shall be compatible with all VRV, SkyAir, and Daikin RA and FTXS indoor units with the use of the KRP928BB2S RA Adapter. The advanced multi-zone controller wiring consist of a non-polar two-wire connection to the outdoor unit. The advanced multi-zone controllers may be wall-mounted and can be adjusted to maintain the optimal operation of up to 64 connected indoor unit groups and 128 indoor units. Set temperatures can be adjusted in increments of 1°F. In the cases where a system or unit error may occur, the VRV controllers will display a two-digit error code and the unit address.

A. DCM601A71: intelligent Touch Manager (iTM) V. 2.0 (Basis of Design)
The intelligent Touch Manager (version 2.0) shall provide control for all VRV, SkyAir, and Daikin RA and FTXS indoor units with the use of the KRP928BB2S RA Adapter. It shall be capable of controlling a maximum or 64 indoor unit groups and 128 indoor units connected to a maximum of 10 outdoor units. The intelligent Touch Manager shall support operations superseding that of the local remote controller, system configuration, daily/weekly scheduling, monitoring of operation status, and malfunction monitoring.

The controller wiring shall consist of a non-polar two-wire connection to the indoor unit at terminals F1F2 (out-out) of the outdoor unit. The intelligent Touch Manager is wall mounted and can be adjusted to maintain the optimal operation of the connected indoor unit(s).

The intelligent Touch Manager can be used in conjunction with the BRC1E71/72 (Navigation Remote Controller), the BRC2A71 (Simplified Remote Controller), or the BRC4C82/7E83/7C812/7E818 (Wireless Remote Controller), BACnet, and Lonworks interfaces to control the same indoor unit groups. The remote controller shall require daisy chain wiring for grouping multiple indoor units (up to 16) together. Manual addressing is required of each remote controller group associated with the intelligent Touch Manager. DIII-NET address can be set for one (1) indoor unit or each indoor unit in the remote controller group. No more than 2 remote controllers can be placed in the same group.

The intelligent Touch Manager shall be equipped with two RJ-45 Ethernet ports for 100 Mbps network communication to support interconnection with a network PC via the Internet, Local Area Network (LAN), or connection with a non-networked PC after completed installation.

Web access functions shall be available so that facility staff can securely log into each Intelligent Touch Manager via the PC's web browser to support monitoring, scheduling, error recognition, and general user functions. Error emais are also sent to designated email addresses. An additional optional software function Power Proportional Distribution (PPD) tenant billing shall also be available. The optional software shall require advanced purchase and can only be activated upon receipt of a license activation key from Daikin AC.

1. Mounting:

The intelligent Touch Manager shall be mounted on the wall or into the mounting fixtures included with the intelligent Touch Manager.

2. Display Features:
   a. The intelligent Touch Manager shall be approximately 11.42" x 9.57" x 1.97' in size with a backlit 10.4" LCD display.
   b. Display information shall be selectable from English, French, Italian, Korean, Dutch, Portuguese, Chinese, Japanese, German, or Spanish.
   c. Featured backlit LCD with auto off after 30 minutes (default) is adjustable between 1 to 60 minutes, or the choice of 3 different screen savers.
   d. Area and Group configuration
      1) Area contains one (1) or more Area(s) or Group(s)
      2) A Group may be an indoor unit, Di, Dio point that has a DIII-NET address
      3) A Group may be an external management point such as a Di, Do, Ai, or Ao that does not have a DIII-NET address
   e. An Area is a tiered group where management points (indoor unit, digital input/output, and analog input/output groups) can be monitored and controlled by global settings. Up to 650 Areas can be created. Area hierarchy can have up to 10 tiered levels (ex. top level: 1st floor West, 2nd level: offices, hallways, 3rd level: Office 101, 102, and 103, etc.). Area configuration shall classify levels of monitoring and control for each management point
      1) Areas and Groups may be assigned names (ex. Office 101, Lobby, North Hallway, etc.)
   f. The Controller shall display On/Off, Operation Mode, Setpoint, Space Temperature, Louver Position, Fan Speed for each Area or Group.
   g. The Controller shall display Date (mm/dd/yyyy, yyyy/mm/dd, or dd/mm/yyyy format selectable) and day of the week along with the time of day (12hr or 24hr display selectable).
   h. The Controller shall adjust for daylight savings time (DST) automatically.
   i. Display information shall be updated every 3 seconds to show the latest status of the indoor unit groups.
   j. System status icons shall display On/Off (color coded), Malfunction/Error (color coded), Forced Stop, Setback, Filter, Maintenance, and Screen Lock.
   k. The controller shall display the temperature setpoint in one degree increments with a range of 60°F – 90°F, 1°F basis (16°C – 32°C, 0.1°C basis).
      1) Display of temperature setpoint information shall be configurable for Fahrenheit or Celsius
   l. Display shall reflect room temperature in one tenth degree increments with a range of-58°F – 248°F, 0.1°F basis (-50°C – 120°C, 0.1°C basis) with 0.1°C accuracy.
      1) Display of room temperature information shall be configurable for Fahrenheit or Celsius
   m. The Menu List shall be used to configure options and display information for each Area or Group.
   n. Error status shall be displayed in the event of system abnormality/error with one of three color coded icons placed over the indoor unit icon or lower task bar.
      1) System errors are generated when the intelligent Touch Manager system with other VRV controls systems are combined incorrectly or power proportional distribution calculation errors occur. The intelligent Touch Manager shall display the error with a red triangle placed on the lower task bar.
      2) Unit errors occurring within the VRV system shall be displayed with a yellow triangle placed over the indoor unit icon
      3) Limit errors are based upon preconfigured analog input upper and lower limit settings and are generated when the limits have been met. When limit error is generated a yellow triangle will be placed over the unit icon.

4) Communication errors between the intelligent Touch Manager and the indoor units shall be displayed with a blue triangle placed over the indoor unit icon
5) Error history shall be available for viewing for up to 500,000 errors/abnormality events with operation events.

o. Layout View
1) Capable of displaying site floor plan as the background for visual navigation. Indoor unit, DIII-NET Di and Dio, and External Di, DO, Ai, and Ao icons with operational status can be placed on the floor layout
i) Up to 4 status points can be assigned to the indoor unit icon (room name, room temperature, setpoint, and mode)
ii) Digital input and output icons will display On/Off status
iii) Analog input icons will display analog value
2) Up to 60 floor layout sections can be created

3. Basic Operation:
a. Capable of controlling by Area(s) or Group(s)
b. Controller shall control the following group operations:
1) On/Off
2) Operation Mode (Cool, Heat, Fan, Dry, and Auto)
3) Independent Cool and Heat dual Setpoints or single Setpoint for current mode in the occupied period
4) Controller shall be able to limit the user adjustable setpoint ranges individually for cooling and heating based upon the Area or Group configurations
5) Independent Setup (Cooling) and Setback (Heating) setpoints in the unoccupied mode adjustable to 50 - 95^{0}F
i) Setup and Setback setpoints can only be set outside of the occupied setpoint range
ii) The Setup and Setback setpoints will automatically maintain a 2^{o}F fixed differential from the highest possible occupied setpoints
iii) The recovery differential shall be 4^{0}F (default) and adjustable between 2 – 10^{0}F
iv) Settings shall be applied based upon the Area or Group configurations
6) Fan Speed
i) Up to 3 speeds (dependent upon indoor unit type)
7) Airflow direction (dependent upon indoor unit type)
i) 5 fixed positions or oscillating
8) Remote controller permit/prohibit of On/Off, Mode, and Setpoint
9) Lock out setting for Intelligent Touch Manager display
10) Indoor unit Group/Area assignment
c. Capable of providing battery backup power for the clock at least 1 year when no AC power is applied.
1) The battery can last at least 13 years when AC power is applied
2) Settings stored in non-volatile memory

4. Programmability:
a. Controller shall support weekly schedule settings.
1) 7 day weekly pattern (7)
2) Weekday + Weekend (5 + 2)
3) Weekday + Saturday + Sunday (5 + 1 + 1)
4) Everyday (1)
5) The schedule shall have the capabilities of being enabled or disabled
6) 100 independent schedules configurable with up to 20 events settable for each days schedule
i) Each scheduled event shall specify time and target Area or Group

ii) Each scheduled event shall include On/Off, Optimum Start, Operation Mode, Occupied Setpoints, Setback Setpoints, Remote Controller On/Off Prohibit, Remote Controller Mode Prohibit, Remote Controller Setpoint Prohibit, Timer Extension Setting, Fan Speed, and Setpoint Range Limit
- Setpoint when unit is On (occupied)
- Configurable Setup (Cooling) and Setback (Heating) setpoints when unit is Off (unoccupied)

iii) Time setting in 1-minute increments
iv) Timer Extension shall be used for a timed override (settable from 30 – 180 minutes) to allow indoor unit operation during the unoccupied period

7) A maximum of 40 exception days can be schedule on the yearly schedule (repeats yearly)
i) Exception days shall be used to override specified days on the weekly schedule based upon irregular occupied/unoccupied conditions
ii) Exception days can be configured on a set date (Jan 1) or floating date (1st Monday in September)

b. Controller shall support auto-changeover.
1) Auto-change shall provide Fixed (default), Individual, Averaging, and Vote changeover methods for both Heat Pump and Heat Recovery systems based upon the changeover group configuration. This will allow for the optimal room temperature to be maintained by automatically switching the indoor unit's mode between Cool and Heat in accordance with the room temperature and setpoint. The following changeover scheme shall be applicable to the Fixed, Individual, and Averaging methods.
i) Changeover to cooling mode shall occur at cooling setpoint + 1°F (0.5°C) as the primary changeover deadband and takes the guard timer into consideration
- Configurable from 1 – 4°F (0.5 – 2°C)

ii) Changeover to cooling mode shall occur at the primary changeover deadband to cooling + 1°F (0.5°C) as the secondary changeover deadband.
- Configurable from 1 – 4°F (0.5 – 2°C)

iii) Changeover to heating mode shall occur at heating setpoint - 1°F (0.5°C) as the primary changeover deadband and takes the guard timer into consideration
- Configurable from 1 – 4°F (0.5 – 2°C)

iv) Changeover to heating mode shall occur at the primary changeover deadband to heating - 1°F (0.5°C) as the secondary changeover deadband.
- Configurable from 1 – 4°F (0.5 – 2°C)

v) A weighted demand shall be configurable for the Averaging and Vote methods.

2) Fixed Method
i) Changeover evaluated by room temperature and setpoint of the representative indoor unit (first registered indoor unit in changeover group) in the changeover group even when it is not operating (must be in Cool, Heat, or Auto mode)
ii) Changeover affects all indoor unit groups in the changeover group.

3) Individual method (recommended for Heat Recovery Systems)
i) Changeover evaluated by room temperature and setpoints of the individual indoor unit group in the changeover group
ii) Changeover affects individual indoor unit group in the changeover group

4) Average method
i) Changeover evaluated by the average of all indoor unit group's room temperatures and setpoints operating in Cool, Heat, or Auto mode in the changeover group list

ii) If none of the indoor units in the group meet the above requirements the Fixed method of changeover will be applied
iii) A weighted demand (0 – 3) can be configured for each indoor unit in the changeover group.
iv) Changeover affects all indoor unit groups in the changeover group.

5) Vote Method
i) In each indoor unit, the cooling demand is calculated based upon the difference between the room temperature and cooling setpoint. If the room temperature falls below the primary cool changeover point (cool setpoint plus the primary changeover deadband) the cooling demand is considered as 0 (zero). Then the total cooling demand is calculated as the sum of each indoor unit's cooling demand
ii) The opposite is true for the total heating demand
iii) A weight (0-3) can be added to each indoor unit's demand in the changeover group. The default setting is 1
iv) The weight 0 (zero) means the indoor unit's demand is not added in the total demand, so the indoor unit's demand is considered to be 0 (zero)
v) The weight 2 or 3 means the indoor unit's demand is added 2 or 3 times in the total demand, respectively
vi) Changeover to cooling mode shall occur when the total cooling demand is greater than the total heating demand.
vii) The opposite is true for changeover to heating
viii) Vote supports a Heating Override option, which prioritizes switching to the heating mode if at least one room temperature falls below the secondary heat changeover point (heat setpoint minus the secondary changeover deadband) even if the total cooling demand is greater than the total heating demand.
ix) Changeover affects all indoor unit groups in the changeover group.

6) Changeover shall change the operation mode of the indoor unit that is set as the Changeover Master. The Changeover Master indoor unit shall then change the operation mode of all indoor unit groups daisy chained to the same outdoor unit in the Heat Pump system or branch selector box in the Heat Recovery system.
7) Guard timer
i) Upon changeover, guard timer will prevent another changeover during the guard timer activation period (15, 30, 60 (default) min).
ii) Guard timer is ignored by a change of setpoint manually from either intelligent Touch Manger or Remote Controller, by schedule, or the room temperature meets or exceeds the secondary changeover deadband of the mode opposite of the current mode setting

c. Controller shall support Interlock
1) Interlock feature for use with 3rd party equipment (DOAS, dampers, occupancy sensing, etc…) to automatically control Groups or Areas corresponding to the change of the operation states or the On/Off states of any Group.
2) WAGO I/O unit – Di, Do, Ai, Ao
i) On/Off based monitoring and control of equipment
ii) Manual or scheduled operation of equipment
iii) Operation based upon interlock with management points (group(s))
iv) Monitor equipment error/alarm status
3) Digital Input/Output (DEC102A51-US2) unit or Digital Input (DEC101A51-US2) unit
i) On/Off based monitoring and control of equipment
ii) Manual or scheduled operation of equipment

iii) Operation based upon interlock with management points (group(s))
iv) Monitor equipment error/alarm status

d. Controller shall support force shutdown of associated indoor unit groups.

5. Web/Email Function
   a. Each intelligent Touch Manager shall be capable of monitoring, operating, and scheduling a maximum of 64 indoor unit groups (up to 512 indoor unit groups with the addition of the iTM Plus Adapter) from a networked PC's web browser. It shall also be capable of creating general user access and sending detailed error emails to a customized distribution list (up to 10 email addresses).
   b. All PCs shall be field supplied

PART 3 - WARRANTY

3.1 Special Warranty: Manufacturer and Installer shall agree to repair or replace in part or entirety any component that fail in materials or workmanship within a specified warranty period. Verified available warranties and warranty periods for units and components shall be provided to owner.

1. Warranty Period: Five years from date of Substantial Completion.

SECTION 23 82 16.14 - COILS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes electric resistance air coils.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each air coil.
2. Include rated capacities, operating characteristics, and pressure drops for each air coil.

B. Shop Drawings: Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which coil location and ceiling-mounted access panels are shown and coordinated with each other.

B. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For air coils to include in operation and maintenance manuals.

1.6 FIELD CONDITIONS

A. Altitude above Mean Sea Level: 0 feet**.**

PART 2 - PRODUCTS

2.1 DESCRIPTION

A. ASHRAE Compliance: Comply with applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

2.2 COILS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Chromalox Inc..
2. Indeeco.
3. Trane Company (The); Unitary Products Group.

A. Testing Agency Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Coil Assembly: Comply with UL 1995.

C. Heating Elements: Open-coil resistance wire of 80 percent nickel and 20 percent chromium, supported and insulated by floating ceramic bushings recessed into casing openings, and fastened to supporting brackets.

D. High-Temperature Coil Protection: Disk-type, automatically reset, thermal-cutout, safety device; serviceable through terminal box without removing heater from duct or casing.

1. Secondary Protection: Load-carrying, manually reset or manually replaceable, thermal cutouts; factory wired in series with each heater stage.

E. Frames: Galvanized-steel channel frame, minimum 0.052 inch thick for slip-in or flanged mounting.

F. Control Panel: Unit mounted with disconnecting means and overcurrent protection. Include the following controls:

1. Magnetic contactor.
2. Mercury contactor.
3. Toggle switches; one per step.
4. Step controller.
5. Time-delay relay.
6. Pilot lights; one per step.
7. Airflow proving switch.

G. Capacities and Characteristics: As indicated on Drwaings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine ducts, plenums, and casings to receive air coils for compliance with requirements for installation tolerances and other conditions affecting coil performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install coils level and plumb.

B. Install coils in metal ducts and casings constructed according to SMACNA's "HVAC Duct Construction Standards, Metal and Flexible."

C. Clean coils using materials and methods recommended in writing by manufacturers, and clean inside of casings and enclosures to remove dust and debris.

3.3 CONNECTIONS

A. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

B. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Operational Test: After electrical circuitry has been energized, operate electric coils to confirm proper unit operation.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Prepare test and inspection reports.

END OF SECTION 238216.14

SECTION 23 82 39 - UNIT HEATERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Cabinet unit heaters with centrifugal fans and electric-resistance heating coils.
2. Propeller unit heaters with electric-resistance heating coils.

1.3 DEFINITIONS

A. BAS: Building automation system.
B. CWP: Cold working pressure.
C. PTFE: Polytetrafluoroethylene plastic.
D. TFE: Tetrafluoroethylene plastic.

1.4 SUBMITTALS

A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories for each product indicated.

B. Field quality-control test reports.

C. Operation and Maintenance Data: For cabinet unit heaters to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2004, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

C. ASHRAE/IESNA 90.1-2004 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004, Section 6 - "Heating, Ventilating, and Air-Conditioning."

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of unit heaters that fail in materials or workmanship for not less than a period of two years.

1.7 MAINTENANCE SPARE PARTS

A. Spare parts: Manufacturer's recommended quantity, but not less than 10% of all replacement parts, with a minimum quantity of one each.

PART 2 - PRODUCTS

2.1 CABINET UNIT HEATERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Berko Electric Heating; a division of Marley Engineered Products.
   2. Indeeco.
   3. QMark Electric Heating; a division of Marley Engineered Products.
   4. Trane.

B. Description: A factory-assembled and -tested unit complying with ARI 440.

   1. Comply with UL 2021.

C. Cabinet: Steel with baked-enamel finish with manufacturer's standard paint, in color selected by City/Engineer.

   1. Vertical Unit, Exposed Front Panels: Minimum 0.1 inch thick, galvanized, sheet steel, removable panels with channel-formed edges secured with tamperproof cam fasteners.

   2. Control Access Door: Key operated.

   3. Base: Minimum 0.1-inch thick steel, finished to match cabinet, 4 inches (100 mm) high with leveling bolts.

   4. False Back: Minimum 0.0428-inch- (1.1-mm-) thick steel, finished to match cabinet.

D. Electric-Resistance Heating Coil: Nickel-chromium heating wire, free from expansion noise and hum, mounted in ceramic inserts in a galvanized-steel housing; with fuses in terminal box for over current protection and limit controls for high-temperature protection. Terminate elements in stainless-steel machine-staked terminals secured with stainless-steel hardware.

E. Fan and Motor Board: Removable.

   1. Fan: Forward curved, double width, centrifugal; directly connected to motor. Thermoplastic or painted-steel wheels, and aluminum, painted-steel, or galvanized-steel fan scrolls.

   2. Motor: Permanently lubricated, multispeed; resiliently mounted on motor board. Comply with requirements in Section 23 05 13 – Common Motor Requirements for HVAC Equipment.

   3. Wiring Terminations: Connect motor to chassis wiring with plug connection.

F. Basic Unit Controls:

   1. Control voltage transformer.

2. Unit-mounted thermostat and factory wired low voltage control circuit and contactors with the following features.
   a. Fan on-auto switch.
   b. Manual fan speed switch.
   c. Adjustable deadband.
   d. Concealed set point.
   e. Exposed indication.
   f. Deg F (Deg C) indication.

G. Electrical Connection: Factory wire motors and controls for a single field connection and disconnect.

H. Capacities and Characteristics: As indicated on drawings.

1. Cabinet:

   a. Vertical, Surface Mounted: Upflow.
      1) Top: Flat.
      2) Air Inlet: Front, punched louver grille.
      3) Air Outlet: Front punched louver.

2.2 PROPELLER UNIT HEATERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Airtherm; a Mestek Company.
2. Engineered Air Ltd.
3. McQuay International.
4. Rosemex Products.
5. Ruffneck Heaters; a division of Lexa Corporation.
6. Trane.
7. Markel Products; a division of TPI Corporation.

B. Description: An assembly including casing, coil, fan, and motor in horizontal/vertical discharge configuration with adjustable discharge louvers and mounting brackets dust shield. Test propeller unit heater before shipping.

C. Comply with UL 2021.

D. Comply with UL 823.

E. Cabinet: Removable panels for maintenance access to controls.

F. Cabinet Finish: Steel with baked-enamel finish with manufacturer's standard paint, color selected by City/Engineer.

G. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.

H. Discharge Louver: Adjustable fin diffuser for horizontal units and conical diffuser for vertical units.

I. Electric-Resistance Heating Elements: Nickel-chromium heating wire, free from expansion noise and 60-Hz hum, embedded in magnesium oxide refractory and sealed in steel or corrosion-resistant metallic sheath with fins no closer than 0.16 inch (4 mm). Element ends

shall be enclosed in terminal box. Fin surface temperature shall not exceed 550 deg F (288 deg C) at any point during normal operation.

1. Circuit Protection: One-time fuses in terminal box for overcurrent protection and limit controls for high-temperature protection of heaters.
2. Wiring Terminations: Stainless-steel or corrosion-resistant material.

J. Fan: Propeller type with aluminum wheel directly mounted on motor shaft in the fan venturi.

K. Fan Motors: Comply with requirements in Section 23 05 13 – Common Motor Requirements for HVAC Equipment.

1. Motor Type: Permanently lubricated.

L. Control Devices:

1. Unit-mounted thermostat and disconnect.

M. Capacities and Characteristics: As indicated on drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive unit heaters for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine roughing-in for electrical connections to verify actual locations before unit heater installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install wall boxes in finished wall assembly; seal and weatherproof. Joint-sealant materials and applications are specified in Section 07 92 00 – Joint Sealants.

B. Install cabinet unit heaters to comply with NFPA 90A.

C. Install propeller unit heaters level and plumb.

D. Suspend propeller unit heaters from structure with all-thread hanger rods and spring hangers. Hanger rods and attachments to structure are specified in Section 23 05 29 – Hangers and Supports for HVAC Piping and Equipment. Vibration hangers are specified in Section 23 05 48 – Vibration and Seismic Controls for HVAC Piping and Equipment, or by manufacturer supplied mounting brackets and dust shields.

3.3 CONNECTIONS

A. Comply with safety requirements in UL 1995.

B. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

C. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports:

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.

2. Operate electric heating elements through each stage to verify proper operation and electrical connections.

3. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

C. Remove and replace malfunctioning units and retest as specified above.

3.5 ADJUSTING

A. Adjust initial temperature set points.

B. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Baltimore City maintenance personnel to adjust, operate, and maintain cabinet unit heaters.

B. Refer Division 01 for administrative and procedural requirements for demonstration and training.

END OF SECTION 23 82 39

Set No._____

Project Manual
for
Construction of the

BCDC YOUTH DETENTION CENTER

at the
Baltimore City Detention Center
in the
Division of Pretrial Detention and Services (DPDS)

STATE OF MARYLAND
CONTRACT NO.: DPSCS KT-000-150-C01

5 FEBRUARY 2015

Department of Public Safety & Correctional Services
Stephen T. Moyer Secretary
David Bezanson, Assistant Secretary

Board of Public Works
Lawrence J. Hogan, Jr.,Governor
Peter Franchot, Comptroller
Nancy K. Kopp, Treasurer

Architect (A Joint Venture): **PSA-Dewberry + Penza Bailey Architects**

Joint Venture Prime / Contract Office
Penza Bailey Architects
401 Woodbourne Avenue
Baltimore, MD 21212

Joint Venture Prime / Security
PSA-Dewberry
401 SW Water Street #701
Peoria, IL 61602

Civil / Geotechnical / Environmental Engineer
EBA Engineering, Inc.
4813 Seton Drive
Baltimore, MD 21215

Structural Engineer
Hope Furrer Associates, Inc.
501 Fairmount Ave. Suite 205
Towson, MD 21286

Surveyor
Dewberry & Davis, LLC
3106 Lord Baltimore Drive
Baltimore, MD 21244

Mechanical / Plumbing / Elect. / IT / Telecom / MATV-CATV Fire Protection Engineer
Sidhu Associates, Inc.
11350 McCormick Drive #1000
Hunt Valley, MD 21031

Food Service / Laundry Consultant
R&R Designer, Inc.
5300 Holmes Run Parkway
Suite 1006
Alexandria, VA 22304

Landscape Architect
P.E.L.A. Design, Inc.
7400 York Road, Suite 403
Towson, MD 21204

Cost Estimator
Lewicki Estimating Services, Inc.
13600 Old Chatwood Place
Chantilly, VA 20151

Sustainability Consultant
TerraLogos Eco Architecture
2901 E. Baltimore Street, #300
Baltimore, MD 21224

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volume 5 of 6

Bid documents are available only online from eMaryland Marketplace (eMM). Those are the only official documents to be used by Bidders for this Invitation for Bid (IFB). The Bidders shall print on their own stationary the required documents for submitting their bid (as Construction BID Form, Bid Proposal Affidavit, BID Bond, etc.) and submit to the Owner (DPSCS, Division of Capital Construction and Facilities Maintenance) in a sealed envelope which clearly indicates that it contains a sealed bid for this project with the bid due date and the name and address of the Bidder.

Minority Business Enterprises (MBEs) are encouraged to participate and respond to this request for Bid.

CONFORMED DOCUMENT 3 APRIL 2015: This project manual contains sections revised during bidding, and is published for the Contractor's convenience for use during construction. It does not replace the Contract Documents, which comprise the Bid Documents plus revisions issued as Addenda.

VOLUME 1

DIVISION 00 – BIDDING AND CONTRACT REQUIREMENTS

DIVISION 01 - GENERAL REQUIREMENTS

VOLUME 2

DIVISION 02 – EXISTING CONDITIONS

DIVISION 03 - CONCRETE

DIVISION 04 – MASONRY

DIVISION 05 – METALS

DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

VOLUME 3

DIVISION 08 - OPENINGS

DIVISION 09 - FINISHES

DIVISION 10 - SPECIALTIES

DIVISION 11 - EQUIPMENT

VOLUME 4

DIVISION 21 – FIRE SUPPRESSION

DIVISION 22 – PLUMBING

DIVISION 23 - HEATING VENTILATING AND AIR CONDITIONING

VOLUME 5

DIVISION 26 - ELECTRICAL

DIVISION 27 - COMMUNICATIONS

DIVISION 28 - ELECTRONIC SAFETY AND SECURITY

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DVISION 33 - UTILITIES

VOLUME 6

END OF TABLE OF CONTENTS

SECTION 26 05 13 - MEDIUM-VOLTAGE CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes cables and related splices, terminations, and accessories for medium-voltage electrical distribution systems.

B. Related Requirements:

1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.

2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners

1.3 DEFINITIONS

A. NETA ATS: Acceptance Testing Specification.

1.4 MRc2: CONSTRUCTION WASTE MANAGEMENT

A. No less than the specified minimum proportion of all construction waste from the project shall be diverted from disposal in a landfill and/or incineration in accordance with the project requirements for Construction Waste Management. See Section 018113 Sustainable Design Requirements.

B. EQc4.1: LOW-EMITTING MATERIALS – SEALANTS AND ADHESIVES

All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the project requirements for Low-Emitting Materials – Sealants and Adhesives. See Section 018113 Sustainable Design Requirements.

Contractor shall provide LEED credit verification as per Section 013300 Submittal Procedures.

1.5 SUBMITTALS

A. Product Data: For each type of cable indicated. Include splices and terminations for cables and cable accessories.

B. Qualification Data: For Installer and testing agency.

C. Material Certificates: For each cable and accessory type, signed by manufacturers.

D. Source quality-control test reports.

E. Field quality-control test reports.

1.6 QUALITY ASSURANCE

A. Installer: Engage a cable splicer, trained and certified by splice material manufacturer, to install, splice, and terminate medium-voltage cable.

B. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.

C. Source Limitations: Obtain cables and accessories through one source from a single manufacturer.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

E. Comply with IEEE C2 and NFPA 70.

1.7 WARRANTY

A. Special Project Warranty: Submit a written warranty, mutually executed by manufacturer and the principal Installer, agreeing to repair or replace medium-voltage cables, splices, and terminations that fail in materials or workmanship within the special project warranty period specified below. This warranty shall be in addition to, and not a limitation of, other rights and remedies the Authority may have against the Contractor under the Contract Documents.

B. Special Project Warranty Period: 20 years beginning on the date of Substantial Completion.

1.8 COMMISSIONING

A. The materials, components and systems described in this section are subject to the Commissioning process. Contractor must comply with all Commissioning Requirements. Commissioning Requirements are described in Section 019113 General Commissioning Requirements and in Division 36 Commissioning. Division 36 provides

an individual Commissioning specification section for each Division 2 through Division 33 specification section requiring Commissioning.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cables:

   a. American Insulated Wire Corp.; a Leviton Company.
   b. General Cable Technologies Corporation.
   c. Kerite Co. (The); Hubbell Incorporated.
   d. Okonite Company (The).
   e. Pirelli Cables & Systems NA.
   f. Rome Cable Corporation.
   g. Southwire Company.

2. Cable Splicing and Terminating Products and Accessories:

   a. Engineered Products Company.
   b. G&W Electric Company.
   c. MPHusky.
   d. Raychem Corp.; Telephone Energy and Industrial Division; Tyco International Ltd.
   e. RTE Components; Cooper Power Systems, Inc.
   f. Scott Fetzer Co. (The); Adalet.
   g. Thomas & Betts Corporation.
   h. Thomas & Betts Corporation/Elastimold.
   i. 3M; Electrical Products Division.

2.2 CABLES

A. Cable Type: Cable shall be single conductor type, size as indicated on contract drawing. Cable shall conform to UL Standard 1072, AEIC CS 8, ICEA S-93-639, ICEA S-97-682 and ASTM B8.

B. Conductor: Copper.

C. Conductor Stranding: Uncoated soft, Class B, stranded compressed concentric round. Copper shall conform to ASTM B8. Electrical resistance shall meet the requirements of ICEA S-93-639.

D. Strand Filling: Conductor interstices are filled with impermeable compound.

E. Conductor Insulation: Insulation shall be flexible thermosetting dielectric based on an Ethylene-propylene rubber. The insulation shall limit degree of susceptibility to treeing experienced by crystalline materials.

1. Voltage Rating: 15 kV.
2. Insulation Thickness: 133 percent insulation level.

F. Shielding: Copper shielding tape, 5 mil thick helically applied over semiconducting insulation shield with 12-1/2% overlap for all feeder circuits.

G. Jacket: Shall be black, sunlight resistant polyvinyl chloride with minimum average thickness of 80 mil. Minimum thickness shall not be less than 64 mil.

H. Cable Armor: Interlocked galvanized steel applied over cable.

2.3 SPLICE KITS

A. Connectors and Splice Kits: Comply with IEEE 404; type as recommended by cable or splicing kit manufacturer for the application.

B. Splicing Products: As recommended, in writing, by splicing kit manufacturer for specific sizes, ratings, and configurations of cable conductors. Include all components required for complete splice, with detailed instructions.

1. Combination tape and cold-shrink-rubber sleeve kit with rejacketing by cast-epoxy-resin encasement or other waterproof, abrasion-resistant material.
2. Heat-shrink splicing kit of uniform, cross-section, polymeric construction with outer heat-shrink jacket.
3. Premolded, cold-shrink-rubber, in-line splicing kit.
4. Premolded EPDM splicing body kit with cable joint sealed by interference fit of mating parts and cable.

C. Splices shall be made with standard splicing kits and shall be of the following types:

1. Separable insulated splice, 600 amps, 3 phase rated, with capacitive test point on molded T-body. Voltage rating of separable splice shall be 35 kV for use on 35 kV systems and 15kV for 15kV system. All current carrying components including the entire compression connector shall be copper.

2.4 SOLID TERMINATIONS

A. Conductor Terminations, General: Comply with Class 1, IEEE Standard 48. Insulation class shall be equivalent to that of the cable upon which they are installed. Terminations for shielded cables shall include a shield-grounding strap. Include an effective moisture seal for the end of the insulation whether or not this item is included in termination kits. Seal shall be silicone rubber tape, cold shrink rubber sleeve, or heat shrink plastic sleeve as recommended by the kit manufacturer. Termination kits shall be performance tested for compliance with IEEE Standard 48 and shall be of the following types:

1. Class 1 Termination for Shielded Cable: Modular type, furnished as a kit, with stress relief tube, multiple molded silicone rubber insulator modules, shield ground strap, and compression type connector.

2. Class 1 Termination for Shielded Cable: Heat shrinkable type with heat shrinkable inner stress control and outer non-tracking tubes, multiple molded non-tracking skirt modules, and compression type connector.
3. Separable insulated elbow connectors: Modular system, complying with IEEE Standard 386. System shall consist of disconnecting, 600A, 3 phase rated single pole, cable terminators and matching stationary, plug-in, dead front terminals. System components shall be designed for the system voltage and for sealing against moisture. Elbows shall include voltage test points on molded connector body. Voltage rating of separable elbow connectors shall be 15 kV for use on 15 kV systems. All current carrying components shall be copper.

2.5 ARC-PROOFING MATERIALS

A. Tape for First Course on Metal Objects: 10-mil thick, corrosion-protective, moisture-resistant, PVC pipe-wrapping tape.

B. Arc-Proofing Tape: Fireproof tape, flexible, conformable, intumescent to 0.3 inch thick, compatible with cable jacket.

C. Glass-Cloth Tape: Pressure-sensitive adhesive type, 1/2 inch wide.

2.6 SOURCE QUALITY CONTROL

A. Test and inspect cables according to ICEA S-97-682 before shipping.

B. Test strand-filled cables for water-penetration resistance according to ICEA T-31-610, using a test pressure of 5 psig.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install cables according to IEEE 576.

B. Pull Conductors: Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

1. Where necessary, use manufacturer-approved pulling compound or lubricant that will not deteriorate conductor or insulation.
2. Use pulling means, including fish tape, cable, rope, and basket-weave cable grips that will not damage cables and raceways. Do not use rope hitches for pulling attachment to cable.

C. Install exposed cables parallel and perpendicular to surfaces of exposed structural members and follow surface contours where possible.

D. Install cable splices at pull points and elsewhere as indicated; use standard kits.

E. Install terminations at ends of conductors and seal multiconductor cable ends with standard kits.

F. Install separable insulated-connector components as follows:

1. Protective Cap: At each terminal junction, with one on each terminal to which no feeder is indicated to be connected.
2. Portable Feed-Through Accessory: Three.
3. Standoff Insulator: Three.

G. Arc Proofing: Unless otherwise indicated, arc proof medium-voltage cable at locations not protected by conduit, cable tray, direct burial, or termination materials. In addition to arc-proofing tape manufacturer's written instructions, apply arc proofing as follows:
1. Clean cable sheath.
2. Wrap metallic cable components with 10-mil pipe-wrapping tape.
3. Smooth surface contours with electrical insulation putty.
4. Apply arc-proofing tape in one half-lapped layer with coated side toward cable.
5. Band arc-proofing tape with 1-inch wide bands of half-lapped, adhesive, glass-cloth tape 2 inches o.c.

H. Seal around cables passing through fire-rated elements according to Division 07 Section "Penetration Firestopping."

I. Ground shields of shielded cable at terminations, splices, and separable insulated connectors. Ground metal bodies of terminators, splices, cable and separable insulated-connector fittings, and hardware.

J. Identify cables according to Division 26 Section "Identification for Electrical Systems."

3.2 FIELD QUALITY CONTROL

A. Testing: Engage a qualified testing and inspecting agency to perform the following field tests and inspections and prepare test reports:

B. Perform the following field tests and inspections and prepare test reports:
1. Perform each visual and mechanical inspection and electrical test stated in NETA ATS. Certify compliance with test parameters.
2. After installing medium-voltage cables and before electrical circuitry has been energized, test for compliance with requirements.

C. Allow for torque witnessing of all medium voltage connections and terminations. Provide owner seven working days advance notice.

D. Cables: Perform the following tests on cables size 1/0 and larger, unless noted otherwise. Provide torque witness testing per this Specification.

1. Medium-Voltage Cables:

a. Perform visual and mechanical inspection as follows:

1) Inspect exposed sections for physical damage.
2) Verify cable is supplied and connected in accordance with single-line diagram.
3) Inspect for shield grounding, cable support, and termination.
4) Check for visible cable bends against ICEA or manufacturer's minimum allowable bending radius.
5) Inspect for proper fireproofing in common cable areas.

6) If cables are terminated through window-type CT's, make an inspection to verify that neutrals and grounds are properly terminated for proper operation of protective devices.
7) Visually inspect jacket and insulation condition.
8) Inspect for proper phase identification and arrangement.

b. Perform electrical tests as follows:

1) Perform a shield continuity test on each power cable by the ohmmeter method. Record ohmic value.
2) Perform an insulation-resistance test utilizing a megohmmeter with a voltage output of at least 2500 volts. Individually test each conductor with all other conductors and shields grounded. Test duration shall be one minute.
3) Perform a dc high-potential test on all cables. Adhere to all precautions and limits as specified in the applicable NEMA/ICEA Standard for the specific cable. Perform tests in accordance with ANSI/IEEE Std. 400. Test procedure shall be as follows, and the results for each cable test shall be recorded as specified herein. Test voltages shall not exceed 80% of cable manufacturer's factory test value or the maximum test voltage in NETA ATS. Overpotential tests shall not be performed until insulation-resistance levels are above minimum values.
    a) Current-sensing circuits in test equipment shall measure only the leakage current associated with the cable under test and shall not include internal leakage of the test equipment.
    b) Record wet- and dry-bulb temperatures or relative humidity and temperature.
    c) Test each section of cable individually.
    d) Individually test each conductor with all other conductors grounded. Ground all shields.
    e) Terminations shall be properly corona-suppressed by guard ring, field reduction sphere, or other approved methods as necessary.
    f) Ensure that the maximum test voltage does not exceed the limits for terminators specified in IEEE Standard 48 or Manufacturer's specification.
    g) Apply a dc high-potential test in at least five equal increments until maximum test voltage is reached. No increment shall exceed the voltage rating of the cable. Record dc leakage current at each step after a constant stabilization time consistent with system charging current.
    h) Raise the conductor to the specified maximum test voltage and hold for fifteen minutes. Record readings of leakage current at 30 seconds and one minute and at one-minute intervals thereafter.
    i) Reduce the conductor test potential to zero and measure residual voltage at discrete intervals.
    j) Apply grounds for a time period adequate to drain all insulation-stored charge.

c. Test Values:

1) Shielding must exhibit continuity. Investigate resistance values in excess of 10 ohms per 1000 feet of cable.

E. A graphic plot shall be made with leakage current (X axis) versus voltage (Y axis) at each increment. The step voltage slope shall be reasonably linear. Absorption slope shall be flat or negative. In no case shall slope exhibit a positive characteristic

F. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION 260513

SECTION 26 05 19 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.

B. Related Sections include the following:

1. Division 26 Section "Medium-Voltage Cables" for single-conductor and multiconductor cables, cable splices, and terminations for electrical distribution systems with 2001 to 35,000 V.
2. Division 27 Section "Communications Horizontal Cabling" for cabling used for voice and data circuits.
3. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
4. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 DEFINITIONS

A. EPDM: Ethylene-propylene-diene terpolymer rubber.

B. NBR: Acrylonitrile-butadiene rubber.

1.4 MRc2: CONSTRUCTION WASTE MANAGEMENT

A. No less than the specified minimum proportion of all construction waste from the project shall be diverted from disposal in a landfill and/or incineration in accordance with the project requirements for Construction Waste Management. See Section 018113 Sustainable Design Requirements.

B. EQc4.1: LOW-EMITTING MATERIALS – SEALANTS AND ADHESIVES

All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the project requirements for Low-Emitting Materials – Sealants and Adhesives. See Section 018113 Sustainable Design Requirements.

Contractor shall provide LEED credit verification as per Section 013300 Submittal Procedures.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Field quality-control test reports.

1.7 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

1.8 WARRANTY

A. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Alcan Products Corporation; Alcan Cable Division.
2. American Insulated Wire Corp.; a Leviton Company.
3. General Cable Corporation.
4. Senator Wire & Cable Company.
5. Southwire Company.

B. Copper Conductors: Comply with NEMA WC 70.

C. Conductor Insulation: Comply with NEMA WC 70 for Types THHN-THWN **.**

D. Multiconductor Cable: Comply with NEMA WC 70 for metal-clad cable, Type MC, mineral-insulated, metal-sheathed cable, Type MI with ground wire.

2.2 CONNECTORS AND SPLICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AFC Cable Systems, Inc.
2. Hubbell Power Systems, Inc.
3. O-Z/Gedney; EGS Electrical Group LLC.
4. 3M; Electrical Products Division.
5. Tyco Electronics Corp.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN-THWN, single conductors in raceway..

B. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway.

C. Feeders Installed below Raised Flooring: single conductors in Metal-clad cable, Type MC.

D. Exposed Branch Circuits, Including in Crawlspaces: Type THHN-THWN, single conductors in raceway.

E. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.

F. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway**.**

G. Branch Circuits in Cable Tray: Type THHN-THWN, single conductors in raceway.

H. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.

I. Class 1 Control Circuits: Type THHN-THWN, in raceway.

J. Class 2 Control Circuits: Type THHN-THWN, in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.

B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

D. Support cables according to Division 26 Section "Hangers and Supports for Electrical Systems."

E. Identify and color-code conductors and cables according to Division 26 Section "Identification for Electrical Systems."

3.4 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

1. Use oxide inhibitor in each splice and tap conductor for aluminum conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.5 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Division 07 Section "Penetration Firestopping."

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections and prepare test reports.

B. Perform tests and inspections and prepare test reports.

C. Tests and Inspections:

1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors, and conductors feeding the critical equipment and services for compliance with requirements.

2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

3. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, and at 11 months after date of acceptance, perform an infrared scan of each splice in cables and conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner.

    a. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
    b. Record of Infrared Scanning: Prepare a certified report that identifies splices checked and that describes scanning results. Include notation of deficiencies detected, remedial actiontaken, and observations after remedial action.

D. Test Reports: Prepare a written report to record the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

E. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION 260519

SECTION 26 05 26 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes: Grounding systems and equipment.

B. Section includes grounding systems and equipment, plus the following special applications:

1. Underground distribution grounding.
2. Ground bonding common with lightning protection system.

C. Related Requirements:

1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 MRc2: Construction Waste Management

A. No less than the specified minimum proportion of all construction waste from the project shall be diverted from disposal in a landfill and/or incineration in accordance with the project requirements for Construction Waste Management. See Section 018113 Sustainable Design Requirements.

B. EQc4.1: LOW-EMITTING MATERIALS – SEALANTS AND ADHESIVES

All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the project requirements for Low-Emitting Materials – Sealants and Adhesives. See Section 018113 Sustainable Design Requirements.

Contractor shall provide LEED credit verification as per Section 013300 Submittal Procedures.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Informational Submittals: Plans showing dimensioned as-built locations of grounding features specified in "Field Quality Control" Article, including the following:

1. Test wells.
2. Ground rods.
3. Ground rings.
4. Grounding arrangements and connections for separately derived systems.
5. Grounding for sensitive electronic equipment.

C. Qualification Data: For qualified testing agency and testing agency's field supervisor.

D. Field quality-control reports.

E. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

a. Tests shall determine if ground-resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if values do not.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 CONDUCTORS

A. Insulated Conductors**:** Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Tinned Conductors: ASTM B 33.
3. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
4. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
5. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

2.2 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, pressure type with at least two bolts.

1. Pipe Connectors: Clamp type, sized for pipe.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

D. Bus-bar Connectors: Mechanical type, cast silicon bronze, solderless compression type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2.3 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad; 3/4 inch by 10 feet in diameter.

B. Chemical-Enhanced Grounding Electrodes: Copper tube, straight or L-shaped, charged with

1. Termination: Factory-attached No. 4/0 AWG bare conductor at least 48 inches long.
2. Backfill Material: Electrode manufacturer's recommended material.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

B. Underground Grounding Conductors: Install bare copper conductor, No. 2/0 AWG minimum.

1. Bury at least 24 inches below grade.

C. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.

D. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

1. Install bus on insulated spacers 2 inches minimum from wall, 6 inches above finished floor unless otherwise indicated.

2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down to specified height above floor; connect to horizontal bus.

E. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
3. Connections to Structural Steel: Welded connectors.

3.2 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

A. Comply with IEEE C2 grounding requirements.

B. Grounding Manholes and Handholes: Install a driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inches will extend above finished floor. If necessary, install ground rod before manhole is placed and provide No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches above to 6 inches below concrete. Seal floor opening with waterproof, nonshrink grout.

C. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper bonding conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields according to written instructions by manufacturer of splicing and termination kits.

D. Pad-Mounted Transformers and Switches: Install two ground rods and ground ring around the pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes. Install tinned-copper conductor not less than No. 2 AWG for ground ring and for taps to equipment grounding terminals. Bury ground ring not less than 6 inches from the foundation.

3.3 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:

1. Feeders and branch circuits.
2. Lighting circuits.
3. Receptacle circuits.
4. Single-phase motor and appliance branch circuits.
5. Three-phase motor and appliance branch circuits.
6. Flexible raceway runs.
7. Armored and metal-clad cable runs.

8. Busway Supply Circuits: Install insulated equipment grounding conductor from grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.
9. Rack-Mounted Electronic Equipment Circuits: Install insulated equipment grounding conductor in branch-circuit runs from equipment-area power panels and power-distribution units.
10. X-Ray Equipment Circuits: Install insulated equipment grounding conductor in circuits supplying x-ray equipment.

C. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

D. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

E. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.

F. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply circuit raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate insulated equipment grounding conductor. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.

G. Signal and Communication Equipment: In addition to grounding and bonding required by NFPA 70, provide a separate grounding system complying with requirements in TIA/ATIS J-STD-607-A.

1. For telephone, alarm, voice and data, and other communication equipment, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.
2. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-4-by-12-inch grounding bus.
3. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

H. Metal Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

3.4 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.

C. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade unless otherwise indicated.

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
2. For grounding electrode system, install at **least three** rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.

D. Test Wells: Ground rod driven through drilled hole in bottom of handhole. Handholes are specified in Division 26 Section "Underground Ducts and Raceways for Electrical Systems," and shall be at least 12 inches deep, with cover.

1. Test Wells: Install at least one test well for each service unless otherwise indicated. Install at the ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.

E. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

F. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

G. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install tinned bonding jumper to bond across flexible duct connections to achieve continuity.

H. Ground Ring: Install a grounding conductor, electrically connected to each building structure ground rod and to each steel column, extending around the perimeter of building.

1. Install tinned-copper conductor not less than No. 2/0 AWG for ground ring and for taps to building steel.
2. Bury ground ring not less than 24 inches from building's foundation.

I. Ufer Ground (Concrete-Encased Grounding Electrode): Fabricate according to NFPA 70; use a minimum **of** 20 feet of bare copper conductor not smaller than No. 4AWG.

1. If concrete foundation is less than 20 feet long, coil excess conductor within base of foundation.
2. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building's grounding grid or to grounding electrode external to concrete.

3.5 LABELING

A. Comply with requirements in Division 26 Section "Identification for Electrical Systems" Article for instruction signs. The label or its text shall be green.

B. Install labels at the telecommunications bonding conductor and grounding equalizer

1. Label Text: "If this connector or cable is loose or if it must be removed for any reason, notify the facility manager."

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Engag**e** a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

D. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at ground test wells[, and at individual ground rods. Make tests at ground rods before any conductors are connected.

a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
b. Perform tests by fall-of-potential method according to IEEE 81.

4. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

E. Grounding system will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

G. Report measured ground resistances that exceed the following values:

1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 ohms.
3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
4. Power Distribution Units or Panelboards Serving Electronic Equipment: 3 ohms.
5. Substations and Pad-Mounted Equipment: **5**ohms.
6. Manhole Grounds: 10 ohms.

H. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 260526

SECTION 26 05 29 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Hangers and supports for electrical equipment and systems.

B. Construction requirements for concrete bases. Related Sections include the following:

1. Division 26 Section "Vibration And Seismic Controls For Electrical Systems" for products and installation requirements necessary for compliance with seismic criteria.

C. Related Requirements:

1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. RMC: Rigid metal conduit.

1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

D. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.5 MRc2: CONSTRUCTION WASTE MANAGEMENT

A. No less than the specified minimum proportion of all construction waste from the project shall be diverted from disposal in a landfill and/or incineration in accordance with the project requirements for Construction Waste Management. See Section 018113 Sustainable Design Requirements.

B. EQc4.1: LOW-EMITTING MATERIALS – SEALANTS AND ADHESIVES

All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the project requirements for Low-Emitting Materials – Sealants and Adhesives. See Section 018113 Sustainable Design Requirements.

Contractor shall provide LEED credit verification as per Section 013300 Submittal Procedures.

C. EQc4.2: LOW-EMITTING MATERIALS – PAINTS AND COATINGS

All paints and coatings used in the building interior comply with the project requirements for Low-Emitting Materials – Paints and Coatings. See Section 018113 Sustainable Design Requirements.

Contractor shall provide LEED credit verification as per Section 013300 Submittal Procedures

1.6 SUBMITTALS

A. Product Data: For the following:

1. Steel slotted support systems.
2. Nonmetallic slotted support systems.

B. Shop Drawings: Show fabrication and installation details and include calculations for the following:

1. Trapeze hangers. Include Product Data for components.
2. Steel slotted channel systems. Include Product Data for components.
3. Nonmetallic slotted channel systems. Include Product Data for components.
4. Equipment supports.

C. Welding certificates.

1.7 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Comply with NFPA 70.

1.8 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07 Section "Roof Accessories."

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Allied Tube & Conduit.
      b. Cooper B-Line, Inc.; a division of Cooper Industries.
      c. ERICO International Corporation.
      d. GS Metals Corp.
      e. Thomas & Betts Corporation.
      f. Unistrut; Tyco International, Ltd.
      g. Wesanco, Inc.
   2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
   3. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
   4. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
   5. Channel Dimensions: Selected for applicable load criteria.

B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

C. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
   1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
b. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Hilti Inc.
2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
3) MKT Fastening, LLC.
4) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.

2. Mechanical-Expansion Anchors: Insert-wedge-type, stainless steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.

a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
b. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Cooper B-Line, Inc.; a division of Cooper Industries.
2) Empire Tool and Manufacturing Co., Inc.
3) Hilti Inc.
4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
5) MKT Fastening, LLC.

3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

B. Materials: Comply with requirements in Division 05 Section "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.

B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.

C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Raceway Support Methods: In addition to methods described in NECA 1, [EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.

C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb .

D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To New Concrete: Bolt to concrete inserts.
2. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
3. To Existing Concrete: Expansion anchor fasteners.
4. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
5. To Steel: Beam clamps MSS Type 19, 21, 23, 25, or 27 complying with MSS SP-69.
6. To Light Steel: Sheet metal screws.
7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.
8. Drill holes for exp Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.

E. Expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements in Division 05 Section "Metal Fabrications" for site-fabricated metal supports.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

A. Construct concrete bases of dimensions indicated but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

B. Use 3000-psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Division 03 Section Cast-in-Place Concrete.

C. Anchor equipment to concrete base.

1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor bolts to elevations required for proper attachment to supported equipment.
3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 260529

SECTION 26 05 33 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

B. Related Sections include the following:

1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.

2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

3. Division 26 Section "Underground Ducts and Raceways for Electrical Systems" for exterior ductbanks, manholes, and underground utility construction

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. RGS: Rigid metal conduit.

C. EPDM: Ethylene-propylene-diene terpolymer rubber.

D. FMC: Flexible metal conduit.

E. IMC: Intermediate metal conduit.

F. LFMC: Liquidtight flexible metal conduit.

G. LFNC: Liquidtight flexible nonmetallic conduit.

H. NBR: Acrylonitrile-butadiene rubber.

I. RNC: Rigid nonmetallic conduit.

1.4 MRc2: CONSTRUCTION WASTE MANAGEMENT

A. No less than the specified minimum proportion of all construction waste from the project shall be diverted from disposal in a landfill and/or incineration in accordance with the project requirements for Construction Waste Management. See Section 018113 Sustainable Design Requirements.

B. EQc4.1: LOW-EMITTING MATERIALS – SEALANTS AND ADHESIVES

All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the project requirements for Low-Emitting Materials – Sealants and Adhesives. See Section 018113 Sustainable Design Requirements.

Contractor shall provide LEED credit verification as per Section 013300 Submittal Procedures.

C. EQc4.2: LOW-EMITTING MATERIALS – PAINTS AND COATINGS

All paints and coatings used in the building interior comply with the project requirements for Low-Emitting Materials – Paints and Coatings. See Section 018113 Sustainable Design Requirements.

Contractor shall provide LEED credit verification as per Section 013300 Submittal Procedures.

1.5 SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. Shop Drawings: For the following raceway components. Include plans, elevations, sections, details, and attachments to other work.

1. Custom enclosures and cabinets.
2. For handholes and boxes for underground wiring, including the following:

    a. Duct entry provisions, including locations and duct sizes.
    b. Frame and cover design.
    c. Grounding details.
    d. Dimensioned locations of cable rack inserts, and pulling-in and lifting irons.
    e. Joint details.

C. Samples for Initial Selection**:** For wireways, surface raceways with factory-applied texture and color finishes.

D. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

1. Structural members in the paths of conduit groups with common supports.
2. HVAC and plumbing items and architectural features in the paths of conduit groups with common supports.

E. Qualification Data: For professional engineer and testing agency.

F. Manufacturer Seismic Qualification Certification: Submit certification that enclosures and cabinets and their mounting provisions, including those for internal components, will withstand seismic forces defined in Division 26 Section "Vibration and Seismic Controls for Electrical Systems." Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

a. The term "withstand" means "the cabinet or enclosure will remain in place without separation of any parts when subjected to the seismic forces specified.

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

G. Source quality-control test reports.

1.6 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.7 Comply with NFPA 70. WARRANTY

A. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND TUBING

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AFC Cable Systems, Inc.
2. Alflex Inc.
3. Allied Tube & Conduit; a Tyco International Ltd. Co.
4. Anamet Electrical, Inc.; Anaconda Metal Hose.
5. Electri-Flex Co.
6. Manhattan/CDT/Cole-Flex.
7. Maverick Tube Corporation.
8. O-Z Gedney; a unit of General Signal.
9. Wheatland Tube Company.

B. Rigid Steel Conduit: ANSI C80.1.

C. IMC: ANSI C80.6.

D. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit..

1. Comply with NEMA RN 1.
2. Coating Thickness: 0.040 inch) minimum.

E. EMT: ANSI C80.3.

F. FMC: Zinc-coated steel.

G. LFMC: Flexible steel conduit with PVC jacket.

H. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.

1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886.
2. Fittings for EMT: Steel, compression type.
3. Coating for Fittings for PVC-Coated Conduit: Minimum thickness, 0.040 inch with overlapping sleeves protecting threaded joints.

I. Joint Compound for Rigid Steel Conduit or IMC: Listed for use in cable connector assemblies, and compounded for use to lubricate and protect threaded raceway joints from corrosion and enhance their conductivity.

2.2 NONMETALLIC CONDUIT

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AFC Cable Systems, Inc.
2. Anamet Electrical, Inc.; Anaconda Metal Hose.
3. Arnco Corporation.
4. CANTEX Inc.
5. CertainTeed Corp.; Pipe & Plastics Group.
6. Condux International, Inc.
7. ElecSYS, Inc.
8. Electri-Flex Co.
9. Lamson & Sessions; Carlon Electrical Products.
10. Manhattan/CDT/Cole-Flex.
11. RACO; a Hubbell Company.
12. Thomas & Betts Corporation.

B. RNC: NEMA TC 2, Type EPC-40-PVC**,** unless otherwise indicated.

C. LFNC: UL 1660.

D. Fittings for ENT and RNC: NEMA TC 3; match to conduit or tubing type and material.

E. Fittings for LFNC: UL 514B.

2.3 METAL WIREWAYS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper B-Line, Inc.
2. Hoffman.
3. Square D; Schneider Electric.

C. Description: Sheet metal sized and shaped as indicated, NEMA 250, Type 1, unless otherwise indicated.

D. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

E. Finish: Manufacturer's standard enamel finish.

2.4 SURFACE RACEWAYS

A. Surface Metal Raceways: Galvanized steel with snap-on covers. Manufacturer's standard enamel finish in color selected by Architect.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Thomas & Betts Corporation.
b. Walker Systems, Inc.; Wiremold Company (The).
c. Wiremold Company (The); Electrical Sales Division.

2.5 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
2. EGS/Appleton Electric.
3. Erickson Electrical Equipment Company.
4. Hoffman.
5. Hubbell Incorporated; Killark Electric Manufacturing Co. Division.
6. O-Z/Gedney; a unit of General Signal.
7. RACO; a Hubbell Company.
8. Robroy Industries, Inc.; Enclosure Division.
9. Scott Fetzer Co.; Adalet Division.
10. Spring City Electrical Manufacturing Company.
11. Thomas & Betts Corporation.
12. Walker Systems, Inc.; Wiremold Company (The).
13. Woodhead, Daniel Company; Woodhead Industries, Inc. Subsidiary.

B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.

C. Cast-Metal Outlet and Device Boxes: NEMA FB 1**,** aluminum, Type FD, with gasketed cover.

D. Metal Floor Boxes: Cast or sheet metal, rectangular.

E. Nonmetallic Floor Boxes: Nonadjustable, round.

F. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

G. Cast-Metal Access, Pull, and Junction Boxes: NEMA FB 1, with gasketed cover.

H. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous-hinge cover with flush latch, unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.

I. Cabinets:

1. NEMA 250, Type 1, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.

2.6 SLEEVES FOR RACEWAYS

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

C. Sleeves for Rectangular Openings: Galvanized sheet steel with minimum 0.052- or 0.138-inch thickness as indicated and of length to suit application.

D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."

2.7 SLEEVE SEALS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide a comparable product by one of the following:

1. Advance Products & Systems, Inc.
2. Calpico, Inc.

3. Metraflex Co.
4. Pipeline Seal and Insulator, Inc.

C. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and cable.

1. Sealing Elements: EPDM, NBR interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
2. Pressure Plates: Stainless steel. Include two for each sealing element.
3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.8 SOURCE QUALITY CONTROL FOR UNDERGROUND ENCLOSURES

A. Handhole and Pull-Box Prototype Test: Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.

1. Tests of materials shall be performed by a independent testing agency.
2. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.
3. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012, and traceable to NIST standards.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:

1. Exposed Conduit: Rigid steel conduit.
2. Concealed Conduit, Aboveground: RNC, Type EPC-40-PVC.
3. Underground Conduit: RNC, Type EPC-40 PVC, direct buried.
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC**.**
5. Boxes and Enclosures, Aboveground: NEMA 250, Type 4X.

B. Comply with the following indoor applications, unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT, Rigid steel conduit areas access to inmates conduit below 11’ aff and garage area.
2. Exposed and Subject to Severe Physical Damage: Rigid steel conduit. Includes raceways in the following locations:

    a. Loading dock.
    b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
    c. Mechanical rooms.
    d. Areas access to inmates below 11’ aff.

e. Garage

3. Concealed in Ceilings and Interior Walls and Partitions: EMT.
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
5. Damp or Wet Locations: Rigid steel conduit
6. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4, stainless steel in damp or wet locations.

C. Minimum Raceway Size: 3/4-inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with that material. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer.

3.2 INSTALLATION

A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.

B. Keep raceways at least 6 inches)away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation.

D. Support raceways as specified in Division 26 Section "Hangers and Supports for Electrical Systems."

E. Arrange stub-ups so curved portions of bends are not visible above the finished slab.

F. Install no more than the equivalent of teo 90-degree bends in any conduit run for communications conduits.

G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.

H. Raceways Embedded in Slabs:

1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
3. Change from ENT to RNC, Type EPC-40-PVC, rigid steel conduit, or IMC before rising above the floor.

I. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

J. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.

K. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.

L. Raceways for Optical Fiber and Communications Cable: Install raceways, metallic and nonmetallic, rigid and flexible, as follows:

1. 3/4-Inch Trade Size and Smaller: Install raceways in maximum lengths of 50 feet'.
2. 1-Inch Trade Size and Larger: Install raceways in maximum lengths of 75 feet .
3. Install with a maximum of two 90-degree bends or equivalent for each length of raceway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes or terminations at distribution frames or cabinets where necessary to comply with these requirements.

M. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where otherwise required by NFPA 70.

N. Expansion-Joint Fittings for RNC: Install in each run of aboveground conduit that is located where environmental temperature change may exceed 30 deg F and that has straight-run length that exceeds 25 feet .

1. Install expansion-joint fittings for each of the following locations, and provide type and quantity of fittings that accommodate temperature change listed for location:

   a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg temperature change.
2. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at the time of installation.

O. Flexible Conduit Connections: Use maximum of 72 inches of flexible conduit for recessed and semi-recessed lighting fixtures for areas not accessible to inmates**,** equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations subject to severe physical damage.

P. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall.

Q. Set metal floor boxes level and flush with finished floor surface.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Division 31 Section "Earth Moving" for pipe less than 6 inches in nominal diameter.
2. Install backfill as specified in Division 31 Section "Earth Moving."
3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Division 31 Section "Earth Moving."
4. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through the floor.

    a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete.
    b. For stub-ups at equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches from edge of equipment pad or foundation. Install insulated grounding bushings on terminations at equipment.

5. Warning Planks: Bury warning planks approximately 12 inches above direct-buried conduits, placing them 24 inches o.c. Align planks along the width and along the centerline of conduit.

3.4 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."

B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

D. Rectangular Sleeve Minimum Metal Thickness:

1. For sleeve cross-section rectangle perimeter less than 50 inches and no side greater than 16 inches , thickness shall be 0.052 inch

E. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

F. Extend sleeves installed in floors 2 inches above finished floor level.

G. Seal space outside of sleeves with grout for penetrations of concrete and masonry and with approved joint compound for gypsum board assemblies.

H. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway, using joint sealant appropriate for size, depth, and location of joint. Refer to Division 07 Section "Joint Sealants" for materials and installation.

I. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway penetrations. Install sleeves and seal with firestop materials. Comply with Division 07 Section "Penetration Firestopping."

J. Roof-Penetration Sleeves: Seal penetration of individual raceways with flexible, boot-type flashing units applied in coordination with roofing work.

K. Aboveground, Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

L. Underground, Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for 1-inch annular clear space between raceway and sleeve for installing mechanical sleeve seals.

3.5 SLEEVE-SEAL INSTALLATION

A. Install to seal underground, exterior wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for raceway material and size. Position raceway in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.6 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping."

3.7 PROTECTION

A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

SECTION 26 05 36 - CABLE TRAYS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Ladder cable trays.
2. Wire-basket cable trays.

B. Related Requirements:

1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of cable tray.

1. Include data indicating dimensions and finishes for each type of cable tray indicated.

B. Shop Drawings: For each type of cable tray.

1. Show fabrication and installation details of cable trays, including plans, elevations, and sections of components and attachments to other construction elements. Designate components and accessories, including clamps, brackets, hanger rods, splice-plate connectors, expansion-joint assemblies, straight lengths, and fittings.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Floor plans and sections, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Include scaled cable tray layout and relationships between components and adjacent structural, electrical, and mechanical elements.
2. Vertical and horizontal offsets and transitions.
3. Clearances for access above and to side of cable trays.
4. Vertical elevation of cable trays above the floor or below bottom of ceiling structure.

B. Seismic Qualification Certificates: For cable trays, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Field quality-control reports.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design cable tray supports and seismic bracing.

2.2 GENERAL REQUIREMENTS FOR CABLE TRAYS

A. Cable Trays and Accessories: Identified as defined in NFPA 70 and marked for intended location, application, and grounding.

1. Source Limitations: Obtain cable trays and components from single manufacturer.

B. Sizes and Configurations: See the Cable Tray Schedule on Drawings for specific requirements for types, materials, sizes, and configurations.

C. Structural Performance: See articles for individual cable tray types for specific values for the following parameters:

1. Uniform Load Distribution: Capable of supporting a uniformly distributed load on the indicated support span when supported as a simple span and tested according to NEMA VE 1.
2. Concentrated Load: A load applied at midpoint of span and centerline of tray.
3. Load and Safety Factors: Applicable to both side rails and rung capacities.

2.3 LADDER CABLE TRAYS

A. Description:

1. Configuration: Two I-beam side rails with transverse rungs welded to side rails.
2. Rung Spacing: **12 inches** o.c.
3. Radius-Fitting Rung Spacing: 9 inches at center of tray's width.
4. Minimum Cable-Bearing Surface for Rungs: 7/8-inch width with radius edges.
5. No portion of the rungs shall protrude below the bottom plane of side rails.
6. Structural Performance of Each Rung: Capable of supporting a maximum cable load, with a safety factor of 1.5, plus a 200-lb concentrated load, when tested according to NEMA VE 1.

7. Minimum Usable Load Depth: **4 inches.**
8. Straight Section Lengths: **10 feet** except where shorter lengths are required to facilitate tray assembly.
9. Width: **12** unless otherwise indicated on Drawings.
10. Fitting Minimum Radius: **24 inches.**
11. Splicing Assemblies: Bolted type using serrated flange locknuts.
12. Hardware and Fasteners: **ASTM F 593 and ASTM F 594 stainless steel, Type 316.**
13. Splice Plate Capacity: Splices located within support span shall not diminish rated loading capacity of cable tray.

2.4 WIRE-BASKET

A. Description:

1. Configuration: Wires are formed into a standard 2-by-4-inch wire mesh pattern with intersecting wires welded together. Mesh sections must have at least one bottom longitudinal wire along entire length of section.
2. Materials: High-strength-steel longitudinal wires with no bends.
3. Safety Provisions: Wire ends along wire-basket sides (flanges) rounded during manufacturing to maintain integrity of cables and installer safety.

4. Connector Assemblies: Bolt welded to plate shaped to fit around adjoining tray wires and mating plate. Mechanically joins adjacent tray wires to splice sections together or to create horizontal fittings.
5. Connector Assembly Capacity: Splices located within support span shall not diminish rated loading capacity of cable tray.
6. Hardware and Fasteners: **ASTM F 593 and ASTM F 594 stainless steel, Type 316** .

2.5 MATERIALS AND FINISHES

A. Steel:

1. Straight Section and Fitting Side Rails and Rungs: Steel complies with the minimum mechanical properties of **ASTM A 1011/A 1011M, SS, Grade 33**.
2. Steel Tray Splice Plates: ASTM A 1011/A 1011M, HSLAS, Grade 50, Class 1.
3. Fasteners: Steel complies with the minimum mechanical properties of ASTM A 510/A 510M, Grade 1008.
4. Finish: Mill galvanized before fabrication.

   a. Standard: Comply with ASTM A 653/A 653M, G90.
   b. Hardware: **Galvanized, ASTM B 633**.

2.6 CABLE TRAY ACCESSORIES

A. Fittings: Tees, crosses, risers, elbows, and other fittings as indicated, of same materials and finishes as cable tray.

B. Barrier Strips: Same materials and finishes as for cable tray.

C. Cable tray supports and connectors, including bonding jumpers, as recommended by cable tray manufacturer.

2.7 SOURCE QUALITY CONTROL

A. Testing: Test and inspect cable trays according to **NEMA FG 1**.

PART 3 - EXECUTION

3.1 CABLE TRAY INSTALLATION

A. Install cable trays according to **NEMA FG 1**.

B. Install ladder cable trays inside IDF and MDF rooms and wire basket in hallways.

C. Install cable trays as a complete system, including fasteners, hold-down clips, support systems, barrier strips, adjustable horizontal and vertical splice plates, elbows, reducers, tees, crosses, cable dropouts, adapters, covers, and bonding.

D. Install cable trays so that the tray is accessible for cable installation and all splices are accessible for inspection and adjustment.

E. Remove burrs and sharp edges from cable trays.

F. Join aluminum cable tray with splice plates; use four square neck-carriage bolts and locknuts.

G. Fasten cable tray supports to building structure.

H. Design fasteners and supports to carry cable tray, the cables, and a concentrated load of 200 lb. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems.

I. Place supports so that spans do not exceed maximum spans on schedules and provide clearances shown on Drawings. Install intermediate supports when cable weight exceeds the load-carrying capacity of the tray rungs.

J. Construct supports from channel members, threaded rods, and other appurtenances furnished by cable tray manufacturer. Arrange supports in trapeze or wall-bracket form as required by application.

K. Support bus assembly to prevent twisting from eccentric loading.

L. Install center-hung supports for single-rail trays designed for 60 versus 40 percent eccentric loading condition, with a safety factor of 3.

M. Locate and install supports according to **NEMA FG 1**. Do not install more than one cable tray splice between supports.

N. Support wire-basket cable trays with **center support hangers** or **trapeze hangers.**.

O. Support wire-basket trays with **3/8-inch-**diameter rods.

P. Make connections to equipment with flanged fittings fastened to cable trays and to equipment. Support cable trays independent of fittings. Do not carry weight of cable trays on equipment enclosure.

Q. Install expansion connectors where cable trays cross building expansion joints and in cable tray runs that exceed dimensions recommended in **NEMA FG 1.** Space connectors and set gaps according to applicable standard.

R. Make changes in direction and elevation using manufacturer's recommended fittings.

S. Make cable tray connections using manufacturer's recommended fittings.

T. Seal penetrations through fire and smoke barriers. Comply with requirements in Section 078413 "Penetration Firestopping."

U. Install capped metal sleeves for future cables through firestop-sealed cable tray penetrations of fire and smoke barriers.

V. Install cable trays with enough workspace to permit access for installing cables.

W. Install barriers to separate cables of different systems, such as power, communications, and data processing; or of different insulation levels, such as 600, 5000, and 15 000 V.

X. Install permanent covers, if used, after installing cable. Install cover clamps according to NEMA VE 2.

Y. Clamp covers on cable trays installed outdoors with heavy-duty clamps.

Z. Install warning signs in visible locations on or near cable trays after cable tray installation.

3.2 CABLE TRAY GROUNDING

A. Ground cable trays according to NFPA 70 unless additional grounding is specified. Comply with requirements in Section 270526 "Grounding and Bonding for Communications Systems."

B. Cable trays with communications cable shall be bonded together with splice plates listed for grounding purposes or with listed bonding jumpers.

C. Cable trays with control conductors shall be bonded together with splice plates listed for grounding purposes or with listed bonding jumpers.

D. When using epoxy- or powder-coat painted cable trays as a grounding conductor, completely remove coating at all splice contact points or ground connector attachment. After completing splice-to-grounding bolt attachment, repair the coated surfaces with coating materials recommended by cable tray manufacturer.

E. Bond cable trays to power source for cables contained within with bonding conductors sized according to NFPA 70, Article 250.122, "Size of Equipment Grounding Conductors."

3.3 CABLE INSTALLATION

A. Install cables only when each cable tray run has been completed and inspected.

B. Fasten cables on horizontal runs with cable clamps or cable ties according to NEMA VE 2. Tighten clamps only enough to secure the cable, without indenting the cable jacket. Install cable ties with a tool that includes an automatic pressure-limiting device.

C. Fasten cables on vertical runs to cable trays every 18 inches.

D. Fasten and support cables that pass from one cable tray to another or drop from cable trays to equipment enclosures. Fasten cables to the cable tray at the point of exit and support cables independent of the enclosure. The cable length between cable trays or between cable tray and enclosure shall be no more than 72 inches.

E. In existing construction, remove inactive or dead cables from cable trays.

3.4 CONNECTIONS

A. Remove paint from all connection points before making connections. Repair paint after the connections are completed.

B. Connect pathways to cable trays according to requirements in NEMA VE 2 and NEMA FG 1.

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. After installing cable trays and after electrical circuitry has been energized, survey for compliance with requirements.
2. Visually inspect cable insulation for damage. Correct sharp corners, protuberances in cable trays, vibrations, and thermal expansion and contraction conditions, which may cause or have caused damage.
3. Verify that the number, size, and voltage of cables in cable trays do not exceed that permitted by NFPA 70. Verify that communications or data-processing circuits are separated from power circuits by barriers or are installed in separate cable trays.
4. Verify that there are no intruding items such as pipes, hangers, or other equipment in the cable tray.
5. Remove dust deposits, industrial process materials, trash of any description, and any blockage of tray ventilation.
6. Visually inspect each cable tray joint and each ground connection for mechanical continuity. Check bolted connections between sections for corrosion. Clean and retorque in suspect areas.
7. Check for improperly sized or installed bonding jumpers.
8. Check for missing, incorrect, or damaged bolts, bolt heads, or nuts. When found, replace with specified hardware.
9. Perform visual and mechanical checks for adequacy of cable tray grounding; verify that all takeoff raceways are bonded to cable trays. Test entire cable tray system for continuity. Maximum allowable resistance is 1 ohm.

B. Prepare test and inspection reports.

3.6 PROTECTION

A. Protect installed cable trays and cables.

1. Install temporary protection for cables in open trays to safeguard exposed cables against falling objects or debris during construction. Temporary protection for cables and cable

tray can be constructed of wood or metal materials and shall remain in place until the risk of damage is over.

2. Repair damage to galvanized finishes with zinc-rich paint recommended by cable tray manufacturer.
3. Repair damage to paint finishes with matching touchup coating recommended by cable tray manufacturer.

END OF SECTION 270536

SECTION 26 05 43 - UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Conduit, ducts, and duct accessories for concrete-encased duct banks, and in single duct runs.

B. Related Requirements:

1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 DEFINITION

A. RNC: Rigid nonmetallic conduit.

1.4 MRc2: Construction Waste Management

A. No less than the specified minimum proportion of all construction waste from the project shall be diverted from disposal in a landfill and/or incineration in accordance with the project requirements for Construction Waste Management. See Section 018113 Sustainable Design Requirements.

B. EQc4.1: LOW-EMITTING MATERIALS – SEALANTS AND ADHESIVES

All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the project requirements for Low-Emitting Materials – Sealants and Adhesives. See Section 018113 Sustainable Design Requirements.

Contractor shall provide LEED credit verification as per Section 013300 Submittal Procedures.

C. EQc4.2: LOW-EMITTING MATERIALS – PAINTS AND COATINGS

All paints and coatings used in the building interior comply with the project requirements for Low-Emitting Materials – Paints and Coatings. See Section 018113 Sustainable Design Requirements.

Contractor shall provide LEED credit verification as per Section 013300 Submittal Procedures.

1.5 SUBMITTALS

A. Product Data: For the following:

1. Duct-bank materials, including separators and miscellaneous components.
2. Ducts and conduits and their accessories, including elbows, end bells, bends, fittings, and solvent cement.

B. Shop Drawings for Pre-cast or Factory-Fabricated Underground Utility Structures: Include plans, elevations, sections, details, attachments to other work, and accessories, including the following:

1. Duct entry provisions, including locations and duct sizes.
2. Reinforcement details.

C. Duct-Bank Coordination Drawings: Show duct profiles and coordination with other utilities and underground structures.

1. Include plans and sections, drawn to scale, and show bends and locations of expansion fittings.

D. Product Certificates: For concrete and steel used in pre-cast concrete manholes and handholes, as required by ASTM C 858.

E. Source quality-control test reports.

F. Field quality-control test reports.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated

B. Comply with ANSI C2.

C. Comply with NFPA 70.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver ducts to Project site with ends capped. Store nonmetallic ducts with supports to prevent bending, warping, and deforming.

B. Store pre-cast concrete underground utility structures at Project site as recommended by manufacturer to prevent physical damage. Arrange so identification markings are visible.

C. Lift and support pre-cast concrete units only at designated lifting or supporting points.

1.8 COORDINATION

A. Coordinate layout and installation of ducts and boxes with final arrangement of other utilities, site grading, and surface features as determined in the field.

B. Coordinate elevations of ducts and duct-bank entrances into boxes with final locations and profiles of ducts and duct banks as determined by coordination with other utilities, underground obstructions, and surface features. Revise locations and elevations from those indicated as required to suit field conditions.

PART 2 - PRODUCTS

2.2 DUCTS

A. RNC: NEMA TC 2, Type EPC-40-PVC and Type EPC-80-PVC, UL 651, with matching fittings by same manufacturer as the conduit, complying with NEMA TC 3 and UL 514B.

2.3 NONMETALLIC DUCT ACCESSORIES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. ARNCO Corp.
2. Lamson & Sessions; Carlon Electrical Products.
3. Spiraduct/AFC Cable Systems, Inc.
4. Or Approved Equal

B. Duct Accessories:

1. Duct Separators: Factory-fabricated rigid PVC interlocking spacers, sized for type and sizes of ducts with which used, and selected to provide minimum duct spacings indicated while supporting ducts during concreting or backfilling.
2. Warning Tape: Underground-line warning tape specified in Division 26 Section "Identification for Electrical Systems."

2.4 SOURCE QUALITY CONTROL

A. Test and inspect pre-cast concrete utility structures according to ASTM C 1037.

PART 3 - EXECUTION

3.2 UNDERGROUND ENCLOSURE APPLICATION

3.3 EARTHWORK

A. Excavation and Backfill: Do not use heavy-duty, hydraulic-operated, compaction equipment.

B. Restore surface features at areas disturbed by excavation and reestablish original grades, unless otherwise indicated. Replace removed sod immediately after backfilling is completed.

C. Restore areas disturbed by trenching, storing of dirt, cable laying, and other work. Restore vegetation and include necessary topsoiling, fertilizing, liming, seeding, sodding, sprigging, and mulching.

D. Cut and patch existing pavement in the path of underground ducts and utility structures.

3.4 DUCT INSTALLATION

A. Joints: Use solvent-cemented joints in ducts and fittings and make watertight according to manufacturer's written instructions. Stagger couplings so those of adjacent ducts do not lie in same plane.

B. Sealing: Provide temporary closure at terminations of ducts that have cables pulled. Seal spare ducts at terminations. Use sealing compound and plugs to withstand at least 15-psig hydrostatic pressure.

C. Pulling Cord: Install 200-lbf- test nylon cord in ducts, including spares.

D. Concrete-Encased Ducts: Support ducts on duct separators.

1. Separator Installation: Space separators close enough to prevent sagging and deforming of ducts, with not less than 5 spacers per 20 feet of duct. Secure separators to earth and to ducts to prevent floating during concreting. Stagger separators approximately 6 inches between tiers. Tie entire assembly together using fabric straps; do not use tie wires or reinforcing steel that may form conductive or magnetic loops around ducts or duct groups.
2. Concreting Sequence: Pour each run of envelope between manholes or other terminations in one continuous operation.

B. Start at one end and finish at the other, allowing for expansion and contraction of ducts as their temperature changes during and after the pour. Use expansion fittings installed according to manufacturer's written recommendations, or use other specific measures to prevent expansion-contraction damage.

C. If more than one pour is necessary, terminate each pour in a vertical plane and install 3/4-inch reinforcing rod dowels extending 18 inches into concrete on both sides of joint near corners of envelope.

3. Pouring Concrete: Spade concrete carefully during pours to prevent voids under and between conduits and at exterior surface of envelope. Do not allow a heavy mass of concrete to fall directly onto ducts. Use a plank to direct concrete down sides of bank assembly to trench bottom. Allow concrete to flow to center of bank and rise up in middle, uniformly filling all open spaces. Do not use power-driven agitating equipment unless specifically designed for duct-bank application.
4. Forms: Use walls of trench to form side walls of duct bank where soil is self-supporting and concrete envelope can be poured without soil inclusions; otherwise, use forms.
5. Stub-Ups: Use manufactured duct elbows for stub-ups at poles and equipment and at building entrances through the floor, unless otherwise indicated. Extend concrete encasement throughout the length of the elbow.
6. Warning Tape: Bury warning tape approximately 12 inches below grade, above all concrete-encased ducts and duct banks. Align tape parallel to and within 3 inches of the centerline of duct bank.

3.5 GROUNDING

A. Ground underground ducts and utility structures according to Division 26 Section "Grounding and Bonding for Electrical Systems."

3.6 FIELD QUALITY CONTROL

A. Perform the following tests and inspections and prepare test reports:

1. Demonstrate capability and compliance with requirements on completion of installation of underground ducts and utility structures.
2. Pull aluminum or wood test mandrel through duct to prove joint integrity and test for out-of-round duct. Provide mandrel equal to 80 percent fill of duct. If obstructions are indicated, remove obstructions and retest.

B. Correct deficiencies and retest as specified above to demonstrate compliance

3.7 CLEANING

A. Pull leather-washer-type duct cleaner, with graduated washer sizes, through full length of ducts. Follow with rubber duct swab for final cleaning and to assist in spreading lubricant throughout ducts.

B. Clean internal surfaces of manholes, including sump. Remove foreign material.

END OF SECTION 260543

SECTION 26 05 48 - VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Isolation pads.
2. Spring isolators.
3. Restrained spring isolators.
4. Channel support systems.
5. Restraint cables.
6. Hanger rod stiffeners.
7. Anchorage bushings and washers.

B. Related Sections include the following:

1. Division 26 Section "Hangers And Supports For Electrical Systems" for commonly used electrical supports and installation requirements.

C. Related Requirements:

1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 DEFINITIONS

A. The IBC: International Building Code.

B. ICC-ES: ICC-Evaluation Service.

C. OSHPD: Office of Statewide Health Planning and Development for the State of California.

1.4 PERFORMANCE REQUIREMENTS

A. Seismic-Restraint Loading:

1. Site Class as Defined in the IBC: B**.**

2. Assigned Seismic Use Group or Building Category as Defined in the IBC: III.

    a. Component Importance Factor: 1.0.
    b. Component Response Modification Factor: 2.5
    c. Component Amplification Factor: 2.5

3. Design Spectral Response Acceleration at Short Periods (0.2 Second):
4. Design Spectral Response Acceleration at 1.0-Second Period:

1.5 MRc2: CONSTRUCTION WASTE MANAGEMENT

A. No less than the specified minimum proportion of all construction waste from the project shall be diverted from disposal in a landfill and/or incineration in accordance with the project requirements for Construction Waste Management. See Section 018113 Sustainable Design Requirements.

B. EQc4.1: LOW-EMITTING MATERIALS – SEALANTS AND ADHESIVES

All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the project requirements for Low-Emitting Materials – Sealants and Adhesives. See Section 018113 Sustainable Design Requirements.

Contractor shall provide LEED credit verification as per Section 013300 Submittal Procedures.

1.6 SUBMITTALS

A. Product Data: For the following:

1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.
2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic-restraint component used.

    a. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear as evaluated by an agency acceptable to authorities having jurisdiction.
    b. Annotate to indicate application of each product submitted and compliance with requirements.

3. Restrained-Isolation Devices: Include ratings for horizontal, vertical, and combined loads.

B. Delegated-Design Submittal: For vibration isolation and seismic-restraint details indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Design Calculations: Calculate static and dynamic loading due to equipment weight and operation, seismic forces required to select vibration isolators and seismic restraints.

a. Coordinate design calculations with wind-load calculations required for equipment mounted outdoors. Comply with requirements in other Division 26 Sections for equipment mounted outdoors.

2. Indicate materials and dimensions and identify hardware, including attachment and anchorage devices.
3. Field-fabricated supports.
4. Seismic-Restraint Details:

   a. Design Analysis: To support selection and arrangement of seismic restraints. Include calculations of combined tensile and shear loads.
   b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to the restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events.
   c. Preapproval and Evaluation Documentation: By an evaluation service member an agency acceptable to authorities having jurisdiction], showing maximum ratings of restraint items and the basis for approval (tests or calculations).

C. Coordination Drawings: Show coordination of seismic bracing for electrical components with other systems and equipment in the vicinity, including other supports and seismic restraints.

D. Welding certificates.

E. Qualification Data: For professional engineer and testing agency.

F. Field quality-control test reports.

1.7 QUALITY ASSURANCE

A. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.

B. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

C. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage pre-approval OPA number from OSHPD, pre-approval by ICC-ES, or pre-approval by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If pre-approved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

D. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 VIBRATION ISOLATORS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Ace Mountings Co., Inc.
2. Amber/Booth Company, Inc.
3. California Dynamics Corporation.
4. Isolation Technology, Inc.
5. Kinetics Noise Control.
6. Mason Industries.
7. Vibration Eliminator Co., Inc.
8. Vibration Isolation.
9. Vibration Mountings & Controls, Inc.

B. Pads Arrange in single or multiple layers of sufficient stiffness for uniform loading over pad area, molded with a non-slip pattern and galvanized-steel base plates, and factory cut to sizes that match requirements of supported equipment.

1. Resilient Material: Oil- and water-resistant neoprene, rubber, or hermetically sealed compressed fiberglass.

C. Spring Isolators: Freestanding, laterally stable, open-spring isolators.

1. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
2. Minimum Additional Travel: 50 percent of the required deflection at rated load.
3. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
4. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
5. Base-plates: Factory drilled for bolting to structure and bonded to 1/4-inch-(thick, rubber isolator pad attached to base-plate underside. Base-plates shall limit floor load to 500 psig
6. Top Plate and Adjustment Bolt: Threaded top plate with adjustment bolt and cap screw to fasten and level equipment.

D. Restrained Spring Isolators : Freestanding, steel, open-spring isolators with seismic or limit-stop restraint.

1. Housing: Steel with resilient vertical-limit stops to prevent spring extension due to weight being removed; factory-drilled base-plate bonded to 1/4-inch- thick, neoprene or rubber isolator pad attached to base-plate underside; and adjustable equipment mounting and leveling bolt that acts as blocking during installation.
2. Restraint: Seismic or limit-stop as required for equipment and authorities having jurisdiction.
3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
4. Minimum Additional Travel: 50 percent of the required deflection at rated load.
5. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
6. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

2.2 SEISMIC-RESTRAINT DEVICES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Amber/Booth Company, Inc.
2. California Dynamics Corporation.
3. Cooper B-Line, Inc.; a division of Cooper Industries.
4. Hilti Inc.
5. Loos & Co.; Seismic Earthquake Division.
6. Mason Industries.
7. TOLCO Incorporated; a brand of NIBCO INC.
8. Unistrut; Tyco International, Ltd.

B. General Requirements for Restraint Components: Rated strengths, features, and application requirements shall be as defined in reports by an agency acceptable to authorities having jurisdiction.

1. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they will be subjected.

C. Channel Support System: MFMA-3, shop- or field-fabricated support assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; and rated in tension, compression, and torsion forces.

D. Restraint Cables: ASTM A 603 galvanized steel cables with end connections made of steel assemblies with thimbles, brackets, swivels, and bolts designed for restraining cable service; and with a minimum of two clamping bolts for cable engagement.

E. Hanger Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connection to hanger rod. Do not weld stiffeners to rods.

F. Bushings for Floor-Mounted Equipment Anchor: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchors and studs.

G. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings, and matched to type and size of attachment devices.

H. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

I. Mechanical Anchor: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchors with strength required for anchor and as tested according to ASTM E 488. Minimum length of eight times diameter.

J. Adhesive Anchor: Drilled-in and capsule anchor system containing polyvinyl or urethane methacrylate-based resin and accelerator, or injected polymer or hybrid mortar adhesive. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

2.3 FACTORY FINISHES

A. Finish: Manufacturer's standard paint applied to factory-assembled and -tested equipment before shipping.

1. Powder coating on springs and housings.
2. All hardware shall be galvanized. Hot-dip galvanized metal components for exterior use.
3. Baked enamel or powder coat for metal components on isolators for interior use.
4. Color-code or otherwise mark vibration isolation and seismic-control devices to indicate capacity range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and equipment to receive vibration isolation and seismic-control devices for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

A. Multiple Raceways or Cables: Secure raceways and cables to trapeze member with clamps approved for application by an agency acceptable to authorities having jurisdiction.

B. Hanger Rod Stiffeners: Install hanger rod stiffeners where required to prevent buckling of hanger rods due to seismic forces.

C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.

3.3 SEISMIC-RESTRAINT DEVICE INSTALLATION

A. Equipment and Hanger Restraints:

1. Install restrained isolators on electrical equipment.
2. Install resilient, bolt-isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch .
3. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction providing required submittals for component.

B. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.

C. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

D. Drilled-in Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid pre-stressed tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
5. Set anchors to manufacturer's recommended torque, using a torque wrench.
6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.4 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Install flexible connections in runs of raceways, cables, wire-ways, cable trays, and bus-ways where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where they terminate with connection to equipment that is anchored to a different structural element from the one supporting them as they approach equipment.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections and prepare test reports.

B. Perform tests and inspections.

C. Tests and Inspections:

1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
2. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless post-connection testing has been approved), and with at least seven days' advance notice.
3. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.

4. Test at least **four** of each type and size of installed anchors and fasteners selected by Architect.
5. Test to 90 percent of rated proof load of device.
6. Measure isolator restraint clearance.
7. Measure isolator deflection.
8. Verify snubber minimum clearances.
9. If a device fails test, modify all installations of same type and retest until satisfactory results are achieved.

D. Remove and replace malfunctioning units and retest as specified above.

E. Prepare test and inspection reports.

3.6 ADJUSTING

A. Adjust isolators after isolated equipment is at operating weight.

B. Adjust limit stops on restrained spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.

C. Adjust active height of spring isolators.

D. Adjust restraints to permit free movement of equipment within normal mode of operation.

END OF SECTION 260548

SECTION 26 05 53 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Identification for raceways.
2. Identification of power and control cables.
3. Identification for conductors.
4. Underground-line warning tape.
5. Warning labels and signs.
6. Instruction signs.
7. Equipment identification labels.
8. Miscellaneous identification products.

B. Related Requirements:

1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 MRc2: CONSTRUCTION WASTE MANAGEMENT

A. No less than the specified minimum proportion of all construction waste from the project shall be diverted from disposal in a landfill and/or incineration in accordance with the project requirements for Construction Waste Management. See Section 018113 Sustainable Design Requirements.

B. EQc4.1: LOW-EMITTING MATERIALS – SEALANTS AND ADHESIVES

All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the project requirements for Low-Emitting Materials – Sealants and Adhesives. See Section 018113 Sustainable Design Requirements.

Contractor shall provide LEED credit verification as per Section 013300 Submittal Procedures.

1.4 SUBMITTALS

A. Product Data: For each electrical identification product indicated.

B. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.

1.5 QUALITY ASSURANCE

A. Comply with ANSI A13.1 and IEEE C2**.**

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

D. Comply with ANSI Z535.4 for safety signs and labels.

E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

1.6 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

C. Coordinate installation of identifying devices with location of access panels and doors.

D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 POWER RACEWAY IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.

B. Colors for Raceways Carrying Circuits at 600 V or Less:

1. Black letters on an orange field.
2. Legend: Indicate voltage and system or service type**.**

C. Colors for Raceways Carrying Circuits at More Than 600 V:

1. Black letters on an orange field.

2. Legend: "DANGER CONCEALED HIGH VOLTAGE WIRING" with 3-inch- high letters on 20-inch centers.

D. Self-Adhesive Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

E. Snap-Around Labels for Raceways Carrying Circuits at 600 V or Less: Slit, pre-tensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

F. Snap-Around, Color-Coding Bands for Raceways Carrying Circuits at 600 V or Less: Slit, pre-tensioned, flexible, solid-colored acrylic sleeve, 2 inches long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

G. Tape and Stencil for Raceways Carrying Circuits More Than 600 V: 4-inch- wide black stripes on 10-inch centers diagonally over orange background that extends full length of raceway or duct and is 12 inches wide. Stop stripes at legends.

H. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch with stamped legend, punched for use with self-locking cable tie fastener.

2.2 METAL-CLAD CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

B. Colors for Raceways Carrying Circuits at 600 V and Less:

1. Black letters on an orange field.
2. Legend: Indicate voltage.

C. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

D. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; 2 inches wide; compounded for outdoor use.

2.3 POWER AND CONTROL CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

C. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch with stamped legend, punched for use with self-locking cable tie fastener.

1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
2. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

D. Snap-Around Labels: Slit, pre-tensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

E. Snap-Around, Color-Coding Bands: Slit, pre-tensioned, flexible, solid-colored acrylic sleeve, 2 inches long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

2.4 CONDUCTOR IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

C. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

D. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

E. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
2. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

2.5 FLOOR MARKING TAPE

A. 2-inch- wide, 5-mil pressure-sensitive vinyl tape, with black and white stripes and clear vinyl overlay.

2.6 UNDERGROUND-LINE WARNING TAPE

A. Tape:

1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
2. Printing on tape shall be permanent and shall not be damaged by burial operations.

3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.

B. Color and Printing:

1. Comply with ANSI Z535.1 through ANSI Z535.5.
2. Inscriptions for Red-Colored Tapes: ELECTRIC LINE, HIGH VOLTAGE.
3. Inscriptions for Orange-Colored Tapes: TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE.

2.7 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.

C. Baked-Enamel Warning Signs:

1. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
2. 1/4-inch grommets in corners for mounting.
3. Nominal size, 7 by 10 inches.

D. Metal-Backed, Butyrate Warning Signs:

1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch galvanized-steel backing; and with colors, legend, and size required for application.
2. 1/4-inch grommets in corners for mounting.
3. Nominal size, 10 by 14 inches .

E. Warning label and sign shall include, but are not limited to, the following legends:

1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."

2.8 INSTRUCTION SIGNS

A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch thick for signs up to 20 sq. inches and 1/8 inch thick for larger sizes.

1. Engraved legend with black letters on white face.
2. Punched or drilled for mechanical fasteners.
3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

B. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch, Overlay shall provide a weatherproof and UV-resistant seal for label.

2.9 EQUIPMENT IDENTIFICATION LABELS

A. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch, Overlay shall provide a weatherproof and UV-resistant seal for label.

B. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch.

2.10 CABLE TIES

A. General-Purpose Cable Ties: Fungus inert, self extinguishing, one piece, self locking, Type 6/6 nylon.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 deg F, According to ASTM D 638: 12,000 psi.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black except where used for color-coding.

B. Plenum-Rated Cable Ties: Self extinguishing, UV stabilized, one piece, self locking.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 deg F, According to ASTM D 638: 7000 psi.
3. UL 94 Flame Rating: 94V-0.
4. Temperature Range: Minus 50 to plus 284 deg F.
5. Color: Black.

2.11 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in Division 09 painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

E. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

F. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

G. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.

H. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:

1. Outdoors: UV-stabilized nylon.
2. In Spaces Handling Environmental Air: Plenum rated.

I. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches overall.

J. Painted Identification: Comply with requirements in Division 09 painting Sections for surface preparation and paint application.

3.2 IDENTIFICATION SCHEDULE

A. Concealed Raceways, Duct Banks, More Than 600 V, within Buildings: Tape and stencil 4-inch- wide black stripes on 10-inch centers over orange background that extends full length of raceway or duct and is 12 inches wide. Stencil legend "DANGER CONCEALED HIGH VOLTAGE WIRING" with 3-inch- high black letters on 20-inch centers. Stop stripes at legends. Apply to the following finished surfaces:

1. Floor surface directly above conduits running beneath and within 12 inches of a floor that is in contact with earth or is framed above unexcavated space.
2. Wall surfaces directly external to raceways concealed within wall.
3. Accessible surfaces of concrete envelope around raceways in vertical shafts, exposed in the building, or concealed above suspended ceilings.

B. Accessible Raceways Snap-around labels. Install labels at 20-foot maximum intervals.

C. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 120V to ground: Identify with self-adhesive vinyl label or self-adhesive vinyl tape applied in bands. Install labels at 30-foot maximum intervals.

D. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:

1. Emergency Power.
2. Power.
3. UPS.

E. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.

1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded service, feeder and branch-circuit conductors.

a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
b. Colors for 208/120-V Circuits:

1) Phase A: Black.
2) Phase B: Red.
3) Phase C: Blue.
4) Neutral: White
5) Ground: Green

c. Colors for 480/277-V Circuits:

1) Phase A: Brown.
2) Phase B: Orange.
3) Phase C: Yellow.
4) Neutral: White
5) Ground: Green

d. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

F. Power-Circuit Conductor Identification, More than 600 V: For conductors in vaults, pull and junction boxes, manholes, and handholes, use write-on tags or nonmetallic plastic tag holder with adhesive-backed phase tags, and a separate tag with the circuit designation.

G. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.

H. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.

I. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.

1. Limit use of underground-line warning tape to direct-buried cables.
2. Install underground-line warning tape for both direct-buried cables and cables in raceway.

J. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

K. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive warning labels or Baked-enamel warning signs**.**

1. Comply with 29 CFR 1910.145.
2. Identify system voltage with black letters on an orange background.
3. Apply to exterior of door, cover, or other access.
4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:

    a. Power transfer switches.
    b. Controls with external control power connections.

L. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.

M. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch- high letters for emergency instructions at equipment used for power transfer, load shedding.

N. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:

    a. Indoor Equipment: Adhesive film label with clear protective overlay,Self-adhesive, engraved, laminated acrylic or melamine label**,** Unless otherwise indicated, provide a single line of text with 1/2-inch high letters on 1-1/2-inch high label; where two lines of text are required, use labels 2 inches high.
    b. Outdoor Equipment: Engraved, laminated acrylic or melamine label, Stenciled legend 4 inches high.
    c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
    d. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

2. Equipment to Be Labeled:

    a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be self-adhesive, engraved, laminated acrylic or melamine label.
    b. Enclosures and electrical cabinets.
    c. Access doors and panels for concealed electrical items.

d. Switchgear.
e. Switchboards.
f. Transformers: Label that includes tag designation shown on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
g. Substations.
h. Emergency system boxes and enclosures.
i. Motor-control centers.
j. Enclosed switches.
k. Enclosed circuit breakers.
l. Enclosed controllers.
m. Variable-speed controllers.
n. Push-button stations.
o. Power transfer equipment.
p. Contactors.
q. Remote-controlled switches, dimmer modules, and control devices.
r. Battery-inverter units.
s. Battery racks.
t. Power-generating units.
u. Monitoring and control equipment.
v. UPS equipment.

END OF SECTION 260553

SECTION 26 05 73 - OVERCURRENT PROTECTIVE DEVICE COORDINATION STUDY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes computer-based, fault-current, over-current protective device coordination studies, and arc flash hazard analysis. Protective devices shall be set based on results of the protective device coordination study.

B. Related Requirements:

1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 SUBMITTALS

A. Product Data: For computer software program to be used for studies.

B. Product Certificates: For coordination-study and fault-current-study computer software programs, certifying compliance with IEEE 399.

C. Qualification Data: For coordination-study specialist.

D. SKM resident master files upon approval of studies.

E. Other Action Submittals: The following submittals shall be made after the approval process for system protective devices has been completed. Submittals shall be in electronic-copy and hard-copy formats.

1. Coordination-study input data, including completed computer program input data sheets.
2. Study and Equipment Evaluation Reports.
3. Coordination-Study Report.
4. Arc flash hazard analysis.

1.4 QUALITY ASSURANCE

A. Studies shall use computer programs that are distributed nationally and are in wide use. Software algorithms shall comply with requirements of standards and guides specified in this Section. Manual calculations are not acceptable.

B. Coordination-Study Specialist Qualifications: An entity experienced in the application of computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices.

C. Comply with IEEE 242 for short-circuit currents and coordination time intervals.

D. Comply with IEEE 399 for general study procedures.

PART 2 - PRODUCTS

2.1 COMPUTER SOFTWARE DEVELOPERS

A. Available Computer Software Developers: Subject to compliance with requirements, companies offering computer software programs that may be used in the Work include, but are not limited to, the following:
1. SKM Systems Analysis, Inc. (no subsutitution)

2.2 COMPUTER SOFTWARE PROGRAM REQUIREMENTS

A. Comply with IEEE 399.

B. Analytical features of fault-current-study computer software program shall include "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.

C. Computer software program shall be capable of plotting and diagramming time-current-characteristic curves as part of its output. Computer software program shall report device settings and ratings of all over-current protective devices and shall demonstrate selective coordination by computer-generated, time-current coordination plots.

1. Also provide the following features:

a. Arcing faults.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine Project over-current protective device submittals for compliance with electrical distribution system coordination requirements and other conditions affecting performance. Devices to be coordinated are indicated on Drawings.

1. Proceed with coordination study only after relevant equipment submittals have been assembled. Over-current protective devices that have not been submitted and approved prior to coordination study may not be used in study.

3.2 POWER SYSTEM DATA

A. Gather and tabulate the following input data to support coordination study:

1. Product Data for over-current protective devices specified in other Division 26 Sections and involved in over-current protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, over-current protective device submittals, input and output data, and recommended device settings.
2. Impedance of utility service entrance.
3. Electrical Distribution System Diagram: In hard-copy and electronic-copy formats, showing the following:

    a. Circuit-breaker and fuse-current ratings and types.
    b. Relays and associated power and current transformer ratings and ratios.
    c. Transformer kilovolt amperes, primary and secondary voltages, connection type, impedance, and X/R ratios.
    d. Generator kilovolt amperes, size, voltage, and source impedance.
    e. Cables: Indicate conduit material, sizes of conductors, conductor material, insulation, and length.
    f. Bus-way ampacity and impedance.
    g. Motor horsepower and code letter designation according to NEMA MG 1.

4. Data sheets to supplement electrical distribution system diagram, cross-referenced with tag numbers on diagram, showing the following:

    a. Special load considerations, including starting inrush currents and frequent starting and stopping.
    b. Transformer characteristics, including primary protective device, magnetic inrush current, and overload capability.
    c. Motor full-load current, locked rotor current, service factor, starting time, type of start, and thermal-damage curve.
    d. Generator thermal-damage curve.
    e. Ratings, types, and settings of utility company's overcurrent protective devices.
    f. Special overcurrent protective device settings or types stipulated by utility company.
    g. Time-current-characteristic curves of devices indicated to be coordinated.
    h. Manufacturer, frame size, interrupting rating in amperes rms symmetrical, ampere or current sensor rating, long-time adjustment range, short-time adjustment range, and instantaneous adjustment range for circuit breakers.
    i. Manufacturer and type, ampere-tap adjustment range, time-delay adjustment range, instantaneous attachment adjustment range, and current transformer ratio for overcurrent relays.
    j. Panelboards, switchboards, motor-control center ampacity, and interrupting rating in amperes rms symmetrical.

3.3 FAULT-CURRENT STUDY

A. Calculate the maximum available short-circuit current in amperes rms symmetrical at circuit-breaker positions of the electrical power distribution system. The calculation shall be for a current immediately after initiation and for a three-phase bolted short circuit at each of the following:

1. 15 KV switchgear.
2. 480V Switchgear and switchboards.
3. Medium-voltage controller.
4. Motor-control center.
5. Distribution panelboard.
6. Branch circuit panelboard.
7. Existing panelboards in OSTC.

B. Study electrical distribution system from normal and alternate (emergency) power sources throughout electrical distribution system for Project. Include studies of system-switching configurations and alternate operations that could result in maximum fault conditions. Include existing panles in OSTC up to 120/208v, 100A panels and feeders larger than 60A.

C. Calculate momentary and interrupting duties on the basis of maximum available fault current.

D. Calculations to verify interrupting ratings of overcurrent protective devices shall comply with IEEE 141 and IEEE 242.

1. Transformers:

a. ANSI C57.12.10.
b. ANSI C57.12.22.
c. ANSI C57.12.40.
d. IEEE C57.12.00.
e. IEEE C57.96.

2. Low-Voltage Circuit Breakers: IEEE 1015 and IEEE C37.20.1.
3. Low-Voltage Fuses: IEEE C37.46.

E. Study Report:

1. Show calculated X/R ratios and equipment interrupting rating (1/2-cycle) fault currents on electrical distribution system diagram.

F. Equipment Evaluation Report:

1. For 600-V overcurrent protective devices, ensure that interrupting ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.
2. For devices and equipment rated for asymmetrical fault current, apply multiplication factors listed in the standards to 1/2-cycle symmetrical fault current.
3. Verify adequacy of phase conductors at maximum three-phase bolted fault currents; verify adequacy of equipment grounding conductors and grounding electrode conductors at maximum ground-fault currents. Ensure that short-circuit withstand ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.

3.4 COORDINATION STUDY

A. Perform coordination study using approved computer software program. Prepare a written report using results of fault-current study. Comply with IEEE 399.

1. Calculate the maximum and minimum 1/2-cycle short-circuit currents.

2. Calculate the maximum and minimum interrupting duty (5 cycles to 2 seconds) short-circuit currents.
3. Calculate the maximum and minimum ground-fault currents.

B. Comply with IEEE 242 recommendations for fault currents and time intervals.

C. Transformer Primary Overcurrent Protective Devices:

1. Device shall not operate in response to the following:

   a. Inrush current when first energized.
   b. Self-cooled, full-load current or forced-air-cooled, full-load current, whichever is specified for that transformer.
   c. Permissible transformer overloads according to IEEE C57.96 if required by unusual loading or emergency conditions.

2. Device settings shall protect transformers according to IEEE C57.12.00, for fault currents.

D. Conductor Protection: Protect cables against damage from fault currents according to ICEA P-32-382, ICEA P-45-482, and conductor melting curves in IEEE 242. Demonstrate that equipment withstands the maximum short-circuit current for a time equivalent to the tripping time of the primary relay protection or total clearing time of the fuse. To determine temperatures that damage insulation, use curves from cable manufacturers or from listed standards indicating conductor size and short-circuit current.

E. Coordination-Study Report: Prepare a written report indicating the following results of coordination study:

1. Tabular Format of Settings Selected for Over-current Protective Devices:

   a. Device tag.
   b. Relay-current transformer ratios; and tap, time-dial, and instantaneous-pickup values.
   c. Circuit-breaker sensor rating; and long-time, short-time, and instantaneous settings.
   d. Fuse-current rating and type.
   e. Ground-fault relay-pickup and time-delay settings.

2. Coordination Curves: Prepared to determine settings of over-current protective devices to achieve selective coordination. Graphically illustrate that adequate time separation exists between devices installed in series, including power utility company's upstream devices. Prepare separate sets of curves for the switching schemes and for emergency periods where the power source is local generation. Show the following information:

   a. Device tag.
   b. Voltage and current ratio for curves.
   c. Three-phase and single-phase damage points for each transformer.
   d. No damage, melting, and clearing curves for fuses.
   e. Cable damage curves.
   f. Transformer inrush points.
   g. Maximum fault-current cutoff point.

F. Completed data sheets for setting of overcurrent protective devices.

3.5 ARC-FLASH HAZARD ANALYSIS

A. The Arc-Flash Hazard Analysis shall be performed with the aid of computer software intended for this purpose in order to calculate Arc-Flash Incident Energy (AFIE) levels and flash protection boundary distances.

B. The Arc-Flash Hazard Analysis shall be performed in conjunction with a short-circuit analysis and a time-current coordination analysis.

C. Results of the analysis shall be submitted in tabular form, and shall include device or bus name, bolted fault and arcing fault current levels, flash protection boundary distances, personal-protective equipment classes and AFIE levels.

D. The analysis shall be performed under worst-case Arc-Flash conditions, and the final report shall describe, when applicable, how these conditions differ from worst-case bolted fault conditions.

E. The Arc-Flash Hazard Analysis shall be performed in compliance with IEEE Standard 1584-2002, the IEEE “Guide for Performing Arc-Flash Calculations”.

F. Labeling on equipment shall be in compliance with NEC 2008 Chapter 1, Article “Flash Protection” and ANSI Z535.4 to identify AFIE and appropriate Personal Protective Equipment classes.

G. Perform analysis and provide labeling on the following:

1. All new Medium Voltage Switchgear
2. All new Low Voltage Switchgear, Motor Control Center, Switchboards, and Panelboards.
3. All existing panleboards in OSTC.
4. All disconnects 60A or larger.

END OF SECTION 260573

SECTION 26 08 00 – COMMISSIONING OF ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 DESCRIPTION

A. The purpose of this section is to specify Division 26 responsibilities in the commissioning process which are being directed by the CA. Other electrical systems testing are required under the direction of the CT.

B. The list of commissioned equipment and systems is found in Section 019113.

C. Commissioning requires the participation of Division 26 to ensure that all systems are operating in a manner consistent with the Contract Documents. The general commissioning requirements and coordination are detailed in Section 019113. Division 26 shall be familiar with all parts of Section 019113 and the commissioning plan issued by the CA and shall execute all commissioning responsibilities assigned to them in the Contract Documents.

1.3 RESPONSIBILITIES

A. Electrical Contractors. The commissioning responsibilities applicable to the electrical contractor are as follows *(all references apply to commissioned equipment)*:

Construction and Acceptance Phases

1. Attend a commissioning scoping meeting and other necessary meetings scheduled by the CA to facilitate the Cx process.
2. Contractors shall provide normal cut sheets and shop drawing submittals to the CA of commissioned equipment.
3. Provide additional requested documentation, prior to normal O&M manual submittals, to the CA for development of start-up and functional testing procedures.
    a. Typically this will include detailed manufacturer installation and start-up, operating, troubleshooting and maintenance procedures, full details of any owner-contracted tests, fan and pump curves, full factory testing reports, if any, and full warranty information, including all responsibilities of the Owner to keep the warranty in force clearly identified. In addition, the installation and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the Commissioning Agent.
    b. The Commissioning Agent may request further documentation necessary for the commissioning process.
    c. This data request may be made prior to normal submittals.
4. Provide a copy of the O&M manuals submittals of commissioned equipment, through normal channels, to the CA for review.
5. Contractors shall assist (along with the design engineers) in clarifying the operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.

6. Provide assistance to the CA in preparation of the specific functional performance test procedures specified in this section. Subs shall review test procedures to ensure feasibility, safety and equipment protection and provide necessary written alarm limits to be used during the tests.
7. Develop a full start-up and initial checkout plan using manufacturer's start-up procedures and the pre-functional checklists from the CA. Submit manufacturer's detailed start-up procedures and the full start-up plan and procedures and other requested equipment documentation to CA for review.
8. During the startup and initial checkout process, execute and document the electrical-related portions of the pre-functional checklists provided by the CA for all commissioned equipment.
9. Perform and clearly document all completed start-up and system operational checkout procedures, providing a copy to the CA.
10. Address current A/E punch list items before functional testing. Air and water TAB shall be completed with discrepancies and problems remedied before functional testing of the respective air- or water-related systems.
11. Provide skilled technicians to execute starting of equipment and to execute the functional performance tests. Ensure that they are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments and problem-solving.
12. Perform functional performance testing under the direction of the CA for specified equipment in this section and 019113. Assist the CA in interpreting the monitoring data, as necessary.
13. Correct deficiencies (differences between specified and observed performance) as interpreted by the CA, CT and A/E and retest the equipment.
14. Prepare O&M manuals according to the Contract Documents, including clarifying and updating the original sequences of operation to as-built conditions.
15. During construction, maintain as-built red-line drawings for all drawings and final CAD as-builts for contractor-generated coordination drawings. Update after completion of commissioning (excluding deferred testing). Prepare red-line as-built drawings for all drawings and final as-built for contractor-generated coordination drawings.
16. Provide training of the Owner's operating personnel as specified.
17. Coordinate with equipment manufacturers to determine specific requirements to maintain the validity of the warranty.

Warranty Period

1. Execute seasonal or deferred functional performance testing, witnessed by the CA, according to the specifications.
2. Correct deficiencies and make necessary adjustments to O&M manuals and as-built drawings for applicable issues identified in any seasonal testing.

B. Electrical Designer/Engineer

1. Refer to Section 019113 for the responsibilities of the Electrical Designer/Engineer.

1.4 RELATED WORK

A. Refer to Section 019113, Part 1.4 for a listing of all sections where commissioning requirements are found.

B. Refer to Section 019113 Part 1.7 for systems to be commissioned and this section for functional testing requirements.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. Division 26 shall provide all test equipment necessary to fulfill the testing requirements of this Division.

B. Refer to Section 019113 Part 2.1 for additional Division 26 requirements.

PART 3 - EXECUTION

3.1 SUBMITTALS

A. Division 26 shall provide submittal documentation relative to commissioning to the CA as requested by the CA. Refer to Section 019113 Part 3.3 for additional Division 26 requirements.

3.2 START-UP

A. The electrical contractors shall follow the start-up and initial checkout procedures listed in the Responsibilities list in this section and in 019113 Part 3.4. Division 26 has start-up responsibility and is required to complete systems and sub-systems so they are fully functional, meeting the design objectives of the Contract Documents. The commissioning procedures and functional testing do not relieve or lessen this responsibility or shift that responsibility partially to the commissioning agent or Owner.

B. Functional testing is intended to begin upon completion of a system. Functional testing may proceed prior to the completion of systems, or sub-systems at the discretion of the CA and CT. Beginning system testing before full completion does not relieve the Contractor from fully completing the system, including all pre-functional checklists as soon as possible.

3.3 FUNCTIONAL PERFORMANCE TESTS

A. Refer to Section 019113 Part 1.7 for a list of systems to be commissioned, 019113 Part 3.6 for a description of the process and to the appendices in this section for specific details on the required functional performance tests.

3.4 TESTING DOCUMENTATION, NON-CONFORMANCE AND APPROVALS

A. Refer to Section 019113 Part 3.4 and 3.7 for specific details on non-conformance issues relating to pre-functional checklists and tests.

B. Refer to Section 019113 Part 3.6 for issues relating to functional performance tests.

3.5 OPERATIONS AND MAINTENANCE (O&M) MANUALS

A. Division 26 shall compile and prepare documentation for all equipment and systems covered in Division 26 and deliver to the CT for inclusion in the O&M manuals, according to Sections 017823 and 019113.
B. The CA shall receive a copy of the O&M manuals for review.

3.6 TRAINING OF OWNER PERSONNEL

A. The CT shall be responsible for training coordination and scheduling and ultimately to ensure that training is completed. Refer to Section 019113 for additional details.

B. The CA shall be responsible for overseeing and approving the content and adequacy of the training of Owner personnel for commissioned equipment. Refer to Section 019113 for additional details.

C. Electrical Contractor. The electrical contractor shall have the following training responsibilities:

1. Provide the CA with a training plan eight a minimum of (8) weeks before the planned training according to the outline described in Section 019113, Part 3.9.
2. Provide designated Owner personnel with comprehensive training in the understanding of the systems and the operation and maintenance of each major piece of commissioned electrical equipment or system.
3. Training shall start with classroom sessions, if necessary, followed by hands on training on each piece of equipment, which shall illustrate the various modes of operation, including start-up, shut down, fire/smoke alarm, power failure, etc.
4. During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system will be repaired or adjusted as necessary and the demonstration repeated.
5. The appropriate trade or manufacturer's representative shall provide the instructions on each major piece of equipment. This person may be the start-up technician for the piece of equipment, the installing contractor or manufacturer's representative. Practical building operating expertise as well as in-depth knowledge of all modes of operation of the specific piece of equipment is required. More than one party may be required to execute the training.
6. The training sessions shall follow the outline in the Table of Contents of the operation and maintenance manual and illustrate whenever possible the use of the O&M manuals for reference.
7. Training shall include:
    a. Use the printed installation, operation and maintenance instruction material included in the O&M manuals.
    b. Include a review of the written O&M instructions emphasizing safe and proper operating requirements, preventative maintenance, special tools needed and spare parts inventory suggestions. The training shall include start-up, operation in all modes possible, shut down, seasonal changeover and any emergency procedures.
    c. Discuss relevant health and safety issues and concerns.
    d. Discuss warranties and guarantees.
    e. Cover common troubleshooting problems and solutions.
    f. Explain information included in the O&M manuals and the location of all plans and manuals in the facility.
    g. Discuss any peculiarities of equipment installation or operation.
    h. The format and training agenda in *Guidelines for Commissioning HVAC Systems*, ASHRAE, Guideline 0-2005.
    i. Classroom sessions shall include the use of overhead projections, slides, video and audio taped material as might be appropriate.
8. Hands-on training shall include start-up, operation in all modes possible, including manual, shut down and any emergency procedures and maintenance of all pieces of equipment.
9. The electrical contractor shall fully explain and demonstrate the operation, function and overrides of any local packaged controls, not *controlled* by the central control system.
10. Training shall occur after functional testing is complete, unless approved otherwise by the Project Manager.
11. Duration of Training. The CT and EC shall provide training and demonstration requirements as specified in each specification section and Section 019113.

3.7 WRITTEN WORK PRODUCTS

A. Written work products of Contractors will consist of the start-up and initial checkout plan described in Section 019113 and the filled out start-up, initial checkout and pre-functional checklists.

4.0 SAMPLE FORMS

4.1 ELECTRICAL TESTING REQUIREMENTS

This section specifies the functional testing requirements for Division 01 systems and equipment. From these requirements, the Commissioning Authority (CA) shall develop step-by-step procedures to be executed by the contractor. The general functional testing process, requirements and test method definitions are described in Section 019113. The test requirements for each piece of equipment or system contain the following:

1. The contractors responsible to execute the tests, under the direction of the CA.
2. A list of the integral components being tested.
3. Pre-functional checklists associated with the components.
4. Functions and modes to be tested.
5. Required conditions of the test for each mode.
6. Special procedures.
7. Required methods of testing.
8. Required monitoring.
9. Acceptance criteria.
10. Sampling strategies allowed.

TESTING

A. A listing of the systems and equipment to be tested are included on the following pages to illustrate the extent of testing to be provided. The actual forms for this section will be produced by the CA before the testing.

B. Additional systems and included may be included for testing as required at the discretion of the CA in order to fulfill LEED Commissioning Requirements.

C. Testing for the electrical power distribution system and fire alarm system supporting the mechanical equipment will be integrated into the testing for each mechanical system as necessary.

1. LIGHTING CONTROLS

The testing requirements apply to the lighting system for the building.

A. Parties Responsible to Execute Functional Test
1. Electrical contractor: operate the lighting system, measure lighting levels of finished spaces (foot candles).
2. CA: to witness, direct and document testing.

B. Integral Components or Related Equipment Being Tested — Pre-functional Checklist ID
1. Lighting Controls — PFC-_____

C. Prerequisites The applicable prerequisite checklist items listed in the beginning of Section 16996 shall be listed on each functional test form and checked off prior to functional testing. The commissioning agent may also spot-check misc. items and calibrations on the pre-functional checklists previously completed by the installer, before the beginning of functional testing.

D. Functions/Modes Required To Be Tested, Test Methods and Seasonal Test Requirements
The following testing requirements are in addition to and do not replace any testing requirements elsewhere in this Division.

	Function/Mode	**Test Method Manual, Monitoring, Either or Both[1]**	**Required Seasonal Test**
General			
1.	Lighting levels (foot candles)	Manual	
2.	Occupancy sensor (response to motion/sound)	Manual	
3.	Occupancy sensor (timed shutoff)	Manual	
4.	Daylighting level reductions (foot candles) – if applicable	Manual	
5.	Schedule (time clock) – if applicable	Either	

E. Special Procedures (other equipment to test with, etc.; reference to function ID)

1. None

F. Required Monitoring

1. None.

G. Acceptance Criteria (referenced by function or mode ID)
1-6. For the conditions, sequences and modes tested, the fans, integral components and related equipment respond to changing conditions and parameters appropriately as expected, as specified and according to acceptable operating practice.

H. Sampling Check Scope Strategy for Identical Units of the same type and function, but different in size, are considered identical for sampling purposes.

1. Randomly test at least 20% of the individual room lighting levels and occupancy sensors. Lighting time clock systems shall be tested 100% to verify occupancy schedule. If 10% of the units in the first sample fail the functional performance

tests, test another 10% of the group (the 2nd sample). If 10% of the units in the 2nd sample fail, test all remaining units in the whole group, fully at the contractor's expense. This sampling applies to the testing subsections. That is, if calibration is off on more than 10% of the tested piece of equipment, then another sample shall have calibrations checked, but not all other tests need to be done on the second sample.

END OF REQUIREMENTS FOR LIGHTING CONTROL TEST

5.0 PRE-FUNCTIONAL CHECKLISTS

Pre-functional checklists shall be developed by the CA and completed by the Contractor for the following equipment/systems:

Room Lighting Controls – Sensors and Switches
Electrical Distribution Panels

The attached sample checklist is intended to serve as an example only. They are not detailed for this project and do not include all the requirements. The actual pre-functional checklists for each piece of equipment and system will be developed by the CA after the submittals have been approved and they will be reviewed by the Cx Team prior to distribution for use. The pre-functional checklists will be written to verify conformance to the requirements of the plans, specifications, manufacturer's product information and actual field conditions prior to proceeding with functional performance testing. The following sample checklists are attached:

1. Room Lighting Controls

PREFUNCTIONAL CHECKLIST: LIGHTING CONTROLS

1. Submittal/Approvals

Submittal. The above equipment and systems integral to them are complete and ready for functional testing. The checklist items are complete and have been checked off only by parties having direct knowledge of the event, as marked below, respective to each responsible contractor. This pre-functional checklist is submitted for approval, subject to an attached list of outstanding items yet to be completed. A Statement of Correction will be submitted upon completion of any outstanding areas. None of the outstanding items preclude safe and reliable functional tests being performed. ___ List attached.

Electrical Contractor	Date	Construction manager	Date

Pre-functional checklist items are to be completed as part of startup & initial checkout, preparatory to functional testing.

- This checklist does not take the place of the manufacturer's recommended checkout and startup procedures or report.
- Items that do not apply shall be noted with the reasons on this form (N/A = not applicable, BO = by others).
- If this form is not used for documenting, one of similar rigor shall be used.
- Contractors assigned responsibility for sections of the checklist shall be responsible to see that checklist items by their subcontractors are completed and checked off.

Approvals. This filled-out checklist has been reviewed. Its completion is approved with the exceptions noted below.

Commissioning Agent	Date	Owner's Representative	Date

Documentation — Complete:

Yes/No/NA	Item Check	Yes/No/NA	Item Check
	1. Manufacturer's submittals/shop drawings approved by A/E		2. Submittals/shop drawings include installation & startup manual and plan
	3. O&M manuals approved by A/E		4. Warranty certificate

Model Verification — Complete:

	Specified	Submitted	Installed
Lighting Panel Tag			
Circuit Numbers			
Lighting Control Manufacturer			
Model Number			
Serial Number			

Installation Checks — Complete:

Installation

Yes/No/NA	Item Check	Yes/No/NA	Item Check
	1. Panel and circuit breakers installed per manufacturer's instructions and specifications		2. Lights installed agree with shop drawings and specifications
	3. Verify mounting, location, and clearances are per plans and specs		4. Lighting controllers (occupancy sensors and switches) installed as required
	5. All zone circuits and inputs are correctly wired, circuits labeled		

Operational Performance Test — Complete:

Operational Checks

Yes/No/NA	Item Check	Yes/No/NA	Item Check
	1. Emergency lights connected to back up power source as required.		2. Emergency lights operate per plan.
	3. Occupancy sensors react to motion/sound activation per requirements. Response Time = _____ seconds		3. Timers for occupancy sensors set per requirements. Shutoff Time = _____ minutes

--- End of Checklist ---

6.0 FUNCTIONAL PERFORMANCE TESTS

Functional performance test procedures shall be developed by the CA and executed by the Contractor with coordination from the CA for the following equipment/systems:

Room Lighting Controls – Sensors and Switches
Electrical Distribution Panels

The attached sample functional performance tests are intended to serve as examples only. They are not detailed for this project and do not include all the requirements. Actual functional performance tests will be developed by the CA after the submittals have been approved and will be reviewed by the Cx Team prior to distribution for use. The functional performance tests will be written to verify conformance to the requirements of the plans, specifications, manufacturer's product information and actual field conditions. The following sample functional performance tests are attached:

1. Room Lighting Controls

FUNCTIONAL PERFORMANCE TEST
LIGHTING CONTROLS

1. Participants:

Representing	**Participant**

Party filling out this form & witnessing _____ Date of Test: _____

Time Clock Information

Manufacturer# _____

Model #: _____ Serial #: _____

Location: _____ Area Served: Corridors

2. Prerequisite Checklist:

a. The following have been started up, startup reports provided, and prefunctional checklists submitted and approved prior to functional testing - Y/N: _____

b. These functional test procedures reviewed by installing contractors and are acceptable for use for the FPTs - Y/N: _____

3. Record of All Values:
Record of "All Values for Current Setpoints(SP), Control Parameters, Limits, Delays, Lockouts, Schedules, etc., changed to accommodate testing:

Parameter	Pre-Test Values	Returned to Pre-Test Values
Occupancy Schedule – Monday		
Occupancy Schedule – Tuesday		
Occupancy Schedule – Wednesday		
Occupancy Schedule – Thursday		
Occupancy Schedule – Friday		
Occupancy Schedule – Saturday		
Occupancy Schedule – Sunday		
Occupancy Sensor – Timed Shut Off		

4. Functional Performance Testing Record for Time Clocks: For the functional performance test for the time clock and corridors, verify occupancy schedule set in time clock is correct and operational, lighting levels meet ,specified requirements, and emergency lights function as required

Lighting Control	Action/Setting	Operational (O) or Non-Operational(NO)	Pass Y/N	Note
Time Clock	Occupancy schedule programmed in time clock Time on: _____ Time off: _____			
	Emergency ballasts stay on during unoccupied schedule			
Area: Panel: Circuit:	Verify lights come on when at start of occupied schedule			
	Verify light level meet specified requirements			
	Verify lights connected to proper circuit as indicated by plans			
	Verify lights shut off at end of occupied schedule			
Area: Panel: Circuit:	Verify lights come on when at start of occupied schedule			
	Verify light level meet specified requirements			
	Verify lights connected to proper circuit as indicated by plans			
	Verify lights shut off at end of occupied schedule			
Area: Panel: Circuit:	Verify lights come on when at start of occupied schedule			
	Verify light level meet specified requirements			
	Verify lights connected to proper circuit as indicated by plans			
	Verify lights shut off at end of occupied schedule			
Area: Panel: Circuit:	Verify lights come on when at start of occupied schedule			
	Verify light level meet specified requirements			
	Verify lights connected to proper circuit as indicated by plans			
	Verify lights shut off at end of occupied schedule			

Notes

Lighting Control	Action/Setting	Operational (O) or Non-Operational(NO)	Pass Y/N	Note

5. **Functional Performance Testing Record for Classrooms and Offices:** For the functional performance test, record the room number, panel ID, circuit number and control type (on/off switch, occupancy sensor,

Calibration Instrument Data:		
Type:	Manufacturer/Model:	Calibration Date
Type:	Manufacturer/Model:	Calibration Date
Type:	Manufacturer/Model:	Calibration Date

Lighting Control	Action/Setting	Operational (O) or Non-Operational(NO)	Pass Y/N	Note
Room: Panel: Circuit: Control Type:	Verify lights come on when motion is detected			
	Verify light level in room meets specified requirements			
	Verify lights shut off after time delay setting is reached			
	Verify lights connected to proper circuit as indicated by plans			
Room: Panel: Circuit: Control Type:	Verify lights come on when motion is detected			
	Verify light level in room meets specified requirements			
	Verify lights shut off after time delay setting is reached			
	Verify lights connected to proper circuit as indicated by plans			
Room: Panel: Circuit: Control Type:	Verify lights come on when motion is detected			
	Verify light level in room meets specified requirements			
	Verify lights shut off after time delay setting is reached			

Lighting Control	Action/Setting	Operational (O) or Non-Operational(NO)	Pass Y/N	Note
	Verify lights connected to proper circuit as indicated by plans			
Room: Panel: Circuit: Control Type:	Verify lights come on when motion is detected			
	Verify light level in room meets specified require-ments			
	Verify lights shut off after time delay setting is reached			
	Verify lights connected to proper circuit as indicated by plans			
Room: Panel: Circuit: Control Type:	Verify lights come on when motion is detected			
	Verify light level in room meets specified require-ments			
	Verify lights shut off after time delay setting is reached			
	Verify lights connected to proper circuit as indicated by plans			
Room: Panel: Circuit: Control Type:	Verify lights come on when motion is detected			
	Verify light level in room meets specified require-ments			
	Verify lights shut off after time delay setting is reached			
	Verify lights connected to proper circuit as indicated by plans			
Room: Panel: Circuit: Control Type:	Verify lights come on when motion is detected			
	Verify light level in room meets specified require-ments			
	Verify lights shut off after time delay setting is reached			
	Verify lights connected to proper circuit as indicated by plans			
Room:	Verify lights come on when motion is detected			

Lighting Control	Action/Setting	Operational (O) or Non-Operational(NO)	Pass Y/N	Note
Panel: Circuit: Control Type:	Verify light level in room meets specified requirements			
	Verify lights shut off after time delay setting is reached			
	Verify lights connected to proper circuit as indicated by plans			
Room: Panel: Circuit: Control Type:	Verify lights come on when motion is detected			
	Verify light level in room meets specified requirements			
	Verify lights shut off after time delay setting is reached			
	Verify lights connected to proper circuit as indicated by plans			
Room: Panel: Circuit: Control Type:	Verify lights come on when motion is detected			
	Verify light level in room meets specified requirements			
	Verify lights shut off after time delay setting is reached			
	Verify lights connected to proper circuit as indicated by plans			
Room: Panel: Circuit: Control Type:	Verify lights come on when motion is detected			
	Verify light level in room meets specified requirements			
	Verify lights shut off after time delay setting is reached			
	Verify lights connected to proper circuit as indicated by plans			

--End of Test--

END OF SECTION 26 08 00

SECTION 26 11 16.11

SECONDARY UNIT SUBSTATIONS – SECONDARY LESS THAN 1000 V

PART 1 GENERAL

1.01 SCOPE

A. The Contractor shall furnish and install the secondary unit substation(s) complete from the incoming line terminals to the outgoing line terminals as specified herein and as shown on the contract drawings.

B. The secondary unit substation shall consist of primary equipment, transformer and secondary equipment as specified below. The manufacturer of the unit substation shall furnish and coordinate all major components of the substations, including incoming primary equipment section, transformer and low-voltage section, as well as circuit breakers, fusible switches, and metering components. Provide a single warranty covering all substation assemblies, transformers and components.

C. Connections between the primary device and transformer shall be bus, and between the transformer and secondary shall be flexible bus braid.

D. Outdoor primary and secondary equipment where specified shall be of weatherproof construction, rodent proof and shall contain 120-volt space heaters, receptacles and lighting as required.

1.02 RELATED SECTIONS

A. Section 16322A – Substation Transformers – Liquid-Filled

B.

C. Section 16361B – Medium Voltage Switches – 5/15 kV – Line-up

D. Section 16426A – Metal-Enclosed Drawout Switchgear (Magnum DS) – Low Voltage

1.03 REFERENCES

A. The secondary unit substation shall be designed, assembled, tested and installed in accordance with latest applicable standards of NEMA, IEEE and ANSI, applicable to its three major sections:

1. MV Load Interrupter Switchgear – NEMA SG4, SG5; ANSI C37
2. MV Motor Controllers – ANSI/NEMA ICS-3-Part 2, UL347
3. Secondary Substation Transformers – NEMA 210, IEEE 100, ANSI C57
4. LV Distribution Switchboards – NEMA PB-2, UL 891

1.04 SUBMITTALS – FOR REVIEW/APPROVAL

A. The following information shall be submitted to the Engineer:
   1. Master drawing index
   2. Front view elevation
   3. Floor plan
   4. Single line
   5. Schematic diagram
   6. Nameplate schedule
   7. Component list
   8. Conduit entry/exit locations
   9. Assembly ratings including:
      a. Short-circuit rating
      b. Voltage
      c. Continuous current
      d. Basic Impulse level for equipment over 600 volts
      e. kVA
   10. Major component ratings including:
      a. Voltage
      b. Continuous current
      c. Interrupting ratings
   11. Cable terminal sizes
   12. Connection details between close-coupled assemblies
   13. Composite front view and floor plan of close-coupled assemblies
   14. Impedance for transformers
   15. Product data sheets

B. Where applicable, the following additional information shall be submitted to the Engineer:
   1. Busway connection
   2. Key interlock scheme drawing and sequence of operation

1.05 SUBMITTALS – FOR CONSTRUCTION

A. The following information shall be submitted for record purposes:
   1. Final as-built drawings and information for items listed Paragraph 1.04, and shall incorporate all changes made during the manufacturing process
   2. Wiring diagrams
   3. Certified production test reports
   4. Installation information

5. Seismic certification as specified

1.06 QUALIFICATIONS

A. The manufacturer of the assembly shall be the manufacturer of the major components within the assembly.

B. For the equipment specified herein, the manufacturer shall be ISO 9001 or 9002 certified.

C. The manufacturer of this equipment shall have produced similar electrical equipment for a minimum period of five (5) years. When requested by the Engineer, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.

   a. The equipment manufacturer shall certify that the equipment can withstand, that is, function following the seismic event, including both vertical and lateral required response spectra as specified in above codes.

   b. The equipment manufacturer shall document the requirements necessary for proper seismic mounting of the equipment. Seismic qualification shall be considered achieved when the capability of the equipment, meets or exceeds the specified response spectra.

1.07 REGULATORY REQUIREMENTS

A. Certified copies of production test reports shall be supplied demonstrating compliance with these standards when requested by the engineer.

1.08 DELIVERY, STORAGE AND HANDLING

A. Equipment shall be handled and stored in accordance with manufacturer's instructions. One (1) copy of these instructions shall be included with the equipment at time of shipment.

1.09 OPERATION AND MAINTENANCE MANUALS

A. Equipment operation and maintenance manuals shall be provided with each assembly shipped and shall include instruction leaflets, instruction bulletins, and renewal parts lists where applicable for the complete assembly and each major component.

PART 2A PRODUCTS – PRIMARY EQUIPMENT

2.01 MANUFACTURERS

A. Eaton Corporation

B. General Electric

C. Siemens

The listing of specific manufacturers above does not imply acceptance of their products that do not meet the specified ratings, features and functions. Manufacturers listed above are not

relieved from meeting these specifications in their entirety. Products in compliance with the specification and manufactured by others not named will be considered only if pre-approved by the Engineer ten (10) days prior to bid date.

2.02 RATINGS

A. Switchgear assembly ratings shall be as follows:

1.	Nominal System Voltage	15kV three-phase three wire
2.	System Grounding	solid
3.	Rated Maximum Voltage	15 kV
4.	Rated Lightning Impulse Withstand Voltage (BIL)	95 kV for 15 kV assemblies
5.	Arc Resistant Accessibility Type	Type 2B per IEEE C37.20.7
6.	Main Cross Bus Continuous Current	600 A
7.	Main Cross Bus Momentary Current (10 Cycle)	40 kA rms Asym/_65 kA peak
8.	Main Cross Bus 2-Second Short Circuit Current	25 kA rms Sym
9.	Enclosure Internal Arc Short Circuit Rating	40 kA rms Sym/65 kA peak
10.	Enclosure Internal Arc Short Circuit Duration	0.5 second
11.	Non-Fused Switch (Continuous and Load Break current)	600Amperes
12.	Non-Fused Switch Fault Close and Momentary withstand	40kA rms Asym
13.	Non-Fused Switch 2-Second Short-time short-circuit current	25kA rms Sym
14.	Fuse Rating	As shown on drawings
15.	Type of Fuse	RBA-400____
16.	Fuse Interrupting Rating	25kA Sym RMS
17.	Fused Switch Fault close & Momentary	40kA Asym RMS

2.03 5 AND 15 KV CONSTRUCTION

A. The metal-enclosed load interrupter switchgear shall consist of deadfront, completely metal-enclosed vertical sections containing load interrupter switches and fuses (where shown) of the number, rating and type noted on the drawings or specified herein.

B. The following features shall be supplied on every vertical section containing a three-pole, two-position open-closed switch:

1. A minimum 5-inch x 18-inch high-impact viewing window that permits full view of the position of all three switch blades through the closed door. Open Switch Blades should provide adequate AIR (normal air) clearance to provide full dielectric insulation between Line and load per IEEE C37.30.4 without the use of insulators or insulating gasses. The window shall not be more than 58-inches above the switch pad level to allow ease of inspection
2. The fuse compartment door shall be interlocked with the switch so that:
   a. The switch must be opened before the fuse compartment door can be opened.
   b. The fuse compartment door must be closed before the switch can be closed.
3. Switch compartment door shall be interlocked such that it cannot be opened until the switch has been locked open and fuse compartment door has been unlocked and opened.
4. Provision for padlocking the switch in the open or closed position
5. Green OPEN, Red CLOSED switch position indicators with the words “Open” and “Closed” in French, Spanish and English
6. A hinged cover with rustproof quarter turn nylon latches over the switch operating mechanism to discourage casual tampering
7. The switch shall be removable from the structure as a complete operational component

C. Vertical section construction shall be of the universal frame type using die-formed and bolted parts. All enclosing covers and doors shall be fabricated from steel with thickness equal to or greater than that specified in ANSI/IEEE C37.20.3. No owner removable hardware for covers or doors shall be thread-forming type. To facilitate installation and maintenance of cables and bus in each vertical section, padlockable hinged rear covers held closed by bolts shall be provided.

D. Each vertical section containing a switch shall have hinged, bolted upper and lower front doors for access to load interrupter switch and fuse compartments. Switch operating mechanism shall be easily accessible from the front without requiring opening of main front doors. Removable handle shall be provided for manual operation of the switch. Provide storage provision for the removable handle within the switch operating mechanism box.

E. Each load interrupter switch shall have the following features:
   1. Three-pole gang-operated mechanism
   2. Manual quick-make, quick-break over-toggle-type mechanism that does not require the use of a chain or a cable for operation, and utilizes a heavy-duty coil spring to provide opening and closing energy
   3. The speed of opening and closing the switch shall be independent of the operator, and it shall be impossible to tease the switch into any intermediate position under normal operation
   4. Separate main and break contacts to provide maximum endurance for fault close and load interrupting duty

5. Insulating barriers between each phase and between the outer phases and the enclosure
6. A maintenance provision for slow closing the switch to check switch blade engagement and slow opening the switch to check operation of the arc interrupting contacts

2.04 BUS

A. All phase bus conductors shall be *[tin-plated copper] [silver-plated copper].

B. Ground bus shall be silver-plated copper and be directly fastened to an unplated metal surface of each vertical section, and be of a size sufficient to carry the rated (2-second) current of the switchgear assembly.

C. A neutral bus shall be provided only when indicated on the drawings. It shall be insulated for 1000 Vac to ground. The current rating of the neutral bus shall be 600 amperes.

2.05 BUS INSULATION SYSTEM

A. All bus shall be supported utilizing a high strength and high creep support providing 10.5-inch of creep distance between phases and ground. The molded fins shall be constructed of high track resistant polyester.

B. All standoff insulators on switches and fuse mountings shall be *[glass polyester] [cycloaliphatic epoxy]

2.06 WIRING/TERMINATIONS

A. One (1) terminal pad per phase shall be provided for attaching contractor-supplied cable terminal lugs for a maximum of two (2) conductors per phase of the sizes indicated on the drawings. Sufficient space shall be allowed for contractor supplied electrical stress relief termination devices.

B. Small wiring, fuse blocks and terminal blocks within the vertical section shall be furnished as indicated on the drawings. Each control wire shall be labeled with wire markers. Terminal blocks shall be provided for owner's connections to other apparatus.

2.07 FUSES

A. Fault protection shall be provided by fuses with continuous ratings as shown in the contract documents. Any fuse/switch integrated momentary and fault close ratings specified shall have been verified by test and UL and CSA certified.

2.08 UTILITY METERING

2.09 ACCESSORIES

A. Supply key interlocks as shown on the drawings.

B. Furnish distribution class surge arresters with ratings in accordance with manufacture's recommendations.

2.10 ENCL OSURES

A. Enclosures shall be constructed per IEEE/ANSI C37.20.3. It shall be designed such that it can be installed indoor or outdoor.

B. Switchgear enclosure shall provide protection against internal arcing faults at the front, sides, and rear as defined by accessibility Type 2B under ANSI test guide C37.20.2.

C. In the event of an internal arcing fault, the resulting arc pressure and the exhaust shall be directed upward and into the plenum fitted above each section.

The switchgear shall be installed outdoor. An enclosed arc exhaust plenum shall be furnished for installation above the switchgear. Arc exhaust shall be vented from the arc-plenum to the exit location via arc-duct as shown on the drawings. Arc duct shall be supplied by *[the switchgear manufacturer][Purchaser]. When supplied by Purchaser, it must be made and installed in accordance with basic minimum design requirements provided by the switchgear manufacturer. Field assembly of the arc-plenum and arc-duct shall be by installing contractor. A minimum of one (1) 250-watt, 120-volt space heater shall be provided in each vertical section. Power for the space heater(s) shall be furnished □[as indicated on the drawings] [by a control power transformer mounted in the switchgear] [by a transformer mounted within the low voltage switchboard/switchgear].

2.11 NAMEPLATES

A. A nameplate shall be mounted on the front door of each switch vertical section in accordance with the drawings.

2.12 FINISH

A. Prior to assembly, all enclosing steel shall be thoroughly cleaned and phosphatized. A powder coating shall be applied electrostatically, then fused-on by baking in an oven. The coating is to have a thickness of not less than 1.5 mils. The finish shall have the following properties:

Impact resistance (ASTM D-2794)	60 direct/60 indirect
Pencil hardness (ASTM D-3363)	H
Flexibility (ASTM D-522)	Pass 1/8-inch mandrel
Salt spray (ASTM B117-85 [20])	600 hours
Color	ANSI 61 gray

2.13 SPECIAL SWITCHGEAR CONFIGURATIONS

A. Duplex Switchgear Assembly

1. Furnish, where shown on the drawings, a duplex switchgear assembly configuration consisting of two (2) load interrupter switches with common load side bus to feed one load circuit, which shall be fused or unfused as indicated on the drawings. Key interlocks shall be supplied to prevent paralleling the incoming sources, and to prevent opening the front door of each vertical section containing one of the two switches unless both switches are locked open

PART 2B PRODUCTS – TRANSFORMERS

2.01 MANUFACTURERS

A. Eaton

B. General Electric

C. Siemens

The listing of specific manufacturers above does not imply acceptance of their products that do not meet the specified ratings, features and functions. Manufacturers listed above are not relieved from meeting these specifications in their entirety. Products in compliance with the specification and manufactured by others not named will be considered only if pre-approved by the Engineer ten (10) days prior to bid date.

2.02 RATINGS

A. The ratings of the transformer shall be as follows or as shown on the drawings:

kVA Rating	1500/1725 ONAN/Future ONAF	
Impedance	5.75% +/- 7-1/2% Standard Tolerance	
HV	15.0kV Delta	
HV BIL	95kV	
HV De-energized Taps	4_____	+/- 2 - 2-1/2% full capacity
LV	277/480VoltsWye	
LV BIL	95kV	

2.03 CONSTRUCTION

A. The unit shall be biodegradable electrical insulating fluid from high oleic vegetable oil sources filled and shall be in accordance with the latest edition of the NEC. High fire point fluids shall be Factory Mutual and UL listed.

B. The transformer shall carry its continuous rating with average winding temperature rise by resistance that shall not exceed 65 degrees C, based on an average ambient of 30 degrees C over 24 hours with a maximum of 40 degrees C.

C. The transformer shall be designed to carry short-time emergency overloads in accordance with ANSI C57.12.92 as applicable. Duration and magnitude of designed withstand capability shall be as outlined in ANSI C57.12.90 and the latest draft of the IEEE short-circuit test code.

D. The transformer shall be designed to meet the sound level standards for liquid transformers as defined in NEMA TR1. The measurement procedure shall be as specified in ANSI C.57.12.90.

E. High-voltage and low-voltage windings shall be copper. Insulation between layers of the windings shall be by Insuldur paper or equal.

F. The main transformer tank and attached components shall be designed to withstand pressures 25% greater than the required operating design value without permanent deformation. Construction shall consist of carbon steel plate reinforced with external sidewall braces. All seams and joints shall be continuously welded.

G. Each radiator assembly shall be individually weldedand receive a quality control pressurized check for leaks. The entire tank assembly shall receive a similar leak test before core and coil are tanked. A final six-hour leak test shall be performed after the transformer is tanked, welded and completed to ensure that there are no leaks before shipment.

2.04 ACCESSORIES

A. Transformer features and accessories shall include:

1. De-energized tap changer with externally operated,padlockablehandle
2. Combination drain and filter valve and sampling device
3. Manual gas pressure test connection
4. Filling plug and filter press connection in cover
5. Dial-type top liquid thermometer
6. Magnetic liquid level gauge
7. Provisions for lifting, provisions for jacking, base designed for skidding or rolling in two directions
8. Ground pad – stainless steel
9. Instruction nameplate aluminum
10. Pressure vacuum gauge
11. Welded-on main tank cover and handhole in cover
12. Pressure relief device

2.05 FINISH

A. The paint shall be applied using an air spray with air dry acrylic topcoat system to a minimum of three mils average thickness. Outdoor liquid transformer units shall include

suitable outdoor paint finish. Units shall be painted ANSI 61 for indoor service or outdoor service and shall match the primary and secondary equipment.

2.06 TERMINAL COMPARTMENTS/FLANGE CONNECTIONS

A. The transformer unit supplied shall include a HV close-coupled flange and a LV close-coupled flange. Connections between the primary device and transformer shall be cable and between the transformer and secondary shall be flexible bus braid.

PART 2 C PRODUCTS – SECONDARY EQUIPMENT

2.01 MANUFACTURERS

A. Eaton

B. General Electric

C. Siemens

The listing of specific manufacturers above does not imply acceptance of their products that do not meet the specified ratings, features and functions. Manufacturers listed above are not relieved from meeting these specifications in their entirety. Products in compliance with the specification and manufactured by others not named will be considered only if pre-approved by the Engineer ten (10) days prior to bid date.

2.02 RATINGS

A. Voltage rating shall be as indicated on the drawings. The entire assembly shall be suitable for 600 volts maximum ac service.

B. The assembly shall be rated to withstand mechanical forces exerted during short-circuit conditions when connected directly to a power source having available fault current of 65,000 amperes symmetrical at rated voltage.

C. The bus system shall have a minimum ANSI short-circuit withstand rating of 100,000 amperes symmetrical tested in accordance with ANSI C37.20.1 and UL1558.

D. All circuit breakers shall have a minimum symmetrical interrupting capacity of 65,000 amperes. To ensure a fully selective system, all circuit breakers shall have 30 cycle short-time withstand ratings equal to their symmetrical interrupting ratings through 85,000 amperes, regardless of whether equipped with instantaneous trip protection or not.

E. All ratings shall be tested to the requirements of ANSI C37.20.1, C37.50 and C37.51 and UL witnessed and approved.

2.03 CONSTRUCTION

A. The switchgear shall consist of the required number of vertical sections bolted together to form a rigid assembly. The sides shall be covered with removable bolt-on covers. All edges of front covers or hinged front panels shall be formed. Provide ventilators located on the top of the switchgear over the breaker and bus compartments to ensure adequate ventilation within the enclosure. Hinged rear doors, complete with provisions for padlocking, shall be provided.

B. The assembly shall be provided with adequate lifting means and shall be capable of being moved into installation position and bolted directly to Provisions shall be made for jacking of shipping groups, for removal of skids or insertion of equipment rollers. Base of assembly shall be suitable for rolling directly on pipes without skids. The base shall be equipped with slots in the base frame members to accommodate the use of pry bars for moving the equipment to its final position.

C. Each vertical steel unit forming part of the switchgear line-up shall be a self-contained housing having one or more individual breaker or instrument compartments, a centralized bus compartment and a rear cable compartment. Each individual circuit breaker compartment, or cell, shall be segregated from adjacent compartments and sections by means of steel barriers to the maximum extent possible. It shall be equipped with drawout rails and primary and secondary disconnecting contacts. Removable hinge pins shall be provided on the breaker compartment door hinges. Current transformers for feeder instrumentation, where shown on the plans, shall be located within the appropriate breaker cells and be front accessible and removable.

D. The stationary part of the primary disconnecting devices for each power circuit breaker shall be breaker mounted and consist of a set of contacts extending to the rear through a glass polyester insulating support barrier; corresponding moving finger contacts, suitably spaced, shall be furnished on the power circuit breaker studs which engage in only the connected position. The assembly shall provide multiple silver-to-silver full floating high pressure point contacts with uniform pressure on each finger maintained by springs. Each circuit shall include the necessary three-phase bus connections between the section bus and the breaker line side studs. Load studs shall be equipped with insulated copper load extension buses terminating in solderless type terminals in the rear cable compartment of each structure. Bus extensions shall be silver-platedwhere outgoing terminals are attached.

E. The circuit breaker door design shall be such that the following functions may be performed without the need to open the circuit breaker door: lever circuit breaker between positions, operate manual charging system, close and open circuit breaker, examine and adjust trip unit, and read circuit breaker rating nameplate.

F. The secondary disconnecting devices shall consist of floating terminals mounted on the stationary unit and engaging mating contacts at the front of the breaker. The secondary disconnecting devices shall be gold-plated and engagement shall be maintained in the “connected” and “test” positions.

G. The removable power circuit breaker element shall be equipped with disconnecting contacts and interlocks for drawout application. It shall have four positions, “connected,” “test,” “disconnected” and “removed.” The breaker drawout element shall contain a worm gear

levering “in” and “out” mechanism with removable lever crank. Levering shall be accomplished via the use of conventional tools. Mechanical interlocking shall be provided so that the breaker is in the tripped position before levering “in” or “out” of the cell. Interlocking that trips the breaker will not be accepted. The breaker shall include an optional provision for key locking open to prevent manual or electric closing. Padlocking shall provide for securing the breaker in the connected, test, or disconnected position by preventing levering.

H. An insulating flash shield shall be mounted above each circuit breaker to prevent flashover from the arc chutes to ground.

I. The switchgear shall be Cutler-Hammer Magnum DS low voltage metal-enclosed switchgear, utilizing Magnum DS power circuit breakers as herein specified.

J. The switchgear shall be suitable for use as service entrance equipment and be labeled in accordance with UL requirements.

K. Provide a rear compartment barrier between the cable compartment and the main bus to protect against inadvertent contact with main or vertical bus bars.

L. Provide in the cell when the circuit breaker is withdrawn, a safety shutter which automatically covers the line and load stabs and protects against incidental contact.

2.04 BUS

A. All bus bars shall be silver-plated copper. Main horizontal bus bars shall be mounted with all three phases arranged in the same vertical plane. Bus sizing shall be based on ANSI standard temperature rise criteria of 65 degrees C over a 40 degrees C ambient (outside the enclosure).

B. Provide a full capacity neutral bus where a neutral bus is indicated on the drawings.

C. A copper ground bus shall be furnished firmly secured to each vertical section structure and shall extend the entire length of the switchgear. The ground bus short-time withstand rating shall meet that of the largest circuit breaker within the assembly.

D. All hardware used on conductors shall be high-tensile strength and zinc-plated. All bus joints shall be provided with Belleville-type washers.

2.05 WIRING/TERMINATIONS

A. Small wiring, necessary fuse blocks and terminal blocks within the switchgear shall be furnished as required. Control components mounted within the assembly shall be suitably marked for identification corresponding to the appropriate designations on manufacturer’s wiring diagrams.

B. Provide a front accessible, isolated vertical wireway for routing of factory and field wiring. Factory provisions shall be made for securing field wiring without the need for adhesive wire anchors.

C. Front access to all circuit breaker secondary connection points shall be provided for ease of troubleshooting and connection to external field connections without the need of removing the circuit breaker for access.

D. All control wire shall be type SIS. Control wiring shall be 16 ga for control circuits and 14 ga for current transformer circuits. Wire bundles shall be secured with nylon ties and anchored to the assembly with the use of pre-punched wire lances or nylon non-adhesive anchors. All current transformer secondary leads shall first be connected to conveniently accessible shorting terminal blocks before connecting to any other device. Shorting screws with provisions for storage shall be provided. All groups of control wires leaving the switchgear shall be provided with terminal blocks with suitable numbering strips and provisions for #10 AWG field connections. Each control wire shall be marked to the origin zone/wire name/destination zone over the entire length of the wire using a cured ink process. [3][Provide wire markers at each end of all control wiring]. Plug-in terminal blocks shall be provided for all shipping split wires. Terminal connections to remote devices or sources shall be front accessible via doors above each circuit breaker.

E. NEMA 2-hole mechanical-type lugs shall be provided for all line and load terminations suitable for copper or aluminum cable rated for 75 degrees C of the size indicated on the drawings.

F. Lugs shall be provided in the incoming line section for connection of the main grounding conductor. Additional lugs for connection of other grounding conductors shall be provided as indicated on the drawings.

G. Reusable insulating boots shall be provided to cover all power cable terminations.

2.06 CIRCUIT BREAKERS

A. All protective devices shall be low voltage power circuit breakers, Cutler-Hammer type Magnum DS or approved equal. All breakers shall be UL listed for application in their intended enclosures for 100% of their continuous ampere rating.

B. All power circuit breakers shall be constructed and tested in accordance with ANSI C37.13, C37.16, C37.17, C37.50, UL 1066 and NEMA SG-3 standard. The breaker shall carry a UL label.

C. Breakers shall be provided in drawout configuration. The 800, 1600, 2000 and 3200 ampere frame power circuit breakers shall be provided in the same physical frame size, while 4000, 5000 and 6000 ampere frame power circuit breakers shall be provided in a second physical frame size. Both physical frame sizes shall have a common height and depth.

D. Power circuit breakers shall utilize a two-step stored-energy mechanism to charge the closing springs. The closing of the breaker contacts shall automatically charge the opening springs to ensure quick-break operation.

E. Breakers shall be manually operated (MO) unless electrically operated (EO) is indicated on the drawings.

F. To facilitate lifting, the power circuit breaker shall have integral handles on the side of the breaker.

G. The power circuit breaker shall have a closing time of not more than 3 cycles.

H. The primary contacts shall have an easily accessible wear indicator to indicate contact erosion.

I. The power circuit breaker shall have three windows in the front cover to clearly indicate any electrical accessories that are mounted in the breaker. The accessory shall have a label that will indicate its function and voltage. The accessories shall be plug and lock type and UL listed for easy field installation. They shall be modular in design and shall be common to all frame sizes and ratings.

J. The breaker control interface shall have color-coded visual indicators to indicate contact open or closed positions, as well as mechanism charged and discharged positions. Manual control pushbuttons on the breaker face shall be provided for opening and closing the breaker. The power circuit breaker shall have a “Positive On” feature. The breaker flag will read “Closed” if the contacts are welded and the breaker is tripped or opened.

K. The current sensors shall have a back cover window that will permit viewing the sensor rating on the back of the breaker. A rating plug will offer indication of the rating on the front of the trip unit.

L. A position indicator shall be located on the faceplate of the breaker. This indicator shall provide color indication of the breaker position in the cell. These positions shall be Connect (Red), Test (Yellow), and Disconnect (Green). The levering door shall be interlocked so that when the breaker is in the closed position, the breaker levering-in door shall not open.

M. Each power circuit breaker shall offer sixty (60) front-mounted dedicated secondary wiring points. Each wiring point shall have finger safe contacts, which will accommodate #10 AWG maximum field connections with ring tongue or spade terminals or bare wire.

2.07 TRIP UNITS

A. Each low voltage power circuit breaker shall be equipped with a solid-state tripping system consisting of three current sensors, microprocessor-based trip device and flux-transfer shunt trip. Current sensors shall provide operation and signal function. The trip unit shall use microprocessor-based technology to provide the basic adjustable time-current protection functions. True rms sensing circuit protection shall be achieved by analyzing the secondary current signals received from the circuit breaker current sensors and initiating trip signals to the circuit breaker trip actuators when predetermined trip levels and time delay settings are reached. Interchangeable current sensors with their associated rating plug shall establish the continuous trip rating of each circuit breaker. The trip unit shall be Cutler-Hammer type Digitrip RMS 520.

B. The trip unit shall have an information system that utilizes battery backup LEDs to indicate mode of trip following an automatic trip operation. The indication of the mode of trip shall be retained after an automatic trip. A reset button shall be provided to turn off the LED

indication after an automatic trip. A test pushbutton shall energize a LED to indicate the battery status.

C. The trip unit shall be provided with a display panel, including a representation of the time/current curve that will indicate the protection functions. The unit shall be continuously self-checking and provide a visual indication that the internal circuitry is being monitored and is fully operational.

D. The trip unit shall be provided with a making-current release circuit. The circuit shall be armed for approximately two cycles after breaker closing and shall operate for all peak fault levels above 25 times the ampere value of the rating plug.

E. Trip unit shall have selectable powered and unpowered thermal memory for enhanced circuit protection.

F. Complete system selective coordination shall be provided by the addition of the following individually adjustable time/current curve shaping solid-state elements:

1. All circuit breakers shall have adjustments for long delay pickup and time
2. All circuit breakers shall have individual adjustments for short delay pickup and time, and include I^2t settings
3. All circuit breakers shall have an adjustable instantaneous pickup
4. All circuit breakers shall have individually adjustable ground fault current pickup and time, and include I^2t settings or ground alarm only

G. The trip unit shall have provisions for a single test kit to test each of the trip functions.

H. The trip unit shall provide zone interlocking for the short-time delay and ground fault delay trip functions for improved system coordination. The zone interlocking system shall restrain the tripping of an upstream breaker and allow the breaker closest to the fault to trip with no intentional time delay. In the event that the downstream breaker does not trip, the upstream breaker shall trip after the present time delay. The trip unit shall include a voltage transformer module, suitable for operation up to 600V, 50/60 Hz. The primary of the voltage transformer module shall be connected internally to the line side of the circuit breaker through a dielectric test disconnect plug.

I. System coordination shall be provided by the following microprocessor-based programmable time-current curve shaping adjustments. The short-time pickup adjustment shall be dependant on the long delay setting.

1. Programmable long-time setting
2. Programmable long-time delay with selectable I^2t or I^4t curve shaping
3. Programmable short-time setting
4. Programmable short-time delay with selectable flat or I^2t curve shaping, and zone selective interlocking
5. Programmable instantaneous setting
6. Programmable ground fault setting trip or ground fault setting alarm

7. Programmable ground fault delay with selectable flat or I^2t curve shaping and zone selective interlocking
8. Adjustable undervoltage release
9. Adjustable overvoltage release
10. Reverse load and fault current
11. Reverse sequence voltage alarm
12. Underfrequency
13. Overfrequency
14. Voltage phase unbalance and phase loss during current detection

J. Each section of the switchgear shall be provided with a space heater thermostatically controlled. Power for the space heaters shall be obtained from a source as indicated on the drawings. Supply voltage shall be 120 volts ac.

K. Fused control power transformers shall be provided as indicated on the drawings or as required for proper operation of the equipment. A manual disconnect shall be provided ahead of the primary fuses.

2.08 ENCLOSURES

A.

B. Outdoor Non-Walk-in Enclosure

1. Switchgear shall be enclosed in an outdoor non-walk-in NEMA 3R enclosure conforming to all applicable requirements of UL and designed to withstand wind velocities of 110mph. The enclosure shall have a roof sloping toward the rear. Outer sections shall be the same widths as indoor structures except the end sections of a non-walk-in enclosure shall be wider than the inner sections to permit opening the inner door. Each end of the outdoor structure shall have an end trim
2. The enclosure shall be provided with front and rear hinged padlockable doors with wind stops for each section. Steel floor plates shall be provided in the rear cable compartment. Ventilating openings shall be provided complete with replaceable fiberglass air filters which are removable from the exterior of the enclosure. Provide necessary space heaters thermostatically controlled for breaker, bus and cable compartments of adequate wattage to prevent the accumulation of moisture within the compartments
3. The construction of the enclosure shall be modular so future sections can be added without affecting NEMA 3R integrity. Provide interior fluorescent lights, switches and GFI protected receptacles
4. The enclosure shall be provided with undercoating applied to all members in contact with the foundation surface to retard corrosion
5. Power for the space heaters, lights and receptacles shall be obtained from a control power transformer within the switchgear. Supply voltage shall be 120 volts ac

6. A portable overhead circuit breaker lifter shall be provided to assist in removal of the circuit breakers from the enclosure
7. Each shipping section shall be shipped completely assembled

2.09 NAMEPLATES

A. Engraved nameplates, mounted on the face of the assembly, shall be furnished for all main and feeder circuits as indicated on the drawings. Nameplates shall be laminated plastic, black characters on white background, and secured with screws. Characters shall be 3/16-inch high, minimum.

B. Furnish master nameplate giving switchgear designation, voltage ampere rating, short-circuit rating, and manufacturer's name.

C. Control components mounted within the assembly, such as fuse blocks, relays, pushbuttons, switches, etc., shall be suitably marked for identification corresponding to appropriate designations on manufacturer's drawings.

2.10 FINISH

A. All exterior and interior steel surfaces of the switchgear shall be properly cleaned and provided with a rust-inhibiting phosphatized coating. Color and finish of the switchgear shall be ANSI 61.

2.11 SURGE PROTECTIVE DEVICES

A. Provide surge protective devices as specified in Section 16671A.

2.12 FACTORY TESTING

A. Standard factory tests shall be performed on the primary equipment provided under this section. All tests shall be in accordance with the latest version of ANSI and NEMA standards.

B. The following factory tests shall be made on all transformers. All tests shall be in accordance with the latest revision of ANSI and NEMA standards.

1. Resistance measurements of all windings on the rated voltage connection of each unit and at the tap extremes of one unit only of a given rating on this project
2. Ratio tests on the rated voltage connection and on all tap connections
3. Polarity and phase-relation tests on the rated voltage connections
4. No-load loss at rated voltage on the rated voltage connection
5. Exciting current at rated voltage on the rated voltage connection

6. Impedance and load loss at rated current on the rated voltage connection of each unit and on the tap extremes of one unit only of a given rating on this project
7. Applied potential test
8. Induced potential tests

C. The following standard factory tests shall be performed on the secondary equipment provided under this section. All tests shall be in accordance with the latest version of ANSI and NEMA standards.
   1. The switchgear shall be completely assembled, wired, adjusted and tested at the factory. After assembly, the complete switchgear shall be tested to ensure the accuracy of the wiring and the functioning of all equipment. The main bus system shall be given a dielectric test of 2200 volts for one minute between live parts and ground and between opposite polarities
   2. The wiring and control circuits shall be given a dielectric test of 1500 volts for one minute or 1800 volts for one second between live parts and ground, in accordance with ANSI C37.20.1

D. The manufacturer shall provide three (3) certified copies of factory test reports.
   1.

2.13 FIELD QUALITY CONTROL

A. Provide the services of a qualified factory-trained manufacturer's representative to assist the Contractor in installation and startup of the equipment specified under this section for a period of 7 working days. The manufacturer's representative shall provide technical direction and assistance to the contractor in general assembly of the equipment, connections and adjustments, and testing of the assembly and components contained herein.

B. The Contractor shall provide three (3) copies of the manufacturer's field startup report.

2.14 MANUFACTURER'S CERTIFICATION

A. A qualified factory-trained manufacturer's representative shall certify in writing that the equipment has been installed, adjusted and tested in accordance with the manufacturer's recommendations.

B. The Contractor shall provide three (3) copies of the manufacturer's representative's certification.

2.15 TRAINING

A. The Contractor shall provide a training session for up to five (5) owner's representatives for 1 normal workdays at a job site location determined by the owner.

B. The training session shall be conducted by a manufacturer's qualified representative. The training program shall include instructions on the assembly including primary equipment, transformer, and secondary equipment. All circuit breakers, protective devices and other major components shall be included.

2.16 INSTALLATION

A. The contractor shall install all equipment per the manufacturer’s recommendation and the contract drawings.

B. All necessary hardware to secure the assembly in place shall be provided by the contractor.

2.17 FIELD ADJUSTMENTS

2.18 FIELD TESTING

SECTION 26 22 00 - LOW-VOLTAGE TRANSFORMERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following types of dry-type transformers rated 600 V and less, with capacities up to 1000 kVA:

1. Distribution transformers.

B. Related Requirements:

1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 MRc2: CONSTRUCTION WASTE MANAGEMENT

A. No less than the specified minimum proportion of all construction waste from the project shall be diverted from disposal in a landfill and/or incineration in accordance with the project requirements for Construction Waste Management. See Section 018113 Sustainable Design Requirements.

B. EQc4.1: LOW-EMITTING MATERIALS – SEALANTS AND ADHESIVES

All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the project requirements for Low-Emitting Materials – Sealants and Adhesives. See Section 018113 Sustainable Design Requirements.

Contractor shall provide LEED credit verification as per Section 013300 Submittal Procedures.

C. EQc4.2: LOW-EMITTING MATERIALS – PAINTS AND COATINGS

All paints and coatings used in the building interior comply with the project requirements for Low-Emitting Materials – Paints and Coatings. See Section 018113 Sustainable Design Requirements.

Contractor shall provide LEED credit verification as per Section 013300 Submittal Procedures.

1.4 SUBMITTALS

A. Product Data: Include rated nameplate data, capacities, weights, dimensions, minimum clearances, installed devices and features, and performance for each type and size of transformer indicated.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Wiring Diagrams: Power, signal, and control wiring.

C. Qualification Data: For testing agency.

D. Manufacturer Seismic Qualification Certification: Submit certification that transformers, accessories, and components will withstand seismic forces defined in Division 26 Section "Vibration and Seismic Controls for Electrical Systems." Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

E. Source quality-control test reports.

F. Field quality-control test reports.

G. Operation and Maintenance Data: For transformers to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7.

B. Source Limitations: Obtain each transformer type through one source from a single manufacturer.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. Comply with IEEE C57.12.91, "Test Code for Dry-Type Distribution and Power Transformers."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Temporary Heating: Apply temporary heat according to manufacturer's written instructions within the enclosure of each ventilated-type unit, throughout periods during which equipment is not energized and when transformer is not in a space that is continuously under normal control of temperature and humidity.

1.7 COORDINATION

A. Coordinate size and location of concrete bases with actual transformer provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

B. Coordinate installation of wall-mounting and structure-hanging supports with actual transformer provided.

1.8 COMMISSIONING

A. The materials, components and systems described in this section are subject to the Commissioning process. Contractor must comply with all Commissioning Requirements. Commissioning Requirements are described in Section 019113 General Commissioning Requirements and in Division 36 Commissioning. Division 36 provides an individual Commissioning specification section for each Division 2 through Division 33 specification section requiring Commissioning.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. ACME Electric Corporation; Power Distribution Products Division.
2. Challenger Electrical Equipment Corp.; a division of Eaton Corp.
3. Controlled Power Company.
4. Eaton Electrical Inc.; Cutler-Hammer Products.
5. Federal Pacific Transformer Company; Division of Electro-Mechanical Corp.
6. General Electric Company.
7. Hammond Co.; Matra Electric, Inc.
8. Magnetek Power Electronics Group.
9. Micron Industries Corp.
10. Myers Power Products, Inc.
11. Siemens Energy & Automation, Inc.
12. Sola/Hevi-Duty.

2.2 GENERAL TRANSFORMER REQUIREMENTS

A. Description: Factory-assembled and -tested, air-cooled units for 60-Hz service.

B. Cores: Grain-oriented, non-aging silicon steel.

C. Coils: Continuous windings without splices except for taps.

1. Internal Coil Connections: Brazed or pressure type.
2. Coil Material: Copper.

2.3 DISTRIBUTION TRANSFORMERS

A. Comply with NEMA ST 20, and list and label as complying with UL 1561.

B. Provide transformers that are constructed to withstand seismic forces specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."

C. Cores: One leg per phase.

D. Enclosure: Ventilate**d** NEMA 250, Type 2.

1. Core and coil shall be encapsulated within resin compound, sealing out moisture and air.

E. Transformer Enclosure Finish: Comply with NEMA 250.

1. Finish Color**:** Gray.

F. Taps for Transformers Smaller Than 3 kVA: None.

G. Taps for Transformers 7.5 to 24 kVA: One 5 percent tap above and one 5 percent tap below normal full capacity.

H. Taps for Transformers 25 kVA and Larger: Two 2.5 percent taps above and two 2.5 percent taps below normal full capacity.

I. Insulation Class: 220 deg C, UL-component-recognized insulation system with a maximum of 80 deg C rise above 40 deg C ambient temperature.

J. Energy Efficiency for Transformers Rated 15 kVA and Larger:

1. Complying with NEMA TP 1, Class 1 efficiency levels.
2. Tested according to NEMA TP 2.

K. K-Factor Rating: Transformers indicated to be K-factor rated shall comply with UL 1561 requirements for nonsinusoidal load current-handling capability to the degree defined by designated K-factor.

1. Unit shall not overheat when carrying full-load current with harmonic distortion corresponding to designated K-factor.
2. Indicate value of K-factor on transformer nameplate.

L. Wall Brackets: Manufacturer's standard brackets.

M. Low-Sound-Level Requirements: As per NEMA ST 20 standard sound levels when factory tested according to IEEE C57.12.91.

2.4 BUCK-BOOST TRANSFORMERS

A. Description: Self-cooled, two-winding dry type, rated for continuous duty and with wiring terminals suitable for connection as autotransformer. Transformers shall comply with NEMA ST 1 and shall be listed and labeled as complying with UL 506 or UL 1561.

B. Enclosure: Ventilated, NEMA 250, Type 2.

1. Finish Color: Gray.

2.5 IDENTIFICATION DEVICES

A. Nameplates: Engraved, laminated-plastic or metal nameplate for each distribution transformer, mounted with corrosion-resistant screws. Nameplates and label products are specified in Division 26 Section "Identification for Electrical Systems."

2.6 SOURCE QUALITY CONTROL

A. Test and inspect transformers according to IEEE C57.12.91.

B. Factory Sound-Level Tests: Conduct sound-level tests on equipment for this Project.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions for compliance with enclosure- and ambient-temperature requirements for each transformer.

B. Verify that field measurements are as needed to maintain working clearances required by NFPA 70 and manufacturer's written instructions.

C. Examine walls, floors, roofs, and concrete bases for suitable mounting conditions where transformers will be installed.

D. Verify that ground connections are in place and requirements in Division 26 Section "Grounding and Bonding for Electrical Systems" have been met. Maximum ground resistance shall be 5 ohms at location of transformer.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install wall-mounting transformers level and plumb with wall brackets fabricated by transformer manufacturer.

1. Brace wall-mounting transformers as specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems.

B. Construct concrete bases and anchor floor-mounting transformers according to manufacturer's written instructions, seismic codes applicable to Project, and requirements in Division 26 Section "Vibration and Seismic Controls for Electrical Systems

3.3 CONNECTIONS

A. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

B. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections and prepare test reports.

B. Perform tests and inspections and prepare test reports.

C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

D. Remove and replace units that do not pass tests or inspections and retest as specified above.

E. Infrared Scanning:

1. Infrared Scanning: Perform the following infrared scan tests and inspections and prepare reports:

a. Infrared Scanning: After the date of acceptance, perform infrared scan of each transformer. Remove front and rear of transformer so joints and connections are accessible to portable scanner.

b. Follow-up infrared canning: perform an additional follow-up infrared scan of each transformer 11 months after date of Acceptance.

c. Record of infrared scanning: Prepare a certified report that identifies transformers are checked and that describes infrared-scanning results. Include notation of deficiencies detected, remedial action taken,and observations after remedial action.

d. Instruments and Equipment:

1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

F. Test Labeling: On completion of satisfactory testing of each unit, attach a dated and signed "Satisfactory Test" label to tested component.

3.5 ADJUSTING

A. Record transformer secondary voltage at each unit for at least 48 hours of typical occupancy period. Adjust transformer taps to provide optimum voltage conditions at secondary terminals. Optimum is defined as not exceeding nameplate voltage plus 10 percent and not being lower than nameplate voltage minus 3 percent at maximum load conditions. Submit recording and tap settings as test results.

B. Connect buck-boost transformers to provide nameplate voltage of equipment being served, plus or minus 5 percent, at secondary terminals.

C. Output Settings Report: Prepare a written report recording output voltages and tap settings.

3.6 CLEANING

A. Vacuum dirt and debris; do not use compressed air to assist in cleaning.

END OF SECTION 262200

SECTION 26 23 00 - METAL-ENCLOSED DRAWOUT SWITCHGEAR (MAGNUM DS) – LOW VOLTAGE

PART 1 GENERAL

1.1 SCOPE

A. The Contractor shall furnish and install, where indicated on the drawings, a deadfront type, low voltage metal-enclosed switchgear assembly utilizing Cutler-Hammer Magnum DS drawout power circuit breakers, as specified herein and shown on the contract drawings.

1.2 RELATED SECTIONS

A. Section 16671A – Transient Voltage Surge Suppression.

B. Section 16901 – Microprocessor-Based Metering Equipment.

C. Related Requirements:

1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 REFERENCES

A. The low voltage metal-enclosed switchgear assembly and all components shall be designed, manufactured and tested in accordance with the following latest applicable standards:

1. ANSI-C37.20 – Switchgear assemblies
2. ANSI-C37.13 – Low voltage power circuit breakers
3. ANSI-C37.17 – Trip devices
4. NEMA SG-5 – Switchgear assemblies
5. NEMA SG-3 – Low voltage power circuit breakers
6. UL 1558

1.4 SUBMITTALS – FOR REVIEW/APPROVAL

A. The following information shall be submitted to the Engineer:

1. Master drawing index
2. Front view and plan view of the assembly
3. Three-line diagram
4. Schematic diagram
5. Nameplate schedule
6. Component list
7. Conduit space locations within the assembly

8. Assembly ratings including:
   a. Short-circuit rating
   b. Voltage
   c. Continuous current rating
9. Major component ratings including:
   a. Voltage
   b. Continuous current rating
   c. Interrupting ratings
10. Cable terminal sizes
11. Product data sheets

B. Where applicable, the following additional information shall be submitted to the Engineer:
1. Busway connection
2. Composite front view and plan view of close-coupled assemblies
3. Key interlock scheme drawing and sequence of operations
4. Mimic bus size and color

1.5 SUBMITTALS – FOR CONSTRUCTION

A. The following information shall be submitted for record purposes:
1. Final as-built drawings and information for items listed in Paragraph 1.04, and shall incorporate all changes made during the manufacturing process
2. Wiring diagrams
3. Certified production test reports
4. Installation information
5. Seismic certification as specified

1.6 QUALIFICATIONS

A. The manufacturer of the assembly shall be the manufacturer of the major components within the assembly.

B. For the equipment specified herein, the manufacturer shall be ISO 9001 or 9002 certified.

C. The manufacturer of this equipment shall have produced similar electrical equipment for a minimum period of five (5) years. When requested by the Engineer, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.

D. Provide Seismic tested equipment as follows:
1. The equipment and major components shall be suitable for and certified by actual seismic testing to meet all applicable seismic requirements of the latest International Building Code (IBC)
2. The Project Structural Engineer will provide site specific ground motion criteria for use by the manufacturer to establish SDS values required.
3. The IP rating of the equipment shall be 1.5

4. The Structural Engineer for the Site will evaluate the SDS values published on the Manufacturer's website to ascertain that they are "equal to" or "greater than" those required for the Project Site.
5. The following minimum mounting and installation guidelines shall be met, unless specifically modified by the above referenced standards.
   a. The Contractor shall provide equipment anchorage details, coordinated with the equipment mounting provision, prepared and stamped by a licensed civil engineer in the state. Mounting recommendations shall be provided by the manufacturer based upon the above criteria to verify the seismic design of the equipment.
   b. The equipment manufacturer shall certify that the equipment can withstand, that is, function following the seismic event, including both vertical and lateral required response spectra as specified in above codes.
   c. The equipment manufacturer shall document the requirements necessary for proper seismic mounting of the equipment. Seismic qualification shall be considered achieved when the capability of the equipment, meets or exceeds the specified response spectra.

1.7 WARRANTY.

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of surge suppressors that fails in materials or workmanship within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

1.8 REGULATORY REQUIREMENTS

A. The switchgear shall bear a UL 1558 label. Certified copies of production test reports shall be supplied demonstrating compliance with these standards.

1.9 DELIVERY, STORAGE AND HANDLING

A. Equipment shall be handled and stored in accordance with manufacturer's instructions. One (1) copy of these instructions shall be included with the equipment at time of shipment.

1.10 OPERATION AND MAINTENANCE MANUALS

A. Equipment operation and maintenance manuals shall be provided with each assembly shipped, and shall include instruction leaflets and instruction bulletins for the complete assembly and each major component.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Eaton

B. General Electric

C. Siemens

The listing of specific manufacturers above does not imply acceptance of their products that do not meet the specified ratings, features and functions. Manufacturers listed above are not relieved from meeting these

specifications in their entirety. Products in compliance with the specification and manufactured by others not named will be considered only if pre-approved by the Engineer ten (10) days prior to bid date.

2.2 RATINGS

A. Voltage rating shall be as indicated on the drawings. The entire assembly shall be suitable for 600 volts maximum ac service.

B. The assembly shall be rated to withstand mechanical forces exerted during short-circuit conditions when connected directly to a power source having available fault current of 65,000amperes symmetrical at rated voltage

C. The bus system shall have a minimum ANSI short-circuit withstand rating of 65,000 amperes symmetrical tested in accordance with ANSI C37.20.1 and UL1558.

D. All circuit breakers shall have a minimum symmetrical interrupting capacity of *[65,000 amperes. To ensure a fully selective system, all circuit breakers shall have 30 cycle short-time withstand ratings equal to their symmetrical interrupting ratings through 85,000 amperes, regardless of whether equipped with instantaneous trip protection or not.

E. All ratings shall be tested to the requirements of ANSI C37.20.1, C37.50 and C37.51 and UL witnessed and approved.

2.3 CONSTRUCTION

A. The switchgear shall consist of the required number of vertical sections bolted together to form a rigid assembly. The sides shall be covered with removable bolt-on covers. All edges of front covers or hinged front panels shall be formed. Provide ventilators located on the top of the switchgear over the breaker and bus compartments to ensure adequate ventilation within the enclosure. The rear covers shall be fabricated in two (2) pieces for ease of handling and shall be mounted using captive hardware.

B. The assembly shall be provided with adequate lifting means and shall be capable of being moved into installation position and bolted directly to *[Contractor supplied floor sills to be set level in concrete per manufacturer's recommendations] [the floor without the use of floor sills providing the floor is level to 1/8 inch per 3-foot distance in any direction. Provisions shall be made for jacking of shipping groups, for removal of skids or insertion of equipment rollers. Base of assembly shall be suitable for rolling directly on pipes without skids. The base shall be equipped with slots in the base frame members to accommodate the use of pry bars for moving the equipment to its final position.

C. Each vertical steel unit forming part of the switchgear line-up shall be a self-contained housing having one or more individual breaker or instrument compartments, a centralized bus compartment and a rear cable compartment. Each individual circuit breaker compartment, or cell, shall be segregated from adjacent compartments and sections by means of steel barriers to the maximum extent possible. It shall be equipped with drawout rails and primary and secondary disconnecting contacts. Removable hinge pins shall be provided on the breaker compartment door hinges. Current transformers for feeder instrumentation, where shown on the plans, shall be located within the appropriate breaker cells and be front accessible and removable.

D. The stationary part of the primary disconnecting devices for each power circuit breaker shall be breaker mounted and consist of a set of contacts extending to the rear through a glass polyester insulating support barrier; corresponding moving finger contacts, suitably spaced, shall be furnished on the power circuit breaker studs which engage in only the connected position. The assembly shall

provide multiple silver-to-silver full floating high pressure point contacts with uniform pressure on each finger maintained by springs. Each circuit shall include the necessary three-phase bus connections between the section bus and the breaker line side studs. Load studs shall be equipped with insulated copper load extension buses terminating in solderless type terminals in the rear cable compartment of each structure. Bus extensions shall be tin-platedwhere outgoing terminals are attached.

E. The circuit breaker door design shall be such that the following functions may be performed without the need to open the circuit breaker door: lever circuit breaker between positions, operate manual charging system, close and open circuit breaker, examine and adjust trip unit, and read circuit breaker rating nameplate.

F. The secondary disconnecting devices shall consist of floating terminals mounted on the stationary unit and engaging mating contacts at the front of the breaker. The secondary disconnecting devices shall be gold-plated and engagement shall be maintained in the “connected” and “test” positions.

G. The removable power circuit breaker element shall be equipped with disconnecting contacts and interlocks for drawout application. It shall have four positions, “connected,” “test,” “disconnected” and “removed.” The breaker drawout element shall contain a worm gear levering “in” and “out” mechanism with removable lever crank. Levering shall be accomplished via the use of conventional tools. Mechanical interlocking shall be provided so that the breaker is in the tripped position before levering “in” or “out” of the cell. Interlocking that trips the breaker will not be accepted. The breaker shall include an optional provision for key locking open to prevent manual or electric closing. Padlocking shall provide for securing the breaker in the connected, test, or disconnected position by preventing levering.

H. An insulating flash shield shall be mounted above each circuit breaker to prevent flashover from the arc chutes to ground.

I. The switchgear shall be Cutler-Hammer Magnum DS low voltage metal-enclosed switchgear, utilizing Magnum DS power circuit breakers as herein specified.

J. The switchgear shall be suitable for use as service entrance equipment and be labeled in accordance with UL requirements.

K. Provide a rear compartment barrier between the cable compartment and the main bus to protect against inadvertent contact with main or vertical bus bars.

L. Provide in the cell when the circuit breaker is withdrawn, a safety shutter which automatically covers the line and load stabs and protects against incidental contact.

M. Provide a metal barrier full height and depth between adjacent vertical structures in the cable compartment.

N. Provide a glass polyester full height and depth barrier between adjacent vertical structures in the bus compartment with appropriate slots for main bus.

2.4 BUS

A. All bus bars shall be tin-plated copper. Main horizontal bus bars shall be mounted with all three phases arranged in the same vertical plane. Bus sizing shall be based on ANSI standard temperature rise criteria of 65 degrees C over a 40 degrees C ambient (outside the enclosure).

B. Provide a full capacity neutral bus where a neutral bus is indicated on the drawings.

C. A copper ground bus shall be furnished firmly secured to each vertical section structure and shall extend the entire length of the switchgear. The ground bus short-time withstand rating shall meet that of the largest circuit breaker within the assembly.

D. All hardware used on conductors shall be high-tensile strength and zinc-plated. All bus joints shall be provided with Belleville-type washers.

2.5 WIRING/TERMINATIONS

A. Small wiring, necessary fuse blocks and terminal blocks within the switchgear shall be furnished as required. Control components mounted within the assembly shall be suitably marked for identification corresponding to the appropriate designations on manufacturer's wiring diagrams.

B. Provide a front accessible, isolated vertical wireway for routing of factory and field wiring. Factory provisions shall be made for securing field wiring without the need for adhesive wire anchors.

C. Front access to all circuit breaker secondary connection points shall be provided for ease of troubleshooting and connection to external field connections without the need of removing the circuit breaker for access.

D. All control wire shall be type SIS. Control wiring shall be 14 ga for control circuits and 12 gafor current transformer circuits. Wire bundles shall be secured with nylon ties and anchored to the assembly with the use of pre-punched wire lances or nylon non-adhesive anchors. All current transformer secondary leads shall first be connected to conveniently accessible shorting terminal blocks before connecting to any other device. Shorting screws with provisions for storage shall be provided. All groups of control wires leaving the switchgear shall be provided with terminal blocks with suitable numbering strips and provisions for #10 AWG field connections. Each control wire shall be marked to the origin zone/wire name/destination zone over the entire length of the wire using a cured ink process. Provide wire markers at each end of all control wiring. Plug-in terminal blocks shall be provided for all shipping split wires. Terminal connections to remote devices or sources shall be front accessible via doors above each circuit breaker.

E. NEMA 2-hole crimp- type lugs shall be provided for all line and load terminations suitable for copper or aluminum cable rated for 75 degrees C of the size indicated on the drawings.

F. Lugs shall be provided in the incoming line section for connection of the main grounding conductor. Additional lugs for connection of other grounding conductors shall be provided as indicated on the drawings.

G. Reusable insulating boots shall be provided to cover all power cable terminations.

2.6 CIRCUIT BREAKERS

A. All protective devices shall be low voltage power circuit breakers, Cutler-Hammer type Magnum DS or approved equal. All breakers shall be UL listed for application in their intended enclosures for 100% of their continuous ampere rating.

B. All power circuit breakers shall be constructed and tested in accordance with ANSI C37.13, C37.16, C37.17, C37.50, UL 1066 and NEMA SG-3 standard. The breaker shall carry a UL label.

C. Breakers shall be provided in drawout configuration. The 800, 1600, 2000 and 3200 ampere frame power circuit breakers shall be provided in the same physical frame size, while 4000, 5000 and 6000 ampere frame power circuit breakers shall be provided in a second physical frame size. Both physical frame sizes shall have a common height and depth.

D. Power circuit breakers shall utilize a two-step stored-energy mechanism to charge the closing springs. The closing of the breaker contacts shall automatically charge the opening springs to ensure quick-break operation.

E. Breakers shall be manually operated (MO) unless electrically operated (EO) is indicated on the drawings.

F. Electrically operated breakers shall be complete with 120 Vac motor operators. The charging time of the motor shall not exceed 6 seconds.

G. To facilitate lifting, the power circuit breaker shall have integral handles on the side of the breaker.

H. The power circuit breaker shall have a closing time of not more than 3 cycles.

I. The primary contacts shall have an easily accessible wear indicator to indicate contact erosion.

J. The power circuit breaker shall have three windows in the front cover to clearly indicate any electrical accessories that are mounted in the breaker. The accessory shall have a label that will indicate its function and voltage. The accessories shall be plug and lock type and UL listed for easy field installation. They shall be modular in design and shall be common to all frame sizes and ratings.

K. The breaker control interface shall have color-coded visual indicators to indicate contact open or closed positions, as well as mechanism charged and discharged positions. Manual control pushbuttons on the breaker face shall be provided for opening and closing the breaker. The power circuit breaker shall have a “Positive On” feature. The breaker flag will read “Closed” if the contacts are welded and the breaker is tripped or opened.

L. The current sensors shall have a back cover window that will permit viewing the sensor rating on the back of the breaker. A rating plug will offer indication of the rating on the front of the trip unit.

M. A position indicator shall be located on the faceplate of the breaker. This indicator shall provide color indication of the breaker position in the cell. These positions shall be Connect (Red), Test (Yellow), and Disconnect (Green). The levering door shall be interlocked so that when the breaker is in the closed position, the breaker levering-in door shall not open.

N. Each power circuit breaker shall offer sixty (60) front-mounted dedicated secondary wiring points. Each wiring point shall have finger safe contacts, which will accommodate #10 AWG maximum field connections with ring tongue or spade terminals or bare wire.

2.7 TRIP UNITS

A. Each low voltage power circuit breaker shall be equipped with a solid-state tripping system consisting of three current sensors, microprocessor-based trip device and flux-transfer shunt trip. Current sensors shall provide operation and signal function. The trip unit shall use microprocessor-based technology to provide the basic adjustable time-current protection functions. True rms sensing circuit protection shall be achieved by analyzing the secondary current signals received from the circuit breaker current sensors and initiating trip signals to the circuit breaker trip actuators when predetermined trip levels and time delay settings are reached. Interchangeable current sensors with their associated rating plug shall establish the continuous trip rating of each circuit breaker. The trip unit shall be Cutler-Hammer type Digitrip RMS 520M.

B. The trip unit shall have an information system that utilizes battery backup LEDs to indicate mode of trip following an automatic trip operation. The indication of the mode of trip shall be retained after an

automatic trip. A reset button shall be provided to turn off the LED indication after an automatic trip. A test pushbutton shall energize a LED to indicate the battery status.

C. The trip unit shall be provided with a display panel, including a representation of the time/current curve that will indicate the protection functions. The unit shall be continuously self-checking and provide a visual indication that the internal circuitry is being monitored and is fully operational.

D. The trip unit shall be provided with a making-current release circuit. The circuit shall be armed for approximately two cycles after breaker closing and shall operate for all peak fault levels above 25 times the ampere value of the rating plug.

E. Trip unit shall have selectable powered and unpowered thermal memory for enhanced circuit protection.

F. Complete system selective coordination shall be provided by the addition of the following individually adjustable time/current curve shaping solid-state elements:

1. All circuit breakers shall have adjustments for long delay pickup and time
2. All circuit breakers shall have individual adjustments for short delay pickup and time, and include I^2t settings
3. All circuit breakers shall have an adjustable instantaneous pickup
4. All circuit breakers shall have individually adjustable ground fault current pickup and time, and include I^2t settings or ground alarm only

G. The trip unit shall have provisions for a single test kit to test each of the trip functions.

H. The trip unit shall provide zone interlocking for the short-time delay and ground fault delay trip functions for improved system coordination. The zone interlocking system shall restrain the tripping of an upstream breaker and allow the breaker closest to the fault to trip with no intentional time delay. In the event that the downstream breaker does not trip, the upstream breaker shall trip after the present time delay

I. Main Circuit breakers, where indicated on the drawings, shall have individually adjustable ground fault alarm only.

J. The trip unit shall have a 4-character LCD display showing phase, neutral, and ground current. The accuracy of these readings shall be +/- 2% of full scale.

K. The trip unit shall include a power/relay module which shall supply control to the readout display. Following an automatic trip operation of the circuit breaker, the trip unit shall maintain the cause of trip history and the mode of trip LED indication as long as its internal power supply is available. An internal relay shall be programmable to provide contacts for remote ground alarm indication.

L. The trip unit shall include a voltage transformer module, suitable for operation up to 600V, 50/60 Hz. The primary of the voltage transformer module shall be connected internally to the line side of the circuit breaker through a dielectric test disconnect plug.

2.8 MISCELLANEOUS DEVICES

A. Key interlocks shall be provided as indicated on the drawings. These interlocks shall keep the circuit breakers trip-free when actuated.

B. Each section of the switchgear shall be provided with a space heater thermostatically controlled. Power for the space heaters shall be obtained from a control power transformer within the switchgear. Supply voltage shall be 120 volts ac.

C. Fused control power transformers shall be provided as indicated on the drawings or as required for proper operation of the equipment. A manual disconnect shall be provided ahead of the primary fuses.

2.9 OWNER METERING

A. Where indicated on the drawings, provide a separate owner metering compartment with front hinged door.

B. Provide current transformers for each meter. Current transformers shall be wired to shorting-type terminal blocks.

C. Provide potential transformers including primary and secondary fuses with disconnecting means for metering as shown on the drawings.

D. Microprocessor-Based Metering System.

2.10 ENCLOSURES

A. NEMA 1 Enclosure

2.11 NAMEPLATES

A. Engraved nameplates, mounted on the face of the assembly, shall be furnished for all main and feeder circuits as indicated on the drawings. Nameplates shall be laminated plastic, black characters on white background, and secured with screws. Characters shall be 3/16-inch high, minimum.

B. Furnish master nameplate giving switchgear designation, voltage ampere rating, short-circuit rating, and manufacturer’s name.

C. Control components mounted within the assembly, such as fuse blocks, relays, pushbuttons, switches, etc., shall be suitably marked for identification corresponding to appropriate designations on manufacturer’s drawings.

2.12 FINISH

A. All exterior and interior steel surfaces of the switchgear shall be properly cleaned and provided with a rust-inhibiting phosphatized coating. Color and finish of the switchgear shall be ANSI 61.

2.13 ACCESSORIES

A. Provide a floor running portable circuit breaker transfer truck with manual lifting mechanism.

2.14 SURGE PROTECTIVE DEVICES

A. Provide surge protective devices as specified in Section 16671A.

PART 3 EXECUTION

3.1 FACTORY TESTING

A. The switchgear shall be completely assembled, wired, adjusted and tested at the factory. After assembly, the complete switchgear shall be tested to ensure the accuracy of the wiring and the functioning of all equipment. The main bus system shall be given a dielectric test of 2200 volts for one minute between live parts and ground and between opposite polarities.

B. The wiring and control circuits shall be given a dielectric test of 1500 volts for one minute, or 1800 volts for one second, between live parts and ground, in accordance with ANSI C37.20.1.

C. A certified test report of all standard production tests shall be shipped with each assembly.

3.2 FIELD QUALITY CONTROL

A. Provide the services of a qualified factory-trained manufacturer's representative to provide start-up of the equipment specified under this section for a period of 2 working days.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each switchgear bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
3. Perform the following infrared scan tests and inspections and prepare reports:

a. Infrared Scanning: After the date of acceptance, perform infrared scan of the each switchgear. Remove front of panels so joints and connections are accessible to portable scanner.

b. Follow-up infrared canning: perform an additional follow-up infrared scan of the each switchgear 11 months after date of Acceptance.

c. Record of infrared scanning: Prepare a certified report that identifies switchgear is checked and that describes infrared-scanning results. Include notation of deficiencies detected, remedial action taken and observations after remedial action.

d. Instruments and Equipment:

1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

B. The Contractor shall provide three (3) copies of the manufacturer's field startup report.

3.3 TRAINING

A. The Contractor shall provide a training session for up to five (5) owner's representatives for 2 normal workdays at a job site location determined by the owner.

B. The training session shall be conducted by a manufacturer's qualified representative. The training program shall consist of the instruction on the operation of the assembly, circuit breakers, and major components within the assembly.

3.4 INSTALLATION

A. The Contractors shall install all equipment per the manufacturer's recommendations and the contract drawings.

B. All necessary hardware to secure the assembly in place shall be provided by the Contractor.

C. The equipment shall be installed and checked in accordance with the manufacturer's recommendations. This shall include but not limited to:

1. Checking to ensure that the pad location is level to within 0.125 inches per three feet of distance in any direction
2. Checking to ensure that all bus bars are torqued to the manufacturer's recommendations
3. Assembling all shipping sections, removing all shipping braces and connecting all shipping split mechanical and electrical connections
4. Securing assemblies to foundation or floor channels
5. Measuring and recording Megger readings phase-to-phase, phase-to-ground, and neutral-to-ground (four wire systems only)
6. Inspecting and installing all circuit breakers in their proper compartments

END OF SECTION 26 23 00

SECTION 26 23 14 – INTERIOR MEDIUM VOLTAGE METAL ENCLOSED SWITCHGEAR

PART 1 GENERAL

1.1 SCOPE

A. The Contractor shall furnish and install the (2) new medium voltage load interrupter switchgear cubicles as specified herein and as shown on the contract drawings. The new cubicles are to be connected to the existing Powercon switchgear. In addition to the installation of the new cubicles, the contractor shall test and repair the existing Powercon switchgear.

1.2 RELATED SECTIONS

A. Related Requirements:

1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 REFERENCES

A. The medium voltage load interrupter switchgear and all components shall be designed, manufactured and tested in accordance with the latest applicable standards as follows:

1. ANSI/IEEE C37.20.3
2. ANSI/IEEE C37.20.4
3. ANSI C37.22
4. ANSI C37.57, C37.58
5. NEMA SG5
6. NEMA SG6
7. CSA 22.2 No.31-M89 (5/15 kV ratings only)
8. EEMAC G8-3.3

B. Listing by Underwriters Laboratories (UL) or Canadian Standards Association (CSA) shall be provided for 5 kV or 15 kV class medium voltage load interrupter switchgear.

1.4 SUBMITTALS – FOR REVIEW/APPROVAL

A. The following information shall be submitted to the Engineer and BGE for their approval:

1. Master drawing index

2. Front view elevation
3. Floor plan
4. Top view
5. Single line
6. Nameplate schedule
7. Component list
8. Conduit entry/exit locations
9. Assembly ratings including:
    a. Short-circuit rating
    b. Voltage
    c. Continuous current
    d. Basic Impulse Level
10. Major component ratings including:
    a. Voltage
    b. Continuous current
    c. Interrupting ratings
11. Cable terminal sizes

A. Where applicable or required by the Engineer the following additional information shall be submitted to the Engineer:

12. Bus duct connection
13. Connection details between close-coupled assemblies
14. Composite floor plan of close-coupled assemblies
15. Electrical schematic diagram
16. Key interlock scheme drawing and sequence of operations
17. Descriptive bulletins
18. Product data sheets

1.5 SUBMITTALS – FOR CONSTRUCTION

A. The following information shall be submitted for record purposes:

1. Final as-built drawings and information for items listed in Paragraph 1.04, and shall incorporate all changes made during the manufacturing process
2. Wiring diagrams
3. Certified production test reports
4. Installation information including equipment anchorage provisions
5. Seismic certification as specified

1.6 QUALIFICATIONS

A. The manufacturer of the assembly shall be Powercon.

B. For the equipment specified herein, the manufacturer shall be ISO 9001 or 9002 certified.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of surge suppressors that fails in materials or workmanship within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

1.8 DELIVERY, STORAGE AND HANDLING

A. Equipment shall be handled and stored in accordance with manufacturer's instructions. One (1) copy of these instructions shall be included with the equipment at time of shipment.

B. Each switchgear assembly shall be split into shipping groups for handling as indicated on the drawings or per the manufacturer's recommendations. Shipping groups shall be designed to be shipped by truck, rail or ship. Shipping groups shall be bolted to skids. Accessories shall be packaged and shipped separately. Each switchgear shipping group shall be equipped with lifting eyes for handling solely by crane.

1.9 OPERATION AND MAINTENANCE MANUALS

A. Equipment operation and maintenance manuals shall be provided with each assembly shipped, and shall include instruction leaflets and instruction bulletins for the complete assembly and each major component.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Powercon (To match existing)

2.2 RATINGS (shall match existing switchgear)

A. Switchgear assembly ratings shall be as follows:

1.	Nominal System Voltage	15 kV three-phase three wire
2.	System Grounding	solid

3. Main Cross Bus Continuous Current — Match existing as determined by manufacture

1. Maximum Design Voltage — 15 kV
2. BIL — 95kV
3. Main Cross Bus Momentary Current (10 Cycle) — 101kA Asymmetrical RMS
4. Main Cross Bus 2-Second Short Circuit Current — 63 kA Symmetrical RMS

5. Non-Fused Switch (Continuous and Load Break) — 600 Amperes
6. Non-Fused Momentary withstand — 64 kA Asym RMS
7. Non-Fused Switch Fault close (3 times minimum, for 4.76 & 15 kV) — 61 kA Asymmetrical
8. Non-Fused Switch 2-Second Short Circuit Current — 38 kA Sym RMS

9. Fuse Rating — 100 Ampere
10. Type of Fuse — CLE
11. Fuse Interrupting Rating — 63 kA Sym RMS
12. Fused Switch Fault close — 101 kA Asym RMS

2.3 15 KV CONSTRUCTION

A. The metal-enclosed load interrupter switchgear shall consist of deadfront, completely metal-enclosed vertical sections containing load interrupter switches and fuses (where shown) of the number, rating and type noted on the drawings or specified herein.

B. The following features shall be supplied on every vertical section containing a three-pole, two-position open-closed switch:

1. A minimum 8-inch x 16-inch high-impact viewing window that permits full view of the position of all three switch blades through the closed door. The window shall not be more than 58-inches above the switch pad level to allow ease of inspection
2. The door shall be interlocked with the switch so that:
   a. The switch must be opened before the door can be opened.
   b. The door must be closed before the switch can be closed.
3. A hinged grounded metal barrier that is bolted closed in front of every switch to prevent inadvertent contact with any live part, yet allows for a full-view inspection of the switch blade position
4. Provision for padlocking the switch in the open or closed position
5. Green OPEN, Red CLOSED switch position indicators with the words “Open” and “Closed” in French, Spanish and English

6. A hinged cover with rustproof quarter turn nylon latches over the switch operating mechanism to discourage casual tampering

7. The switch shall be removable from the structure as a complete operational component

C. Vertical section construction shall be of the universal frame type using die-formed and bolted parts. All enclosing covers and doors shall be fabricated from steel with thickness equal to or greater than that specified in ANSI/IEEE C37.20.3. No owner removable hardware for covers or doors shall be thread-forming type. To facilitate installation and maintenance of cables and bus in each vertical section, a split removable top cover and padlockable hinged rear door held closed by bolts shall be provided. A G90 grade galvanized base shall isolate equipment from contact with the concrete pad providing protection from rust. Heavy-duty hot dipped galvanized anchor clips shall be provided to anchor the switchgear to the concrete pad.

D. Each vertical section containing a switch shall have a single, full-length, flanged front door and shall be equipped with two (2) rotary latch-type padlockable handles. Provision shall be made for operating the switch and storing the removable handle without opening the full length door.

E. Each load interrupter switch shall have the following features:

1. Three-pole gang-operated mechanism

2. Manual quick-make, quick-break over-toggle-type mechanism that does not require the use of a chain or a cable for operation, and utilizes a heavy-duty coil spring to provide opening and closing energy

3. The speed of opening and closing the switch shall be independent of the operator, and it shall be impossible to tease the switch into any intermediate position under normal operation

4. Separate main and break contacts to provide maximum endurance for fault close and load interrupting duty

5. Insulating barriers between each phase and between the outer phases and the enclosure

2.4 A MAINTENANCE PROVISION FOR SLOW CLOSING THE SWITCH TO CHECK SWITCH BLADE ENGAGEMENT AND SLOW OPENING THE SWITCH TO CHECK OPERATION OF THE ARC INTERRUPTING CONTACTS BUS

A. All phase bus conductors shall be tin-plated copper.

B. Ground bus shall be silver-plated copper and be directly fastened to a galvanized metal surface of each vertical section, and be of a size sufficient to carry the rated (2-second) current of the switchgear assembly.

C. A neutral bus shall be provided only when indicated on the drawings. It shall be insulated for 1000 Vac to ground. The current rating of the neutral bus shall be 600 amperes.

2.5 BUS INSULATION SYSTEM

A. All bus shall be supported utilizing a high strength and high creep support providing 10.5-inch of creep distance between phases and ground. The molded fins shall be constructed of high track resistant cycloaliphatic epoxy.

B. All standoff insulators on switches and fuse mountings shall be glass polyester (for 5kV and 15kV class switchgear).

2.6 WIRING/TERMINATIONS

A. One (1) terminal pad per phase shall be provided for attaching contractor-supplied cable terminal lugs for a maximum of two (2) conductors per phase of the sizes indicated on the drawings. Sufficient space shall be allowed for contractor supplied electrical stress relief termination devices.

B. Small wiring, fuse blocks and terminal blocks within the vertical section shall be furnished as indicated on the drawings. Each control wire shall be labeled with wire markers. Terminal blocks shall be provided for owner's connections to other apparatus.

2.7 FUSES

A. Fault protection shall be provided by fuses with continuous ratings as shown in the contract documents. Any fuse/switch integrated momentary and fault close ratings specified shall have been verified by test and UL and CSA certified.

2.9 ACCESSORIES

A. Supply key interlocks as shown on the drawings.

B. Furnish distribution class surge arresters with ratings in accordance with manufacture's recommendations.

C. (1) Set of spare 15KV fuses.

D. Digital electrical power monitor mounted on the front of each cubicle. Power monitor shall include all necessary PTs and CTs.

E. Portal in each new and existing door for infrared viewing.

2.11 ENCLOSURES

A. Enclosures shall be constructed per IEEE/ANSI C37.20.3 Outdoor specifications. (Exceeds NEMA 3R.)

B. Each vertical section shall have a sloped weatherproof roof with labyrinth shaped joints. Use of gasket or caulking to make roof joints weatherproof shall not be permitted. All exterior openings shall be screened to prevent the entrance of small animals and barriered to inhibit the entrance of snow, sand, etc. A minimum of one (1) 250-watt, 120-volt space heater shall be provided in each vertical section. Power for the space heater(s) shall be furnished by a control power transformer mounted in the switchgear. The design shall be non-walk-in type.

C. Each vertical section shall be ventilated at the top and bottom, both front and rear, to allow airflow to provide cooling and help prevent buildup of moisture within the structure. The ventilated covers shall be externally removable to allow safe maintenance of the filter media without providing access to live parts.

D. Enclosure shall be Dust Resistant. All ventilated openings shall be filtered to inhibit the ingress of dust. The ventilated covers shall be externally removable to allow safe maintenance of the filter media without providing access to live parts. All external doors and covers shall be gasketed.

2.12 NAMEPLATES

A. A nameplate shall be mounted on the front door of each switch vertical section in accordance with the drawings.

2.13 FINISH

A. Prior to assembly, all enclosing steel shall be thoroughly cleaned and phosphatized. A powder coating shall be applied electrostatically, then fused-on by baking in an oven. The coating is to have a thickness of not less than 1.5 mils. The finish shall have the following properties:

Impact resistance (ASTM D-2794)	60 direct/60 indirect
Pencil hardness (ASTM D-3363)	H
Flexibility (ASTM D-522)	Pass 1/8-inch mandrel
Salt spray (ASTM B117-85 [20])	600 hours
Color	ANSI 61 gray

2.15 REPAIRS TO EXISTING SWITCHGEAR

A. The contractor performing the repairs to the existing 15KV switchgear shall have NICET or NETA certified technician on site. The testing company shall be responsible to schedule all outages with BGE for all the gear to be tested and repaired. A full test in accordance with NETA standards shall be performed. The automatic transfer scheme shall be fully tested. The control switch handle that failed to operate the main switch shall be fully repaired.

2.16 BGE COORDINATION

A. Contractor shall send shop drawings of new cubicles including time current curves for the installed fuses to BGE for review and their approval.

PART 3 – EXECUTION

3.1 FACTORY TESTING

A. Standard factory tests shall be performed on the equipment under this section. All tests shall be in accordance with the latest version of ANSI and NEMA standards.

B. Factory tests as outlined above shall be witnessed by the owner's representative.

1. The manufacturer shall notify the owner two (2) weeks prior to the date the tests are to be performed

2. The manufacturer shall provide three (3) certified copies of factory test reports.

3.2 FIELD QUALITY CONTROL

A. Provide the services of a qualified factory-trained manufacturer's representative to assist the Contractor in installation and startup of the equipment specified under this section for a period of 2 working days. The manufacturer's representative shall provide technical direction and assistance to the Contractor in general assembly of the equipment, connections and adjustments, and testing of the assembly and components contained therein.

B. The Contractor shall provide three (3) copies of the manufacturer's field startup report.

3.3 MANUFACTURER'S CERTIFICATION

A. The Contractor shall provide a qualified factory-trained manufacturer's representative shall certify in writing that the equipment has been installed, adjusted and tested in accordance with the manufacturer's recommendations.

B. The Contractor shall provide three (3) copies of the manufacturer's representative's certification.

3.4 TRAINING

A. The Contractor shall provide a training session for up to five (5) owner's representatives for 2 normal workdays at a job site location determined by the owner.

B. The training session shall be conducted by a manufacturer's qualified representative and consist of instruction on the assembly, switches and major components.

3.5 INSTALLATION

A. The Contractors shall install all equipment per the manufacturer's recommendations and the contract drawings.

B. All necessary hardware to secure the assembly in place shall be provided by the Contractor.

3.6 FIELD TESTING

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each switchgear bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
3. Perform the following infrared scan tests and inspections and prepare reports:

a. Infrared Scanning: After the date of acceptance, perform infrared scan of each switchgear Remove front of switchgear so joints and connections are accessible to portable scanner.

b. Follow-up infrared canning: perform an additional follow-up infrared scan of each switchgear 11 months after date of Acceptance.

c. Record of infrared scanning: Prepare a certified report that identifies switchgear is checked and that describes infrared-scanning results. Include notation of deficiencies detected, remedial action taken,and observations after remedial action.
d. Instruments and Equipment:

1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

D. Swichgear will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies switchgear included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

END OF SECTION 26 23 13

SECTION 26 24 16 - PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Distribution panelboards.
2. Lighting and appliance branch-circuit panelboards.
3. Load centers.
4. Electronic-grade panelboards.

B. Related Requirements:

1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 DEFINITIONS

A. SVR: Suppressed voltage rating.

B. TVSS: Transient voltage surge suppressor.

1.4 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Panelboards shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

1.5 MRc2: CONSTRUCTION WASTE MANAGEMENT

A. No less than the specified minimum proportion of all construction waste from the project shall be diverted from disposal in a landfill and/or incineration in accordance with the project requirements for Construction Waste Management. See Section 018113 Sustainable Design Requirements.

B. EQc4.1: LOW-EMITTING MATERIALS – SEALANTS AND ADHESIVES

All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the project requirements for Low-Emitting Materials – Sealants and Adhesives. See Section 018113 Sustainable Design Requirements.

Contractor shall provide LEED credit verification as per Section 013300 Submittal Procedures.

C. EQc4.2: LOW-EMITTING MATERIALS – PAINTS AND COATINGS

All paints and coatings used in the building interior comply with the project requirements for Low-Emitting Materials – Paints and Coatings. See Section 018113 Sustainable Design Requirements.

Contractor shall provide LEED credit verification as per Section 013300 Submittal Procedures.

1.6 SUBMITTALS

A. Product Data: For each type of panelboard, switching and overcurrent protective device, transient voltage suppression device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
2. Detail enclosure types and details for types other than NEMA 250, Type 1.
3. Detail bus configuration, current, and voltage ratings.
4. Short-circuit current rating of panelboards and overcurrent protective devices.
5. Include evidence of NRTL listing for series rating of installed devices.
6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
7. Include wiring diagrams for power, signal, and control wiring.
8. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device.

C. Qualification Data: For qualified testing agency.

D. Seismic Qualification Certificates: Submit certification that panelboards, overcurrent protective devices, accessories, and components will withstand seismic forces defined in Division 26 Section "Vibration and Seismic Controls for Electrical Systems." Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

E. Field Quality-Control Reports:

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

F. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing**.**

G. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

1.7 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

B. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.

C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

E. Comply with NEMA PB 1.

F. Comply with NFPA 70.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.

B. Handle and prepare panelboards for installation according to NEMA PB 1.

1.9 PROJECT CONDITIONS

A. Environmental Limitations:

1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:

B. Service Conditions: NEMA PB 1, usual service conditions, as follows:

1. Ambient temperatures within limits specified.
2. Altitude not exceeding 6600 feet.Retain paragraph below if interruption of existing electric service is required.

1.10 COORDINATION

C. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

D. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

1.11 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace transient voltage suppression devices that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

1.12 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Keys: Two spares for each type of panelboard cabinet lock.
2. Circuit Breakers Including GFCI and Ground Fault Equipment Protection (GFEP) Types: Two spares for each panelboard.

1.13 WARRANTY

A. Warranty Period: Two years from date of Substantial Completion.

1.14 COMMISSIONING

A. The materials, components and systems described in this section are subject to the Commissioning process. Contractor must comply with all Commissioning Requirements. Commissioning Requirements are described in Section 019113 General Commissioning Requirements and in Division 36 Commissioning. Division 36 provides an individual Commissioning specification section for each Division 2 through Division 33 specification section requiring Commissioning.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PANELBOARDS

A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."

B. Enclosures: Flush- and surface-mounted cabinets.

1. Rated for environmental conditions at installed location.

a. Indoor Dry and Clean Locations: NEMA 250, Type 1
b. Kitchen or Wash-Down Areas: NEMA 250, Type 4X, stainless steel.
c. Other Wet or Damp Indoor Locations: NEMA 250, Type 4 .

2. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
3. Finishes:

a. Panels and Trim: Steel factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
b. Back Boxes: Galvanized steel, Same finish as panels and trim.

4. Directory Card: Inside panelboard door, mounted in transparent card holder.

C. Incoming Mains Location: Top and bottom.

D. Phase, Neutral, and Ground Buses:

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
3. Isolated Ground Bus: Adequate for branch-circuit isolated ground conductors; insulated from box.
4. Extra-Capacity Neutral Bus: Neutral bus rated 200 percent of phase bus and UL listed as suitable for nonlinear loads.
5. Split Bus: Vertical buses divided into individual vertical sections.

E. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Main and Neutral Lugs: Mechanical type.
3. Ground Lugs and Bus-Configured Terminators: Mechanical type.

4. Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
5. Subfeed (Double) Lugs: Mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
6. Gutter-Tap Lugs: Mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
7. Extra-Capacity Neutral Lugs: Rated 200 percent of phase lugs mounted on extra-capacity neutral bus.

F. Service Equipment Label: NRTL labeled for use as service equipment for panelboards or load centers with one or more main service disconnecting and overcurrent protective devices.

G. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

H. Panelboard Short-Circuit Current Rating: Rated for series-connected system with integral or remote upstream overcurrent protective devices and labeled by an NRTL. Include size and type of allowable upstream and branch devices, listed and labeled for series-connected short-circuit rating by an NRTL.

I. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.2 DISTRIBUTION PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following.

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Panelboards: NEMA PB 1, power and feeder distribution type.

C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.

1. For doors more than 36 inches high, provide two latches, keyed alike.

D. Mains: Circuit breaker/Lugs only.

E. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.

F. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

G. Contactors in Main Bus: NEMA ICS 2, Class A, electrically or mechanically held, general-purpose controller, with same short-circuit interrupting rating as panelboard.

1. Internal Control-Power Source: Control-power transformer, with fused primary and secondary terminals, connected to main bus ahead of contactor connection.

2.3 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

C. Mains: Circuit breaker or lugs only.

D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

E. Contactors in Main Bus: NEMA ICS 2, Class A, electrically or mechanically held, general-purpose controller, with same short-circuit interrupting rating as panelboard.

1. Internal Control-Power Source: Control-power transformer, with fused primary and secondary terminals, connected to main bus ahead of contactor connection.

F. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

G. Column-Type Panelboards: Narrow gutter extension, with cover, to overhead junction box equipped with ground and neutral terminal buses.

2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following.

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with series-connected rating or interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
3. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and the following field-adjustable settings:

a. Instantaneous trip.
b. Long- and short-time pickup levels.
c. Long- and short-time time adjustments.
d. Ground-fault pickup level, time delay, and I^2t response.

4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
5. GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
6. Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Class B ground-fault protection (30-mA trip).
7. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Comply with UL 1699; 120/240-V, single-pole configuration.
8. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:

    a. Standard frame sizes, trip ratings, and number of poles.
    b. Lugs: *Mechanical* style, suitable for number, size, trip ratings, and conductor materials.
    c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Receive, inspect, handle, and store panelboards according to NEMA PB 1.1.

B. Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.

C. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install panelboards and accessories according to NEMA PB 1.1.

B. Equipment Mounting: Install panelboards on concrete bases, 4-inch nominal thickness. Comply with requirements for concrete base specified in Division 03 Section "Cast-in-Place Concrete."

1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around full perimeter of base.
2. For panelboards, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
4. Install anchor bolts to elevations required for proper attachment to panelboards.
5. Attach panelboard to the vertical finished or structural surface behind the panelboard.

C. Mount top of trim so the operating handle of top most circuit breaker is not higher than 79 inches above finished floor..

D. Comply with mounting and anchoring requirements specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."

E. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

F. Install overcurrent protective devices and controllers not already factory installed.

1. Set field-adjustable, circuit-breaker trip ranges.

G. Install filler plates in unused spaces.

H. Arrange conductors in gutters into groups and bundle and wrap with wire ties after completing load balancing.

I. Comply with NECA 1.

3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Division 26 Section "Identification for Electrical Systems."

B. Create a directory to indicate installed loads; incorporate Owner's final room designations. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

D. Device Nameplates: Label each branch circuit device in distribution panelboards with a nameplate complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
3. Perform the following infrared scan tests and inspections and prepare reports:

a. Infrared Scanning: After the date of acceptance, perform infrared scan of each panel board. Remove front of panels so joints and connections are accessible to portable scanner.

b. Follow-up infrared canning: perform an additional follow-up infrared scan of each panel board 11 months after date of Acceptance.

c. Record of infrared scanning: Prepare a certified report that identifies panel boards are checked and that describes infrared-scanning results. Include notation of deficiencies detected, remedial action taken,and observations after remedial action.

d. Instruments and Equipment:

1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

D. Panelboards will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

A. Adjust moving parts and operable component to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges as specified in Division 26 Section "Overcurrent Protective Device Coordination Study.

3.6 PROTECTION

C. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions.

END OF SECTION 262416

SECTION 26 25 24 – COORDINATION WITH DIVISION 28

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this Section.

1.2 SCOPE INCLUDES:

A. This section describes responsibilities of the division 26 electrical contractor relative to coordination with the division 28 security electronics contractor.

B. Work specific to the division 26 electrical scope is described in the division 26 specifications and on drawing sheets with the prefix “EG”, “EL”, “EP” and “ES”.

C. Work specific to the division 28 security electronics scope is described in the division 28 specifications and on drawing sheets with the prefix “TY”.

D. Related Requirements:

1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

PART 2 -– PRODUCTS

2.1 Not used

PART 3 -– EXECUTION

3.1 Work provided under division 28

A. All electrical work associated with the security electronics systems including conduit, conduit bodies, back boxes, wire and cable, wiring devices, panel boards, and all appurtenances thereto are part of the division 26 scope of work; exceptions are as noted under item B below.

B. The interface between the electrical and security electronics scope of work is as follows:

1. Security system power distribution is the responsibility of the division 26 contractor. Conduit, wire, wiring devices and panel boards shall be provided under the division 26 scope of work. All material and workmanship will be as specified in the division 26 specifications. Power to all security control consoles, equipment cabinets, etc. is the responsibility of the division 26 contractor.

2. Elevator interface panels are provided under the division 28 scope of work. All conduit and wire associated with the security electronics control side of the interface is by division 26. Conduit and wire between the security electronics interface panel and the elevator equipment is by division 26.
3. Security lighting control interface requires the lighting distribution circuits to be routed through the relay cabinet. The distribution circuits, relays and locations controlled are described in the relay schedules on sheet E542 and see detail 2 sheet TY601. The division 26 electrical contractor is responsible for all conduit, wire, and fixtures etc. for the lighting circuits. The electrical contractor is responsible for providing the relay panels and control relays and integrating the control into the PLC/Bacnet.
4. Security receptacle control interface requires the power distribution circuits to be routed through the relays cabinet. The distribution circuits, relays and locations controlled are described in the relay schedules on sheet E542 and see detail 2 on sheet TY601. The division 26 electrical contractor is responsible for all conduit, and wire, for the receptacle circuits. The electrical contractor is responsible for providing the relay panels and control relays and integrating the control into the PLC/Bacnet.
5. The signal grounding system indicated on electrical and security drawings provided by the division 26 contractor. Conduit and wire required to connect the TMGB to the main electrical ground point is the responsibility of the division 26 contractor. Connection of the telecommunications rooms (MDF/IDF) ground buss bars to the signal grounding system is by the division 26 contractor.

END OF SECTION 262524

SECTION 26 27 26 - WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Receptacles, receptacles with integral GFCI, and associated device plates.
2. Twist-locking receptacles.
3. Receptacles with integral surge suppression units.
4. Wall-box motion sensors.
5. Isolated-ground receptacles.
6. Hospital-grade receptacles.
7. Snap switches and wall-box dimmers.
8. Solid-state fan speed controls.
9. Wall-switch and exterior occupancy sensors.
10. Communications outlets.
11. Pendant cord-connector devices.
12. Cord and plug sets.
13. Floor service outlets, poke-through assemblies, service poles, and multioutlet assemblies.

B. Related sections

1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners

1.3 DEFINITIONS

A. EMI: Electromagnetic interference.

B. GFCI: Ground-fault circuit interrupter.

C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

D. RFI: Radio-frequency interference.

E. TVSS: Transient voltage surge suppressor.

F. UTP: Unshielded twisted pair.

1.4 MRc2: CONSTRUCTION WASTE MANAGEMENT

A. No less than the specified minimum proportion of all construction waste from the project shall be diverted from disposal in a landfill and/or incineration in accordance with the project requirements for Construction Waste Management. See Section 018113 Sustainable Design Requirements.

B. EQc4.1: LOW-EMITTING MATERIALS – SEALANTS AND ADHESIVES

All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the project requirements for Low-Emitting Materials – Sealants and Adhesives. See Section 018113 Sustainable Design Requirements.

Contractor shall provide LEED credit verification as per Section 013300 Submittal Procedures.

C. EQc4.2: LOW-EMITTING MATERIALS – PAINTS AND COATINGS

All paints and coatings used in the building interior comply with the project requirements for Low-Emitting Materials – Paints and Coatings. See Section 018113 Sustainable Design Requirements.

Contractor shall provide LEED credit verification as per Section 013300 Submittal Procedures.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing label warnings and instruction manuals that include labeling conditions.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of wiring device and associated wall plate through one source from a single manufacturer. Insofar as they are available, obtain all wiring devices and associated wall plates from a single manufacturer and one source.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NFPA 70.

1.7 COORDINATION

A. Receptacles for Owner-Furnished Equipment: Match plug configurations.

1. Cord and Plug Sets: Match equipment requirements.

1.8 EXTRA MATERIALS

A. Furnish extra materials described in subparagraphs below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Floor Service Outlet Assemblies: One for every 10, but no fewer than one.
2. Poke-Through, Fire-Rated Closure Plugs: One for every 10 floor service outlets installed, but no fewer than one.

1.9 WARRANTY

A. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following.

1. Cooper Wiring Devices; a division of Cooper Industries, Inc. (Cooper).
2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
3. Leviton Mfg. Company Inc. (Leviton).
4. Pass & Seymour/Legrand; Wiring Devices & Accessories (Pass & Seymour).

2.2 STRAIGHT BLADE RECEPTACLES

A. All receptacles in inmate area shall be extra heavy duty institution grade and specification grade in other areas.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Cooper
b. Hubbell
c. Leviton
d. Pass & Seymour

C. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.

.

D. Hospital-Grade, Duplex Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498 Supplement SD.

E. Isolated-Ground, Duplex Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.

1. Description: Straight blade; equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.

F. Tamper-Resistant Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.

1. Description: Labeled to comply with NFPA 70, "Health Care Facilities" Article, "Pediatric Locations" Section.

2.3 GFCI RECEPTACLES

A. General Description: Straight blade, non-feed-through type. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped.

B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:

C. Hospital-Grade, Duplex GFCI Convenience Receptacles, 125 V, 20 A: Comply with UL 498 Supplement SD.

.

2.4 TWIST-LOCKING RECEPTACLES

A. Single Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration L5-20R, and UL 498.

B. Isolated-Ground, Single Convenience Receptacles, 125 V, 20 A:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

2. Description: Comply with NEMA WD 1, NEMA WD 6 configuration L5-20R, and UL 498. Equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.

2.5 PENDANT CORD-CONNECTOR DEVICES

A. Description: Matching, locking-type plug and receptacle body connector; NEMA WD 6 configurations L5-20P and L5-20R, heavy-duty grade.

1. Body: Nylon with screw-open cable-gripping jaws and provision for attaching external cable grip.
2. External Cable Grip: Woven wire-mesh type made of high-strength galvanized-steel wire strand, matched to cable diameter, and with attachment provision designed for corresponding connector.

2.6 CORD AND PLUG SETS

A. Description: Match voltage and current ratings and number of conductors to requirements of equipment being connected.

1. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and equipment-rating ampacity plus a minimum of 30 percent.
2. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.7 SNAP SWITCHES

A. Comply with NEMA WD 1 and UL 20.

B. All switches in inmate area shall be extra heavy duty institution grade and specification grade in other areas.

C. Manufacturers: Subject to compliance with requirements, provide products by one of the following.

1. Cooper Wiring Devices; a division of Cooper Industries, Inc. (Cooper).
2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
3. Leviton Mfg. Company Inc. (Leviton).
4. Pass & Seymour/Legrand; Wiring Devices & Accessories (Pass & Seymour).

D. Switches, 120/277 V, 20 A rated.

E. Pilot Light Switches, 20 A rated:
   a. Description: Single pole, with neon-lighted handle, illuminated when switch is "ON."

F. Key-Operated Switches, 120/277 V, 20 A:

1. Description: Single pole, with factory-supplied key in lieu of switch handle.

G. Single-Pole, Double-Throw, Momentary Contact, Center-Off Switches, 120/277 V, 20 A; for use with mechanically held lighting contactors.

H. Key-Operated, Single-Pole, Double-Throw, Momentary Contact, Center-Off Switches, 120/277 V, 20 A; for use with mechanically held lighting contactors, with factory-supplied key in lieu of switch handle.

2.8 WALL-BOX DIMMERS

A. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on-off switches, with audible frequency and EMI/RFI suppression filters.

B. Control: Continuously adjustable slider; with single-pole or three-way switching. Comply with UL 1472.

2.9 OCCUPANCY SENSORS

A. Wall-Switch Sensors:

1. Products: Subject to compliance with requirements, provide one of the following:

   a. Cooper;
   b. Hubbell;
   c. Leviton;
   d. Pass & Seymour;
   e. Watt Stopper (The);

2. Description: Passive-infrared type, 120/277 V, adjustable time delay up to 30 minutes, 180-degree field of view, with a minimum coverage area of 900 sq. ft.

B. Wall-Switch Sensors:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide one of the following:
   a. Hubbell; AT120 for 120 V, AT277 for 277 V.
   b. Leviton; ODS 15-ID.

3. Description: Adaptive-technology type, 120/277 V, adjustable time delay up to 20 minutes, 180-degree field of view, with a minimum coverage area of 900 sq. ft..

C. Long-Range Wall-Switch Sensors:

1. Products: Subject to compliance with requirements, provide one of the following:

   a. Hubbell;
   b. Leviton
   c. Pass & Seymour;
   d. Watt Stopper (The);

2. Description: Passive-infrared type, 120/277 V, adjustable time delay up to 30 minutes, 110-degree field of view, with a minimum coverage area of 1200 sq. ft..

D. Long-Range Wall-Switch Sensors:

1. Description: Dual technology, with both passive-infrared- and ultrasonic-type sensing, 120/277 V, adjustable time delay up to 30 minutes, 110-degree field of view, and a minimum coverage area of 1200 sq. ft..

E. Wide-Range Wall-Switch Sensors:

1. Description: Passive-infrared type, 120/277 V, adjustable time delay up to 30 minutes, 150-degree field of view, with a minimum coverage area of 1200 sq. ft..

2.10 COMMUNICATIONS OUTLETS

A. Telephone Outlet:

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Cooper;
   b. Leviton;.

2. Description: Single RJ-45 jack for terminating 100-ohm, balanced, four-pair UTP; TIA/EIA-568-B.1; complying with Category 5e. Comply with UL 1863.

B. Combination TV and Telephone Outlet:

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Cooper
   b. Leviton;

2. Description: Single RJ-45 jack for 100-ohm, balanced, four-pair UTP; TIA/EIA-568-B.1; complying with Category 5e; and one Type F coaxial cable connector.

2.11 WALL PLATES

A. Single and combination types to match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish; 4 tamper proof screws for each plate for inmate areas.
2. Material for Finished Spaces: Steel with Ivory baked enamel painting. For inmate areas: Security wall plates 14 gage polyester powder finish cold rolled steel with 4 tamper proof T20 TORX screws .
3. Material for Unfinished Spaces: Galvanized steel.
4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in "wet locations."

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with type 3R weather-resistant , die-cast aluminum with lockable cover.

2.12 FLOOR SERVICE FITTINGS

A. Type: Modular, flush-type dual-service units suitable for wiring method used.

B. Compartments: Barrier separates power from voice and data communication cabling.

C. Power Receptacle: NEMA WD 6 configuration 5-20R, gray finish, unless otherwise indicated.

D. Voice and Data Communication Outlets.

2.13 POKE-THROUGH ASSEMBLIES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Hubbell Incorporated; Wiring Device-Kellems.
2. Pass & Seymour/Legrand; Wiring Devices & Accessories.
3. Square D/ Schneider Electric.
4. Thomas & Betts Corporation.
5. Wiremold Company (The).

B. Description: Factory-fabricated and -wired assembly of below-floor junction box with multichanneled, through-floor raceway/firestop unit and detachable matching floor service outlet assembly.

1. Service Outlet Assembly: Flush type .with two simplex receptacles and space for four RJ-45 jacks unless otherwise noted on drawings.
2. Fire Rating: Unit is listed and labeled for fire rating of floor-ceiling assembly.

2.14 MULTIOUTLET ASSEMBLIES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Hubbell Incorporated; Wiring Device-Kellems.
2. Wiremold Company (The).

B. Components of Assemblies: Products from a single manufacturer designed for use as a complete, matching assembly of raceways and receptacles.

C. Raceway Material: Metal, with manufacturer's standard finish.

D. Wire: No. 12 AWG.

2.15 SERVICE POLES

A. Description: Factory-assembled and -wired units to extend power and voice and data communication from distribution wiring concealed in ceiling to devices or outlets in pole near floor.

1. Poles: Nominal 2.5-inch- square cross section, with height adequate to extend from floor to at least 6 inches above ceiling, and with separate channels for power wiring and voice and data communication cabling.
2. Mounting: Ceiling trim flange with concealed bracing arranged for positive connection to ceiling supports; with pole foot and carpet pad attachment.
3. Wiring: Sized for minimum of five No. 12 AWG power and ground conductors and a minimum of four, 4-pair, Category 3 or 5 voice and data communication cables.

4. Power Receptacles: Two duplex, 20-A, heavy-duty, NEMA WD 6 configuration 5-20R units.

2.16 FINISHES

A. Color: Wiring device catalog numbers in Section Text do not designate device color.

1. Wiring Devices Connected to Normal Power System: Ivory and As selected by Architect unless otherwise indicated or required by NFPA 70 or device listing.
2. Wiring Devices Connected to Emergency Power System: Red.
3. TVSS Devices: Blue.
4. Isolated-Ground Receptacles: Orange or with orange triangle on face.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.

B. Coordination with Other Trades:

1. Take steps to insure that devices and their boxes are protected. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of the boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

1. Do not strip insulation from conductors until just before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
4. Existing Conductors:

a. Cut back and pigtail, or replace all damaged conductors.
b. Straighten conductors that remain and remove corrosion and foreign matter.
c. Pigtailing existing conductors is permitted provided the outlet box is large enough.

D. Device Installation:

1. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 2/3 to 3/4 of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by the manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:
1. Install hospital-grade receptacles in patient-care areas with the ground pin or neutral blade at the top.

F. Dimmers:
1. Install dimmers within terms of their listing.
2. Verify that dimmers used for fan speed control are listed for that application.
3. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device listing conditions in the written instructions.

G. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.2 IDENTIFICATION

A. Comply with Division 26 Section "Identification for Electrical Systems."

1. Receptacles: Identify panelboard and circuit number from which served. Use hot, stamped or engraved machine printing with black filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

1. In healthcare facilities, prepare reports that comply with recommendations in NFPA 99.
2. Test Instruments: Use instruments that comply with UL 1436.
3. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated LED indicators of measurement.

B. Tests for Convenience Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is not acceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.
6. The tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

C. Test straight blade convenience outlets in patient-care areas and hospital-grade convenience outlets for the retention force of the grounding blade according to NFPA 99. Retention force shall be not less than 4 oz.

END OF SECTION 262726

SECTION 26 28 16 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Fusible switches.
2. Nonfusible switches.
3. Receptacle switches.
4. Shunt trip switches.
5. Molded-case circuit breakers (MCCBs).
6. Molded-case switches.
7. Enclosures.

B. Related Requirements:

1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 DEFINITIONS

A. NC: Normally closed.

B. NO: Normally open.

C. SPDT: Single pole, double throw.

1.4 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Enclosed switches and circuit breakers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

1.5 MRc2: CONSTRUCTION WASTE MANAGEMENT

A. No less than the specified minimum proportion of all construction waste from the project shall be diverted from disposal in a landfill and/or incineration in accordance with the project requirements for Construction Waste Management. See Section 018113 Sustainable Design Requirements

1.6 SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.

1. Enclosure types and details for types other than NEMA 250, Type 1.
2. Current and voltage ratings.
3. Short-circuit current ratings (interrupting and withstand, as appropriate).
4. Include evidence of NRTL listing for series rating of installed devices.
5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
6. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device. Submit on translucent log-log graph paper.

B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.

1. Wiring Diagrams: For power, signal, and control wiring.

C. Qualification Data: For qualified testing agency.

D. Field quality-control reports.

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

E. Manufacturer's field service report.

F. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
2. Time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device. Submit on translucent log-log graph paper.

1.7 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

B. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.

C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

D. Seismic Qualification Certificates: For enclosed switches and circuit breakers, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

E. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements

F. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

G. Comply with NFPA 70.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:

1. Ambient Temperature: Not less than minus 22 deg F and not exceeding 104 deg F
2. Altitude: Not exceeding 6600 feet .

1.9 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

1.10 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
2. Fuse Pullers: Two for each size and type.

1.11 PRODUCT WARRANTY

A. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 FUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate indicated fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
4. Hookstick Handle: Allows use of a hookstick to operate the handle.
5. Lugs: Mechanical type, suitable for number, size, and conductor material.
6. Service-Rated Switches: Labeled for use as service equipment.

2.2 NONFUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following.

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Hookstick Handle: Allows use of a hookstick to operate the handle.
4. Lugs: Mechanical type, suitable for number, size, and conductor material.

2.3 MOLDED-CASE CIRCUIT BREAKERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.

C. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

D. Adjustable, Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.

E. Electronic Trip Circuit Breakers: Field-replaceable rating plug, rms sensing, with the following field-adjustable settings:

1. Instantaneous trip.
2. Long- and short-time pickup levels.
3. Long- and short-time time adjustments.
4. Ground-fault pickup level, time delay, and I^2t response.

F. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller, and let-through ratings less than NEMA FU 1, RK-5.

G. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker and trip activation on fuse opening or on opening of fuse compartment door.

H. Ground-Fault, Circuit-Interrupter (GFCI) Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).

I. Ground-Fault, Equipment-Protection (GFEP) Circuit Breakers: With Class B ground-fault protection (30-mA trip).

J. Features and Accessories:

1. Standard frame sizes, trip ratings, and number of poles.
2. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.

3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.
4. Ground-Fault Protection: Comply with UL 1053; integrally mounted, self-powered [type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.
5. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.
6. Retain first option in first subparagraph below for solid-state trip units; retain second option for thermal-magnetic trip units.
7. Accessory Control Power Voltage: Integrally mounted, self-powered.

2.4 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
2. Outdoor Locations: NEMA 250, .Type 3R
3. Kitchen or Wash-Down Areas: NEMA 250, Type 4X, stainless steel.
4. Other Wet or Damp, Indoor Locations: NEMA 250**,** Type 4
5. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.
6. Hazardous Areas Indicated on Drawings: NEMA 250, Type 7.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

B. Comply with mounting and anchoring requirements specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."

C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

D. Install fuses in fusible devices.

E. Comply with NECA 1.

3.3 IDENTIFICATION

A. Comply with requirements in Division 26 Section "Identification for Electrical Systems."

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

D. Acceptance Testing Preparation:

1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

E. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
3. Perform the following infrared scan tests and inspections and prepare reports:
    a. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each enclosed switch and circuit breaker. Remove front panels so joints and connections are accessible to portable scanner.
    b. Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

4. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

F. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

G. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges as specified in Division 26 Section "Overcurrent Protective Device Coordination Study.

END OF SECTION 262816

SECTION 26 29 13 - ENCLOSED CONTROLLERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes the following enclosed controllers rated 600 V and less:

1. Full-voltage manual.
2. Full-voltage magnetic.
3. Reduced-voltage magnetic.
4. Reduced-voltage solid state.
5. Multispeed.

B. Related Requirements:

1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 DEFINITIONS

A. CPT: Control power transformer.

B. MCCB: Molded-case circuit breaker.

C. MCP: Motor circuit protector.

D. N.C.: Normally closed.

E. N.O.: Normally open.

F. OCPD: Overcurrent protective device.

G. SCR: Silicon-controlled rectifier.

1.4 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Enclosed controllers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event"

1.5 MRc2: Construction Waste Management

A. No less than the specified minimum proportion of all construction waste from the project shall be diverted from disposal in a landfill and/or incineration in accordance with the project requirements for Construction Waste Management. See Section 018113 Sustainable Design Requirements.

B. EQc4.1: LOW-EMITTING MATERIALS – SEALANTS AND ADHESIVES

All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the project requirements for Low-Emitting Materials – Sealants and Adhesives. See Section 018113 Sustainable Design Requirements.

Contractor shall provide LEED credit verification as per Section 013300 Submittal Procedures.

1.6 SUBMITTALS

A. Product Data: For each type of enclosed controller. Include manufacturer's technical data on features, performance, electrical characteristics, ratings, and enclosure types and finishes.

B. Shop Drawings: For each enclosed controller. Include dimensioned plans, elevations, sections, details, and required clearances and service spaces around controller enclosures.

1. Show tabulations of the following:

a. Each installed unit's type and details.
b. Factory-installed devices.
c. Nameplate legends.
d. Short-circuit current rating of integrated unit.
e. Listed and labeled for integrated short-circuit current (withstand) rating of OCPDs in combination controllers by an NRTL acceptable to authorities having jurisdiction.
f. Features, characteristics, ratings, and factory settings of individual OCPDs in combination controllers.

2. Wiring Diagrams: For power, signal, and control wiring.

C. Qualification Data: For qualified testing agency.
1. anchorage devices on which the certification is based and their installation requirements.

D. Seismic Qualification Certificates: For enclosed controllers, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

E. Field quality-control reports.

F. Operation and Maintenance Data: For enclosed controllers to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Routine maintenance requirements for enclosed controllers and installed components.
2. Manufacturer's written instructions for testing and adjusting circuit breaker and MCP trip settings.
3. Manufacturer's written instructions for setting field-adjustable overload relays.
4. Manufacturer's written instructions for testing, adjusting, and reprogramming reduced-voltage solid-state controllers.

G. Load-Current and Overload-Relay Heater List: Compile after motors have been installed, and arrange to demonstrate that selection of heaters suits actual motor nameplate full-load currents.

H. Load-Current and List of Settings of Adjustable Overload Relays: Compile after motors have been installed, and arrange to demonstrate that switch settings for motor running overload protection suit actual motors to be protected.

1.7 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with NFPA 70.

D. IEEE Compliance: Fabricate and test enclosed controllers according to IEEE 344 to withstand seismic forces defined in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store enclosed controllers indoors in clean, dry space with uniform temperature to prevent condensation. Protect enclosed controllers from exposure to dirt, fumes, water, corrosive substances, and physical damage.

B. If stored in areas subject to weather, cover enclosed controllers to protect them from weather, dirt, dust, corrosive substances, and physical damage.

1.9 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:

1. Ambient Temperature: Not less than minus 22 deg F and not exceeding 104 deg F.
2. Altitude: Not exceeding 6600 feet .

1.10 COORDINATION

A. Coordinate layout and installation of enclosed controllers with other construction including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

C. Coordinate installation of roof curbs, equipment supports, and roof penetrations.

1.11 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses for Fused Switches: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
2. Control Power Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than two of each size and type.
3. Indicating Lights: Two of each type and color installed.
4. Auxiliary Contacts: Furnish one (s) for each size and type of magnetic controller installed.
5. Power Contacts: Furnish three spares for each size and type of magnetic contactor installed.

1.12 WARRANTY

A. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 FULL-VOLTAGE CONTROLLERS

A. General Requirements for Full-Voltage Controllers: Comply with NEMA ICS 2, general purpose, Class A.

B. Motor-Starting Switches: "Quick-make, quick-break" toggle or push-button action; marked to show whether unit is off or on.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
    b. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
    c. Rockwell Automation, Inc.; Allen-Bradley brand.
    d. Siemens Energy & Automation, Inc.
    e. Square D; a brand of Schneider Electric.

C. Fractional Horsepower Manual Controllers: "Quick-make, quick-break" toggle or push-button action; marked to show whether unit is off, on, or tripped.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following.

    a. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
    b. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
    c. Rockwell Automation, Inc.; Allen-Bradley brand.
    d. Siemens Energy & Automation, Inc.
    e. Square D; a brand of Schneider Electric.

2. Configuration: Nonreversing
3. Overload Relays: Inverse-time-current characteristics; NEMA ICS 2, Class 10 tripping characteristics; heaters matched to nameplate full-load current of actual protected motor; external reset push button bimetallic type.
4. Red pilot light.
5. N.O., N.C**.** auxiliary contact.

D. Integral Horsepower Manual Controllers: "Quick-make, quick-break" toggle or push-button action; marked to show whether unit is off, on, or tripped.

1. Manufacturers: Subject to compliance with requirements,[provide products by one of the following:

    a. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
    b. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
    c. Rockwell Automation, Inc.; Allen-Bradley brand.
    d. Siemens Energy & Automation, Inc.
    e. Square D; a brand of Schneider Electric.

2. Configuration: Nonreversing.
3. Overload Relays: Inverse-time-current characteristics; NEMA ICS 2, Class 10 tripping characteristics; heaters and sensors in each phase, matched to nameplate full-load current of actual protected motor and having appropriate adjustment for duty cycle; external reset push button bimetallic type.
4. Red pilot light.
5. N.O., N.C. auxiliary contact.

E. Magnetic Controllers: Full voltage, across the line, electrically held.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
b. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
c. Rockwell Automation, Inc.; Allen-Bradley brand.
d. Siemens Energy & Automation, Inc.
e. Square D; a brand of Schneider Electric.

2. Configuration: Nonreversing
3. Contactor Coils: Pressure-encapsulated type.

a. Operating Voltage: Depending on contactor NEMA size and line-voltage rating, manufacturer's standard matching control power or line voltage.

4. Power Contacts: Totally enclosed, double-break, silver-cadmium oxide; assembled to allow inspection and replacement without disturbing line or load wiring.
5. Control Circuits: 24 or 120V ac; obtained from integral CPT, with primary and secondary fuses with of sufficient capacity to operate integral devices and remotely located pilot, indicating, and control devices.

a. CPT Spare Capacity: 50VA.

6. Bimetallic Overload Relays:

a. Inverse-time-current characteristic.
b. Class 10 tripping characteristic.
c. Heaters in each phase matched to nameplate full-load current of actual protected motor and with appropriate adjustment for duty cycle.
d. Ambient compensated.
e. Automatic resetting.

F. Combination Magnetic Controller: Factory-assembled combination of magnetic controller, OCPD, and disconnecting means.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following.

a. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
b. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
c. Rockwell Automation, Inc.; Allen-Bradley brand.
d. Siemens Energy & Automation, Inc.
e. Square D; a brand of Schneider Electric.

2. Nonfusible Disconnecting Means:

a. NEMA KS 1, heavy-duty, horsepower-rated, nonfusible switch.
b. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.

2.2 MULTISPEED MAGNETIC CONTROLLERS

A. General Requirements for Multispeed Magnetic Controllers: Comply with NEMA ICS 2, general purpose, Class A.

B. Multispeed Magnetic Controllers: Two speed, full voltage, across the line, electrically held.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
   b. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
   c. Rockwell Automation, Inc.; Allen-Bradley brand.
   d. Siemens Energy & Automation, Inc.
   e. Square D; a brand of Schneider Electric.

2. Configuration: Nonreversing;.
3. Contactor Coils: Pressure-encapsulated type.

   a. Operating Voltage: Depending on contactor NEMA size and line-voltage rating, manufacturer's standard matching control power or line voltage.

4. Power Contacts: Totally enclosed, double break, silver-cadmium oxide; assembled to allow inspection and replacement without disturbing line or load wiring.

5. Compelling relays shall ensure that motor will start only at low speed.
6. Accelerating timer relays shall ensure properly timed acceleration through speeds lower than that selected.
7. Decelerating timer relays shall ensure automatically timed deceleration through each speed.
8. Antiplugging timer relays shall ensure a time delay when transferring from FORWARD to REVERSE and back.

9. Bimetallic Overload Relays:

   a. Inverse-time-current characteristic.
   b. Class 10 tripping characteristic.
   c. Heaters in each phase matched to nameplate full-load current of actual protected motor and with appropriate adjustment for duty cycle.
   d. Ambient compensated.
   e. Automatic resetting.

2.3 ENCLOSURES

A. Enclosed Controllers: NEMA ICS 6, to comply with environmental conditions at installed location.

1. Dry and Clean Indoor Locations: Type 1.
2. Outdoor Locations: Type 3R.
3. Kitchen or Wash-Down Areas: Type 4X.
4. Other Wet or Damp Indoor Locations: Type 4.
5. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: Type 12.

2.4 ACCESSORIES

A. General Requirements for Control Circuit and Pilot Devices: NEMA ICS 5; factory installed in controller enclosure cover unless otherwise indicated.

1. Push Buttons, Pilot Lights, and Selector Switches: Heavy duty, type.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and surfaces to receive enclosed controllers, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

B. Examine enclosed controllers before installation. Reject enclosed controllers that are wet, moisture damaged, or mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Wall-Mounted Controllers: Install enclosed controllers on walls with tops at uniform height unless otherwise indicated, and by bolting units to wall or mounting on lightweight structural-steel channels bolted to wall. For controllers not at walls, provide freestanding racks complying with Division 26 Section "Hangers and Supports for Electrical Systems."

B. Floor-Mounted Controllers: Install enclosed controllers on 4-inch nominal-thickness concrete base. Comply with requirements for concrete base specified in Division 03 Section Cast-in-Place Concrete

1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
4. Install anchor bolts to elevations required for proper attachment to supported equipment.

C. Seismic Bracing: Comply with requirements specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."

D. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

E. Install fuses in each fusible-switch enclosed controller.

F. Install fuses in control circuits if not factory installed. Comply with requirements in Division 26 Section "Fuses."

G. Install heaters in thermal overload relays. Select heaters based on actual nameplate full-load amperes after motors have been installed.

H. Install, connect, and fuse thermal-protector monitoring relays furnished with motor-driven equipment.

I. Install power factor correction capacitors. Connect to the [**line**] [**load**] side of overload relays. If connected to the load side of overload relays, adjust overload heater sizes to accommodate the reduced motor full-load currents.

J. Comply with NECA 1.

3.3 IDENTIFICATION

A. Identify enclosed controllers, components, and control wiring. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each enclosure with engraved nameplate.
3. Label each enclosure-mounted control and pilot device.

3.4 CONTROL WIRING INSTALLATION

A. Install wiring between enclosed controllers and remote devices an**d** facility's central control system. Comply with requirements in Division 26 Section "Control-Voltage Electrical Power Cables."

B. Bundle, train, and support wiring in enclosures.

C. Connect selector switches and other automatic-control selection devices where applicable.

1. Connect selector switches to bypass only those manual- and automatic-control devices that have no safety functions when switch is in manual-control position.
2. Connect selector switches with enclosed-controller circuit in both manual and automatic positions for safety-type control devices such as low- and high-pressure cutouts, high-temperature cutouts, and motor overload protectors.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

D. Acceptance Testing Preparation:

1. Test insulation resistance for each enclosed controller, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

E. Tests and Inspections:

1. Inspect controllers, wiring, components, connections, and equipment installation. Test and adjust controllers, components, and equipment**.**
2. Test insulation resistance for each enclosed-controller element, component, connecting motor supply, feeder, and control circuits.
3. Test continuity of each circuit.
4. Verify that voltages at controller locations are within plus or minus 10 percent of motor nameplate rated voltages. If outside this range for any motor, notify Construction Manager & Owner before starting the motor(s).
5. Test each motor for proper phase rotation.
6. Perform each electrical test and visual and mechanical inspection stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
7. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
8. Perform the following infrared (thermographic) scan tests and inspections and prepare reports:

    a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each multi-pole enclosed controller. Remove front panels so joints and connections are accessible to portable scanner.
    b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each multi-pole enclosed controller 11 months after date of Substantial Completion.
    c. Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

9. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

F. Enclosed controllers will be considered defective if they do not pass tests and inspections.

G. Prepare test and inspection reports including a certified report that identifies enclosed controllers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.6 ADJUSTING

A. Set field-adjustable switches, auxiliary relays, time-delay relays, timers, and overload-relay pickup and trip ranges.

B. Adjust overload-relay heaters or settings if power factor correction capacitors are connected to the load side of the overload relays.

C. Adjust the trip settings of MCPs and thermal-magnetic circuit breakers with adjustable instantaneous trip elements. Initially adjust to six times the motor nameplate full-load ampere ratings and attempt to start motors several times, allowing for motor cooldown between starts. If tripping occurs on motor inrush, adjust settings in increments until motors start without tripping. Do not exceed eight times the motor full-load amperes (or 11 times for NEMA Premium Efficient motors if required). Where these maximum settings do not allow starting of a motor, notify Construction Manager & Owner before increasing settings.

D. Set the taps on reduced-voltage autotransformer controllers at **65** percent.

E. Set field-adjustable switches and program microprocessors for required start and stop sequences in reduced-voltage solid-state controllers.

F. Set field-adjustable circuit-breaker trip ranges as specified in Division 26 Section "Overcurrent Protective Device Coordination Study."

3.7 PROTECTION

A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions until enclosed controllers are ready to be energized and placed into service.

B. Replace controllers whose interiors have been exposed to water or other liquids prior to Substantial Completion.

3.8 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain enclosed controllers, and to use and reprogram microprocessor-based, reduced-voltage solid-state controllers.

B. Refer Division 01 for administrative and procedural requirements for demonstration and training.

END OF SECTION 262913

SECTION 26 32 13 – DIESEL GENERATOR

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes packaged engine-generator sets suitable for use in mission critical applications with the features as specified and indicated. Engine generators will be used as the Standby power source for the system, but shall be capable of providing reliable power with no run-time limitations while the primary source of power is unavailable.

B. Related Requirements:

1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 DEFINITIONS

A. Emergency Standby Power (ESP): Per ISO 8528: The maximum power available during a variable electrical power sequence, under the stated operating conditions, for which a generating set is capable of delivering in the event of a utility power outage or under test conditions for up to 200 hours of operation per year with the maintenance intervals and procedures being carried out as prescribed by the manufacturers. The permissible average power output (Ppp) over 24 hours of operation shall not exceed 70 percent of the ESP unless otherwise agreed by the RIC engine manufacturer.

B. Prime Power (PRP): Per ISO 8528: The maximum power which a generating set is capable of delivering continuously whilst supplying a variable electrical load when operated for an unlimited number of hours per year under the agreed operating conditions with the maintenance intervals and procedures being carried out as a prescribed by the manufacturer. The permissible average power output (Ppp) over 24 hours of operation shall not exceed 70 percent of the PRP unless otherwise agreed by the RIC engine manufacturer.

C. Limited Time running Power (LTP): Per ISO 8528: The maximum power available, under the agreed operating conditions, for which the generating set is capable of delivering for up to 500 hours of operation per year with the maintenance intervals and procedures being carried out as prescribed by the manufacturers.

D. Continuous Operating Power (COP): Per ISO 8528: The maximum power which a generating set is capable of delivering continuously whilst supplying a constant electrical load when operated for an unlimited number of hours per year under the agreed operating conditions with the maintenance intervals and procedures being carried out as a prescribed by the manufacturer.

E. Data Center Continuous (DCC): The maximum power which a generating set is capable of delivering continuously whilst supplying a variable or constant electrical load when operated for an unlimited number of hours in a data center application under the agreed operating conditions with the maintenance intervals and procedures being carried out as a prescribed by the manufacturer. The permissible average power output (Ppp) over 24 hours of operation shall not exceed 100 percent of the DCC rating.

F. Operational Bandwidth: The total variation from the lowest to highest value of a parameter over the range of conditions indicated, expressed as a percentage of the nominal value of the parameter.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of packaged engine generator indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. In addition, include the following:

1. Thermal damage curve for generator.

2. Time-current characteristic curves for generator protective device.

3. Sound test data, based on a free field requirement.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, and location and size of each field connection.

1. Dimensioned outline plan and elevation drawings of engine-generator set and other components specified.

2. Wiring Diagrams: Control interconnection, Customer connections.

C. Certifications:

1. Submit statement of compliance which states the proposed product(s) is certified to the emissions standards required by the location for EPA, stationary emergency application.

1.5 INFORMATIONAL SUBMITTALS

A. Source quality-control test reports.

1. Certified summary of prototype-unit test report. See requirements in Part 2 "Source Quality Control" Article Part A. Include statement indicating torsional compatibility of components.

2. Certified Test Report: Provide certified test report documenting factory test per the requirements of this specification, as well as certified factory test of generator set sensors per NFPA110 level 1.

3. List of factory tests to be performed on units to be shipped for this Project.

4. Report of exhaust emissions and compliance statement certifying compliance with applicable regulations.

B. Warranty:

1. Submit manufacturer's warranty statement to be provided for this Project.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Manufacturer Qualifications: A qualified manufacturer. Maintain, within 50 of Project site, a service center capable of providing training, parts, and emergency maintenance repairs.

C. Source Limitations: Obtain packaged generator sets and auxiliary components through one source from a single manufacturer.

D. Comply with NFPA 37 (Standard For the Installation and Use of Stationary Combustion Engines and Gas Turbines).

E. Comply with NFPA 70 (National Electrical Code. Equipment shall be suitable for use in systems in compliance to Article 700, 701, and 702).

F. Comply with NFPA 99 (Essential Electrical Systems for Health Care Facilities).

G. Comply with NFPA 110 (Emergency and Standby Power Systems) requirements for Level 1 emergency power supply system.

1.7 PROJECT CONDITIONS

A. Environmental Conditions: Engine-generator system shall withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability:

1. Ambient Temperature: 0.0 deg C (32.0 deg F) to 37.78 deg C (100.0 deg F).

2. Relative Humidity: 0 to 95 percent.

3. Altitude: Sea level

1.8 WARRANTY

A. Base Warranty: Manufacturer shall provide base warranty coverage on the material and workmanship of the generator set for a minimum of twenty-four (24) months for Standby product and twenty-four (24) months for Prime/Continuous product from registered commissioning and start-up.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: The basis for this specification is MTU/Curtis Engine equipment, approved equals may be considered if equipment performance is shown to meet the requirements herein.

2.2 ENGINE-GENERATOR SET

A. Factory-assembled and -tested, engine-generator set.

B. Mounting Frame: Maintain alignment of mounted components without depending on concrete foundation; and have lifting attachments.

1. Rigging Information: Indicate location of each lifting attachment, generator-set center of gravity, and total package weight in submittal drawings.

C. Capacities and Characteristics:

1. Power Output Ratings: Electrical output power rating for Standby operation of not less than 1000.0kW, at 80 percent lagging power factor, 277/480, Series Wye, Three phase, 4 -wire, 60 hertz.

2. Alternator shall be capable of accepting maximum 1000.0 kVA in a single step and be capable of recovering to a minimum of 90% of rated no load voltage. Following the application of the specified kVA load at near zero power factor applied to the generator set.

3. Nameplates: For each major system component to identify manufacturer's name and address, and model and serial number of component. The engine-generator nameplate shall include information of the power output rating of the equipment.

D. Generator-Set Performance:

1. Steady-State Voltage Operational Bandwidth: 0.5 percent of rated output voltage from no load to full load.

2. Transient Voltage Performance: Not more than 20 percent variation for 25 percent step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within 5 seconds. On application of a 100% load step the generator set shall recover to stable voltage within 10 seconds.

3. Steady-State Frequency Operational Bandwidth: 0.25 percent of rated frequency from no load to full load.

4. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.

5. Transient Frequency Performance: Not more than 15 percent variation for 25 percent step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within 5 seconds. On application of a 100% load step the generator set shall recover to stable frequency within 10 seconds.

6. Output Waveform: At full load, harmonic content measured line to line or line to neutral shall not exceed 5 percent total and 3 percent for any single harmonic. Telephone influence factor, determined according to NEMA MG 1, shall not exceed 50.

7. Sustained Short-Circuit Current: For a 3-phase, bolted short circuit at system output terminals, system shall supply a minimum of 300 percent of rated full-load current for not less than 8 seconds without damage to generator system components. For a 1-phase, bolted short circuit at system output terminals, system shall regulate both voltage and current to prevent over-voltage conditions on the non-faulted phases.

8. Start Time: Comply with NFPA 110, Level 1, Type 10, system requirements.

9. Ambient Condition Performance: Engine generator shall be designed to allow operation at full rated load in an ambient temperature under site conditions, based on highest ambient condition. Ambient temperature shall be as measured at the air inlet to the engine generator for enclosed units, and at the control of the engine generator for machines installed in equipment rooms.

2.3 ENGINE

A. Fuel: ASTM D975 #2 Diesel Fuel

B. Rated Engine Speed: 1800RPM.

C. Lubrication System: The following items are mounted on engine or skid:

1. Lube oil pump: shall be positive displacement, mechanical, full pressure pump.

2. Filter and Strainer: Provided by the engine manufacturer of record to provide adequate filtration for the prime mover to be used.

3. Crankcase Drain: Arranged for complete gravity drainage to an easily removable container with no disassembly and without use of pumps, siphons, special tools, or appliances.

D. Engine Fuel System: The engine fuel system shall be installed in strict compliance to the engine manufacturer's instructions

E. Main Fuel Pump: Mounted on engine. Pump ensures adequate primary fuel flow under starting and load conditions.

F. Coolant Jacket Heater: Electric-immersion type, factory installed in coolant jacket system. Comply with NFPA 110 requirements for Level 1 equipment for heater capacity and performance.

1. Designed for operation on a single 480 VAC, Three phase, 60Hz power connection. Heater voltage shall be shown on the project drawings.

2. Installed with isolation valves to isolate the heater for replacement of the element without draining the engine cooling system or significant coolant loss.

3. Provided with a 24VDC thermostat, installed at the engine thermostat housing

G. Governor: Adjustable isochronous, with speed sensing. The governing system dynamic capabilities shall be controlled as a function of engine coolant temperature to provide fast, stable operation at varying engine operating temperature conditions. The control system

shall actively control the fuel rate as appropriate to the state of the engine generator. Fuel rate shall be regulated as a function of starting, accelerating to start disconnect speed, accelerating to rated speed, and operating in various isochronous states.

H. Cooling System: Closed loop, liquid cooled

1. The generator set manufacturer shall provide prototype test data for the specific hardware proposed demonstrating that the machine will operate at rated standby load in an outdoor ambient condition of 40 deg C.

2. Coolant: Solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anticorrosion additives as recommended by engine manufacturer.

3. Size of Radiator overflow tank: Adequate to contain expansion of total system coolant from cold start to 110 percent load condition.

4. Expansion Tank: Constructed of welded steel plate and rated to withstand maximum closed-loop coolant system pressure for engine used. Equip with gage glass and petcock.

5. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.

6. Duct Flange: Generator sets installed indoors shall be provided with a flexible radiator duct adapter flange.

I. Muffler/Silencer: Selected with performance as required to meet sound requirements of the application, sized as recommended by engine manufacturer and selected with exhaust piping system to not exceed engine manufacturer's engine backpressure requirements. For generator sets with outdoor enclosures the silencer shall be inside the enclosure.

J. Air-Intake Filter: Engine-mounted air cleaner with replaceable dry-filter element and restriction indicator.

K. Starting System: 12 or 24V, as recommended by the engine manufacturer; electric, with negative ground.

1. Components: Sized so they will not be damaged during a full engine-cranking cycle with ambient temperature at maximum specified in Part 1 "Project Conditions" Article.

2. Cranking Cycle: As required by NFPA 110 for level 1 systems.

3. Battery Cable: Size as recommended by engine manufacturer for cable length as required. Include required interconnecting conductors and connection accessories.

4. Battery Compartment: Factory fabricated of metal with acid-resistant finish.

5. Battery-Charging Alternator: Factory mounted on engine with solid-state voltage regulation. The battery charging alternator shall have sufficient capacity to recharge the

batteries with all parasitic loads connected within 4 hours after a normal engine starting sequence.

6. Battery Chargers: Unit shall comply with UL 1236, provide fully regulated, constant voltage, current limited, battery charger for each battery bank. It will include the following features:

   a. Operation: Equalizing-charging rate based on generator set manufacturer's recommendations shall be initiated automatically after battery has lost charge until an adjustable equalizing voltage is achieved at battery terminals. Unit shall then be automatically switched to a lower float-charging mode and shall continue to operate in that mode until battery is discharged again.

   b. Automatic Temperature Compensation: Adjust float and equalize voltages for variations in ambient temperature from minus 20 deg C to plus 40 deg C to prevent overcharging at high temperatures and undercharging at low temperatures.

   c. Automatic Voltage Regulation: Maintain constant output voltage regardless of input voltage variations up to plus or minus 10 percent.

   d. Safety Functions: Sense abnormally low battery voltage and close contacts providing low battery voltage indication on control and monitoring panel. Sense high battery voltage and loss of ac input or dc output of battery charger. Either condition shall close contacts that provide a battery-charger malfunction indication at system control and monitoring panel.

   e. Provide LED indication of general charger condition, including charging, faults, and modes. Provide a LCD display to indicate charge rate and battery voltage. Charger shall provide relay contacts for fault conditions as required by NFPA110.

   f. Enclosure and Mounting: NEMA, Type 1, wall-mounted cabinet.

2.4 FUEL OIL STORAGE

A. Comply with NFPA 30.

B. Sub Base-Mounted Fuel Oil Tank: Provide a double wall secondary containment type sub base fuel storage tank. The tank shall be constructed of corrosion resistant steel and shall be UL 142 listed and labeled. The fuel tank shall include the following features:

   1. Capacity: Fuel for 48 Hour(s) continuous operation at 100 percent rated power output.

   2. Tank rails and lifting eyes shall be rated for the full dry weight of the tank, genset, and enclosure.

   3. Electrical stub up(s)

   4. Normal & emergency vents

   5. Lockable fuel fill

   6. Mechanical fuel level gauge

7. High and low level switches to indicate fuel level

8. Leak detector switch

9. Sub base tank shall include a welded steel containment basin, sized at a minimum of 110% of the tank capacity to prevent escape of fuel into the environment in the event of a tank rupture.

10. Fill port with overfill prevention valve (OFPV)

11. 5 gallon fill/spill dam or bucket

12. Tank design shall meet the regional requirements for the Project location

2.5 CONTROL AND MONITORING

A. Engine generator control shall be microprocessor based and provide automatic starting, monitoring, protection and control functions for the unit.

B. Automatic Starting System Sequence of Operation: When mode-selector switch on the control and monitoring panel is in the automatic position, remote-control contacts in one or more separate automatic transfer switches initiate starting and stopping of generator set. When mode-selector switch is switched to the on position, generator set starts. The off position of same switch initiates generator-set shutdown. (Switches with different configurations but equal functions are acceptable.) When generator set is running, specified system or equipment failures or derangements automatically shut down generator set and initiate alarms. Operation of the local (generator set-mounted) and/or remote emergency-stop switch also shuts down generator set.

C. Manual Starting System Sequence of Operation: Switching on-off switch on the generator control panel to the on position starts generator set. The off position of same switch initiates generator-set shutdown. When generator set is running, specified system or equipment failures or derangements automatically shut down generator set and initiate alarms. Operation of the local (generator set-mounted) and/or remote emergency-stop switch also shuts down generator set.

D. Configuration: Operating and safety indications, protective devices, system controls, engine gages and associated equipment shall be grouped in a common control and monitoring panel. Mounting method shall isolate the control panel from generator-set vibration. AC output power circuit breakers and other output power equipment shall not be mounted in the control enclosure.

E. Indicating and Protective Devices and Controls: As required by NFPA 110 for Level 1 system, and the following:

1. AC voltmeter (3-phase, line to line and line to neutral values).

2. AC ammeter (3-phases).

3. AC frequency meter.

4. AC kW output (total and for each phase). Display shall indicate power flow direction.

5. AC kVA output (total and for each phase). Display shall indicate power flow direction.

6. AC Power factor (total and for each phase). Display shall indicate leading or lagging condition.

7. Ammeter-voltmeter displays shall simultaneously display conditions for all three phases.

8. Emergency Stop Switch: Switch shall be a red “mushroom head” pushbutton device complete with lock-out/tag-out provisions. Depressing switch shall cause the generator set to immediately stop the generator set and prevent it from operating.

9. Fault Reset Switch: Supply a dedicated control switch to reset/clear fault conditions.

10. DC voltmeter (alternator battery charging).

11. Engine-coolant temperature gauge.

12. Engine lubricating-oil pressure gauge.

13. Running-time meter.

14. Generator-voltage and frequency digital raise/lower switches. Rheostats for these functions are not acceptable. The control shall adjustment of these parameters in a range of plus or minus 5% of the voltage and frequency operating set point (not nominal voltage and frequency values.) The voltage and frequency adjustment functions shall be disabled when the paralleling breaker is closed.

15. Fuel tank derangement alarm.

16. Fuel tank high-level shutdown of fuel supply alarm.

17. AC Protective Equipment: The control system shall include over/under voltage, reverse kVAR, reverse kW, over load (kW) short circuit, over current, loss of voltage reference, and over excitation shut down protection. There shall be a ground fault alarm for generator sets rated over 1000 amps, overload warning, and overcurrent warning alarm.

18. Status LED indicating lamps to indicate remote start signal present at the control, existing shutdown condition, existing alarm condition, not in auto, and generator set running.

19. A graphical display panel with appropriate navigation devices shall be provided to view all information noted above, as well as all engine status and alarm/shutdown conditions (including those from an integrated engine emission control system). The display shall also include integrated provisions for adjustment of the gain and stability settings for the governing and voltage regulation systems.

20. Panel lighting system to allow viewing and operation of the control when the generator room or enclosure is not lighted.

21. Data Logging: The control system shall log the latest 20 different alarm and shut down conditions, the total number of times each alarm or shutdown has occurred, and the date and time the latest of these shutdown and fault conditions occurred.

22. DC control Power Monitoring: The control system shall continuously monitor DC power supply to the control, and annunciate low or high voltage conditions. It shall also provide an alarm indicating imminent failure of the battery bank based on degraded voltage recover on loading (engine cranking).

F. Control Heater: Generator sets that are installed in outdoor enclosures, or are in tropical or coastal environments shall be provided with control heaters for anti-condensation protection.

G. Common Remote Audible Alarm: Comply with NFPA 110 requirements for Level 1 systems. Include necessary contacts and terminals in control and monitoring panel.

1. Overcrank shutdown.

2. Coolant low-temperature alarm.

3. Control switch not in auto position.

4. Battery-charger malfunction alarm.

5. Battery low-voltage alarm.

H. Remote Alarm Annunciator: Comply with NFPA 110. An LED labeled with proper alarm conditions shall identify each alarm event and a common audible signal shall sound for each alarm condition.

I. Remote Emergency-Stop Switch: Flush; wall mounted, unless otherwise indicated; and labeled. Push button shall be protected from accidental operation.

2.6 GENERATOR OVERCURRENT AND FAULT PROTECTION

A. Generator Overcurrent Protection: The generator set shall be provided with a UL Listed/CSA Certified protective device that is coordinated with the alternator provided to prevent damage to the generator set on any possible overload or overcurrent condition external to the machine. The protective device shall be listed as a utility grade protective device under UL category NRGU. The control system shall be subject to UL follow-up service at the manufacturing location to verify that the protective system is fully operational as manufactured. Protector shall perform the following functions:

1. Initiates a generator kW overload alarm when generator has operated at an overload equivalent to 110 percent of full-rated load for 60 seconds. Indication for this alarm is integrated with other generator-set malfunction alarms.

2. Under single phase or multiple phase fault conditions, or on overload conditions, indicates an alarm conditions when the current flow is in excess of 110% of rated current for more than 10 seconds.

3. Under single phase or multiple phase fault conditions, operates to switch off alternator excitation at the appropriate time to prevent damage to the alternator.

4. The operator panel shall indicate the nature of the fault condition as either a short circuit or an overload.

5. Senses clearing of a fault by other overcurrent devices and controls recovery of rated voltage to avoid overshoot greater than 120% of nominal voltage.

6. The protective system provided shall not include an instantaneous trip function.

B. Ground-Fault Indication: Comply with NFPA 70, "Emergency System" signals for ground-fault. Integrate ground-fault alarm indication with other generator-set alarm indications.

2.7 GENERATOR, EXCITER, AND VOLTAGE REGULATOR

A. Comply with NEMA MG 1.

B. Drive: Generator shaft shall be directly connected to engine shaft. Exciter shall be rotated integrally with generator rotor.

C. Electrical Insulation: Class H

D. Temperature Rise: 150 / Class H, Standby environment.

E. Construction shall prevent mechanical, electrical, and thermal damage due to vibration, over speed up to 125 percent of rating, and heat during operation at 110 percent of rated capacity.

F. Permanent Magnet Generator (PMG) shall provide excitation power for optimum motor starting and short circuit performance.

G. Enclosure: Drip-proof.

H. Voltage Regulator: Solid-state type, separate from exciter, providing performance as specified. The voltage regulation system shall be microprocessor-controlled, 3-phase true RMS sensing, full wave rectified, and provide a pulse-width modulated signal to the exciter. No exceptions or deviations to these requirements will be permitted.

I. The alternator shall be provided with anti-condensation heater(s) in all applications where the generator set is provided in an outdoor enclosure, or when the generator set is installed in a coastal or tropical environment.

J. Windings: Two-thirds pitch stator winding and fully linked amortisseur winding. Alternators operating at voltage higher than 690VAC shall be provided with form-wound stator coils.

K. Subtransient Reactance: 12 percent maximum, based on the rating of the engine generator set.

2.8 OUTDOOR GENERATOR-SET CUSTOM ENCLOSURE

A. Description: Sound Attenuated Steel housing. Multiple panels shall be lockable and provide adequate access to components requiring maintenance. Instruments, control, and battery system shall be mounted within enclosure.

B. Construction:

1. Louvers: Equipped with bird screen to permit air circulation when engine is not running while excluding birds and rodents.

2. Hinged Doors: With padlocking provisions. Restraint/Hold back hardware to prevent door to keep door open at 180 degrees during maintenance. Rain lips over all doors.

3. Exhaust System:

a. Muffler Location: Within enclosure.

4. Hardware: All hardware and hinges shall be stainless steel.

5. Mounting Base: Suitable for mounting on sub-base fuel tank or housekeeping pad.

6. A weather protective enclosure shall be provided which allows the generator set to operate at full rated load with a static pressure drop equal to or less than 0.5 inches of water.

C. Engine Cooling Airflow through Enclosure: Housing shall provide ample airflow for engine generator operation at rated load in an ambient temperature of 40 deg C.

1. Louvers: Fixed-engine, cooling-air inlet and discharge.

2. Motorized Louvers: At engine cooling-air inlet and discharge. Dampers shall be closed to reduce enclosure heat loss in cold weather when unit is not operating. Dampers shall be of a “fail open” design to allow airflow in the event of failure

D. Sound Performance: Reduce the sound level of the engine generator while operating at full rated load to a maximum of 61 dBA measured at any location 75 ft from the engine generator in a free field environment.

E. Electrical Provisions

1. Compliance with NEC: Package shall comply with the requirements of the National Electrical Code for all wiring materials and component spacing.

2. Provide an internally mounted and wired electrical distribution panel to serve the engine generator and enclosure; including:

a. 100 amp distribution panelboard connected to a 120/240VAC utility service by the installer.

b. Two duplex GFI receptacles, one inside the enclosure, and a weatherproof receptacle on the outside of the enclosure.

c. Factory wired normal AC service from the panelboard to the engine coolant heater, alternator heater, and battery charger.

d. Interior Lights with Switch: Two three-way switches controlling three AC lamps mounted in vapor tight and gasketed fixtures

3. External Electrical Connections: All power and control interconnections shall be made within the perimeter of the enclosure.

F. Site Provisions:

1. Lifting: Complete assembly of engine generator, enclosure, and sub base fuel tank (when used) shall be designed to be lifted into place as a single unit, using spreader bars.

2.9 VIBRATION ISOLATION DEVICES

A. Vibration Isolation: Generators installed on grade shall be provided with elastomeric isolator pads integral to the generator, unless the engine manufacturer requires use of spring isolation.

2.10 FINISHES

A. Indoor and Outdoor Enclosures and Components: Powder-coated and baked over corrosion-resistant pretreatment and compatible primer. Manufacturer's standard color or as directed on the drawings.

2.11 SOURCE QUALITY CONTROL

A. Prototype Testing: Factory test engine-generator set using same engine model, constructed of identical or equivalent components and equipped with identical or equivalent accessories.

1. Tests: Comply with NFPA 110, Level 1 Energy Converters. In addition, the equipment engine, skid, cooling system, and alternator shall have been subjected to actual prototype tests to validate the capability of the design under the abnormal conditions noted in NFPA110. Calculations and testing on similar equipment which are allowed under NFPA110 are not sufficient to meet this requirement.

B. Project-Specific Equipment Tests: Before shipment, factory test engine-generator set manufactured specifically for this Project. Perform tests at rated load and power factor. Include the following tests:

1. Test engine generator set manufactured for this Project to demonstrate compatibility and functionality.

2. Full load run.

3. Maximum power.

4. Voltage regulation.

5. Steady-state governing.

6. Single-step load pickup.

7. Simulated safety shutdowns.

C. Provide 14 days' advance notice of tests and opportunity for observation of tests by Owner's representative.

2.12 GENERATOR PLATFORM

1. Provide generator platform for access to side enclosure doors. Generator platform shall consist of steel frame with diamond plate top and aluminum handrails. Platforms shall be three-sided with two stair access. Platform shall be 52” deep and as indicated on the electrical drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with packaged engine-generator manufacturers' written installation, application, and alignment instructions and with NFPA 110.

B. Equipment shall be installed by the contractor in accordance with final submittals and contract documents. Installation shall comply with applicable state and local codes as required by the authority having jurisdiction. Install equipment in accordance with manufacturer's instructions and instructions included in the listing or labeling of UL listed products.

C. Installation of equipment shall include furnishing and installing all interconnecting wiring between all major equipment provided for the on-site power system. The contractor shall also perform interconnecting wiring between equipment sections (when required), under the supervision of the equipment supplier.

D. Equipment shall be installed on concrete housekeeping pads. Equipment shall be permanently fastened to the pad in accordance with manufacturer’s instructions and seismic requirements of the site.

E. Equipment shall be initially started and operated by representatives of the manufacturer. All protective settings shall be adjusted as instructed by the consulting engineer.

F. All equipment shall be physically inspected for damage. Scratches and other installation damage shall be repaired prior to final system testing. Equipment shall be thoroughly cleaned to remove all dirt and construction debris prior to initial operation and final testing of the system.

G. On completion of the installation by the electrical contractor, the generator set supplier shall conduct a site evaluation to verify that the equipment is installed per manufacturer’s recommended practice.

3.2 ON-SITE ACCEPTANCE TEST

A. The complete installation shall be tested to verify compliance with the performance requirements of this specification following completion of all site work. Testing shall be conducted by representatives of the manufacturer, with required fuel supplied by Contractor. The Engineer shall be notified in advance and shall have the option to witness the tests. The generator set manufacturer shall provide a site test specification covering the entire system. Tests shall include:

B. Prior to start of active testing, all field connections for wiring, power conductors, and bus bar connections shall be checked for proper tightening torque.

C. Installation acceptance tests to be conducted on site shall include a "cold start" test, a two hour full load (resistive) test, and a one-step rated load pickup test in accordance with NFPA 110. Provide a resistive load bank and make temporary connections for full load test, if necessary.

D. Perform a power failure test on the entire installed system. This test shall be conducted by opening the power supply from the utility service, and observing proper operation of the system for at least 2 hours. Coordinate timing and obtain approval for start of test with site personnel.

E. Perform sound level measurements after completion of all construction to determine if the generator sound levels are consistent with manufacturer’s data. The contractor shall provide written test report performed by a certified sound engineering firm to verify the generator sound levels are in accordance with paragraph 2.8 B, Baltimore City Sound regulations. Sound measurements are to be at a minimum of three locations. Test shall be performed by calibrated Field Sound Transmission Classification (STC) Instrumentation per ASTM and ANSI standards

3.3 TRAINING

A. The equipment supplier shall provide training for the facility operating personnel covering operation and maintenance of the equipment provided. The training program shall be not less than 4 hours in duration and the class size shall be limited to 5 persons. Training date shall be coordinated with the facility owner.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

3.5 SERVICE AND SUPPORT

A. The generator set supplier shall maintain service parts inventory for the entire power system at a central location which is accessible to the service location 24 hours per day, 365 days per year. The inventory shall have a commercial value of $3 million or more. The manufacturer of the generator set shall maintain a central parts inventory to support the supplier, covering all the major components of the power system, including engines, alternators, control systems, paralleling electronics, and power transfer equipment.

B. The generator set shall be serviced by a local service organization that is trained and factory certified in generator set service. The supplier shall maintain an inventory of critical power system replacement parts in the local service location. Service vehicles shall be stocked with critical replacement parts. The service organization shall be on call 24 hours per day, 365 days per year. The service organization shall be physically located within 50 of the site.

C. The manufacturer shall maintain model and serial number records of each generator set provided for at least 20 years.

END OF SECTION 26 31 13

SECTION 26 33 53 - THREE-PHASE UNINTERRUPTIBLE POWER SYSTEM 120/208VAC SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. This specification defines the electrical and mechanical characteristics and requirements for a continuous- duty three-phase, solid-state, scalable (field-upgradable) uninterruptible power system (UPS). The UPS shall provide high-quality AC power for sensitive electronic equipment.

B. Related Requirements:

1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.2 STANDARDS

A. The UPS shall be designed in accordance with the applicable sections of the current revision of the following documents. Where a conflict arises between these documents and statements made herein, the statements in this specification shall govern.

1. UL Standard 1778
2. CSA 22.2, No. 107.1
3. FCC Part 15, Class A
4. IEC 61000-4-5
5. National Electrical Code (NFPA-70)
6. NEMA PE-1
7. ISTA_1H

B. The UPS shall be UL and cUL listed per UL Standard 1778.

1.3 SYSTEM DESCRIPTION

A. Design Requirements - UPS Module

1. Voltage. Input/output voltage specifications of the UPS shall be:
2. Rectifier Input: 120/208 volts, three-phase, 4-wire-plus-ground
3. Bypass Input: 120/208 volts, three-phase, 4-wire-plus-ground
4. Output: 120/208 volts, three-phase, 4-wire-plus-ground

B. Output Load Capacity. Specified output load capacity of the UPS shall be 33.3 kVA at 0.9 lagging power factor.

C. Scalable Output Capacity. UPS rated output capacity will be scalable by means of a software update which will require no hardware modifications to the UPS. Models will be available in capacity ranges of 40, 60, 80, 100, 120, 160 and 200kVA.

1. 40kVA model will be scalable from 40k to 60kVA to 80kVA.
2. 80kVA model will be scalable from 80kVA to 100kVA to 120kVA.
3. 160kVA model will be scalable from 160kVA to 200kVA

D. Parallel Operation. Up to four (4) UPS module outputs may be connected together in parallel to provide up to 3X maximum output capacity with redundancy.

E. Current Sharing: When multiple UPS modules are connected in parallel and powering a common load, each UPS module output current will not differ by more than 5% of the rated full load current of one UPS module.

F. Design Requirements - Battery

1. Battery Cells: Valve-regulated, lead acid batteries.
2. Reserve Time: 30 minutes at 26.6kVA, 0.9 power factor, with ambient temperature of 77°F (25°C). Unit shall provide terminal for connection of external batteries.
3. Recharge Time: to 95% capacity within ten (10) times discharge time.

G. Modes of Operation

1. The UPS shall be designed to operate as an on-line, double-conversion, reverse-transfer system with the following operating modes:
   a. Normal - The critical AC load is continuously supplied by the UPS inverter. The rectifier/charger derives power from an AC source and supplies DC power to the inverter while simultaneously float-charging the reserve battery.
   b. Emergency - Upon failure of utility AC power, the critical AC load is supplied by the inverter, which obtains power from the battery. There shall be no interruption in power to the critical load upon failure or restoration of the utility AC source.
   c. Recharge - Upon restoration of utility AC power after a utility AC power outage, the rectifier/charger shall automatically restart and assume the inverter and battery recharge loads.
   d. Bypass - If the UPS must be taken out of service for maintenance or repair or if the inverter overload capacity is exceeded, the static transfer switch shall perform a reverse transfer of the load from the inverter to the bypass source with no interruption in power to the critical AC load.
   e. Eco-Mode - When this mode is enabled by service personnel the UPS will power the critical load through the UPS static bypass. If the bypass source becomes unqualified the UPS will switch to Normal mode of operation as defined above. Utility power is considered unqualified when either the input voltage varies more than +10% of rated voltage or the input frequency varies beyond +10% of 60Hz. Ten (10) minutes after the bypass source becomes qualified the UPS will automatically transfer to Eco-Mode of operation.

H. Performance Requirements

1. AC Input to UPS
   a. Voltage Configuration for Standard Units: 480V, three-phase, three-wire plus ground
   b. Voltage Range: +15%, -20% of nominal without derating
   c. Frequency: 57-66 Hz
   d. Power Factor: >0.99 at nominal input voltage and full-rated UPS output load
   >0.98 at nominal input voltage and half-rated UPS output load
   e. Inrush Current: UPS inrush current not to exceed 1.5 times rated input current. Maintenance bypass and distribution cabinet inrush current not to exceed 8 times rated input current.
   f. Current Limit: 140% of nominal AC input current maximum
   g. Current Distortion: <3% reflected THD maximum at full load
   h. Surge Protection: Sustains input surges without damage per criteria listed in IEC 1000-4-5

I. AC Output, UPS Inverter

1. Voltage Configuration: three-phase, 3-wire plus ground

2. Voltage Regulation:±1% three-phase RMS average for a balanced three-phase load for the combined variation effects of input voltage, connected load, battery voltage, ambient temperature and load power factor±2% three-phase RMS average for a 100% unbalanced load for the combined variation effects of input voltage, connected load, battery voltage, ambient temperature and load power factor
3. Frequency: Nominal frequency ±0.05% for single unit ±0.25% for paralleled units
4. Frequency Slew Rate: Selectable from 0.1Hz/sec to 3.0Hz/sec maximum for single unit
   Fixed maximum of 0.2Hz/sec for paralleled units
5. Phase Displacement: ±0.5 degree for balanced load ,±1.0 degrees for 100% unbalanced load
6. Bypass Line Sync Range: ±2.0 Hz, field-selectable ±0.5 to 5.0 Hz
7. Voltage Distortion: 1% total harmonic distortion (THD) for linear loads,
   <5% THD for 100% nonlinear loads (3:1 crest factor) without kVA/kW derating
8. Load Power Factor Range: 0.7 lagging to 1.0 leading without derating
9. Output Power Rating: Rated kVA at 0.9 lagging power factor
10. Overload Capability:
    a. 110% for 1 hour
    b. 125% for 10 minutes
    c. 150% for 1 minute
11. Voltage Transient Response: 100% load step, ±5.0%, Loss or return of AC input power, ±1.0%
12. Transient Recovery Time: to within 2% of output voltage within one cycle
13. Voltage Unbalance: 100% unbalanced load, ±2%

1.4 ENVIRONMENTAL CONDITIONS

A. The UPS shall be able to withstand the following environmental conditions without damage or degradation of operating characteristics:

1. Operating Ambient Temperature
   a. UPS Module: 32°F to 104°F (0°C to 40°C)
   b. Battery: 77°F ±9°F (25°C ±5°C)
2. Storage/Transport Ambient Temperature
   a. UPS Module: -13°F to 158°F (-25°C to 70°C)
   b. Battery: -4°F to 92°F (-20°C to 33°C)
3. Relative Humidity: 0 to 95%, non-condensing
4. Altitude
   a. Operating: to 6,562 ft. (2000m) above mean sea level without derating. Linearly derated from 100% load at 6,562 ft. (2000m) to 88% load at 9,843 ft. (3000m).
   b. Storage/Transport: to 40,000 ft. (12,200m) above mean sea level.
5. Audible Noise
   a. Less than 61dB for 40-80kVA model
   b. Less than 63dB for 100-120kVA model
   c. Less than 69dB for 160-200kVA model

1.5 SUBMITTALS

A. Proposal Submittals

1. Submittals with the proposal shall include:

a. System configuration with single-line diagrams

b. Functional relationship of equipment including weights, dimensions and heat dissipation

c. Descriptions of equipment to be furnished, including deviations from these specifications

d. Size and weight of shipping units to be handled by installing contractor

e. Detailed layouts of customer power and control connections

f. Detailed installation drawings including all terminal locations

B. UPS Delivery Submittals

1. Submittals upon UPS delivery shall include a complete set of submittal drawings and one (1) set of instruction manuals that shall include a functional description of the equipment with block diagrams, safety precautions, instructions, step-by-step operating procedures and routine maintenance guidelines, including illustrations.

1.6 WARRANTY

A. UPS Module

1. The UPS manufacturer shall warrant the UPS module against defects in materials and workmanship for 24 months after initial startup..

B. Battery

1. The battery manufacturer's standard warranty shall be passed through to the end user.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications

1. A minimum of 20 years' experience in the design, manufacture and testing of solid-state UPS systems is required. The system shall be designed and manufactured according to world-class quality standards. The manufacturer shall be ISO 9001:2000 certified.

B. Factory Testing

1. Before shipment, the manufacturer shall fully and completely test the system to assure compliance with the specification.

PART 2 - PRODUCT

2.1 FABRICATION

A. Materials

1. All materials of the UPS shall be new, of current manufacture and high grade and shall not have been in prior service except as required during factory testing. All active electronic devices shall be solid-state. All power semi-conductors shall be sealed. Control logic and fuses shall be physically isolated from power train components to ensure operator safety and protection from heat. All electronic components shall be accessible from the front without removing sub-assemblies for service access.

B. Wiring

1. Wiring practices, materials and coding shall be in accordance with the requirements of the National Electrical Code, OSHA and applicable local codes and standards. All bolted connections of busbars, lugs and cables shall be in accordance with requirements of the National Electrical Code and other applicable standards. All electrical power connections shall be torqued to the required value and marked with a visual indicator.
2. Provisions shall be made in the cabinets to permit installation of input, output and external control cabling, using raceway or conduit. Provision shall be made for top and bottom access to input, output, bypass and DC connections. In conformance with NEC, connection cabinets shall provide for adequate wire bend radius. All copper busbars for customer power connections shall be tin plated for connection integrity.

C. Construction and Mounting

1. The UPS shall be in NEMA Type 1 enclosures, designed for floor mounting. The UPS shall be structurally adequate and have provisions for hoisting, jacking and forklift handling. Maximum cabinet height shall be 78.7 in. (2000mm).

D. Cooling

1. Cooling of the UPS shall be by forced air using a redundant fan configuration. Fan power shall be provided by the UPS.
2. The thermal design, along with all thermal and ambient sensors, shall be coordinated with the protective devices before excessive component or internal cabinet temperatures are exceeded. Air filters shall be located at the point of air inlet and be changeable.

2.2 COMPONENTS

Rectifier/Charger

A. General

1. The term rectifier/charger shall denote the solid-state equipment and controls necessary to convert AC to regulated DC for input to the inverter and for charging the battery.

B. AC Input Current Limiting

1. The rectifier/charger unit shall be provided with AC input current limiting whereby the maximum input current shall be limited to 140% of the full input current rating. Input current limit will be adjustable by service personnel to allow the UPS to be used with undersized feeder breakers.

C. DC Filter

1. The rectifier/charger shall have an output filter to minimize ripple current into the battery. The AC ripple voltage of the rectifier DC output shall not exceed 1% RMS of the float voltage. The filter shall be adequate to ensure that the DC output of the rectifier/charger will meet the input requirements of the inverter without the battery connected.

D. Automatic Rectifier Restart

1. Upon restoration of utility AC power, after a utility AC power outage and prior to a UPS automatic end-of-discharge shutdown, the rectifier/charger shall automatically restart and assume the inverter and battery recharge loads.

E. Battery Recharge

1. In addition to supplying power for the inverter load, the rectifier/charger shall be capable of producing battery charging current sufficient to replace 95% of the battery discharge power

within ten (10) times the discharge time. After the battery is recharged, the rectifier/charger shall maintain the battery at full charge until the next emergency operation.

F. Overvoltage Protection

1. There shall be DC overvoltage protection so that if the DC voltage rises to the preset limit, the UPS will shut down automatically and initiate an uninterrupted load transfer to the static bypass line.

2.3 INVERTER

A. General

1. The term inverter shall denote the equipment and controls to convert DC from the rectifier/charger or battery to precise AC to power the load. The inverter shall be solid-state, capable of providing rated output power, and for increased performance the inverter shall be a pulse-width-modulated design and utilize insulated gate bipolar transistors (IGBTs).

B. Overload Capability

1. The inverter shall be capable of supplying current and voltage for overloads exceeding 100%. The inverter is to provide 150% of full load for 1 minute, 125% of full load for 10 minutes and 110% of full load for 1 hour. A status indicator and audible alarm shall indicate overload operation. The UPS shall transfer the load to bypass when overload capacity is exceeded.

C. Fault Clearing and Current Limit

1. The inverter shall be capable of supplying an overload current of 150% of its full-load rating for one minute. For greater currents or longer time duration, the inverter shall have electronic current-limiting protection to prevent damage to components. The critical load will be transferred to the static bypass automatically and uninterrupted. The inverter shall be self-protecting against any magnitude of connected output overload. Inverter control logic shall sense and disconnect the inverter from the critical AC load without the requirement to clear protective fuses.

2.4 STEP LOAD RESPONSE

A. Voltage Distortion

1. Total harmonic distortion in the output voltage will not exceed 1% for 0% to 100% linear loads.
2. Total harmonic distortion in the output voltage will not exceed 4% for 0% to 100% non-linear loads.
3. Total harmonic distortion in the output voltage will not exceed 5% for 0% to 100% non-linear, unbalanced loads.

B. Phase Balance

1. Electronic controls shall be provided to regulate each phase so that an unbalanced loading will not cause the output voltage to go outside the specified voltage unbalance or phase displacement. With 100% load on one phase (and 0% load on the other two phases) or 100% load on two phases (and 0% load on the other phase), the voltage balance is to be within 2% and the phase displacement is to be 120 degrees within ±1.5 degrees.

C. Inverter Shutdown

1. For rapid removal of the inverter from the critical load, the inverter control electronics shall instantaneously turn off the inverter transistors. Simultaneously, the static transfer switch shall be turned on to maintain continuous power to the critical load.

D. Inverter DC Protection

1. The inverter shall be protected by the following disconnect levels:
   a. DC Overvoltage Shutdown
   b. DC Undervoltage Warning (Low Battery Reserve)—pre-warning time is adjustable
   c. DC Undervoltage Shutdown (End of Discharge)

E. Output Frequency

1. The output frequency of the inverter shall be controlled by a high-speed DSP capable of holding the inverter output frequency to within ±0.05% during steady state and transient conditions. Total deviation from the rated frequency, including short time fluctuations and drift, shall not exceed 0.05%.

2.5 DISPLAY AND CONTROLS

A. Monitoring and Control

1. The UPS shall be provided with a microprocessor-based unit status display and controls section designed for convenient and reliable user operation. A graphical liquid crystal display (LCD) shall be used to show a single-line diagram of the UPS and shall be provided as part of the monitoring and controls sections of the UPS. All operator controls and monitors shall be located on the front of the UPS cabinet. Monitoring functions such as metering, status and alarms shall be displayed on the graphical LCD. Additional features of the monitoring system shall include:
   a. Menu-driven display with pushbutton navigation
   b. Real-time clock (time and date)
   c. Alarm history with time and date stamp
   d. Memory with battery backup

B. Metering

1. The following parameters shall be displayed:
   a. Input AC voltage line-to-line
   b. Input AC current for each phase
   c. Input frequency
   d. Battery voltage
   e. Battery charge/discharge current
   f. Output AC voltage line-to-line
   g. Output AC current for each phase
   h. Output frequency
   i. Apparent power
   j. Active power
   k. Battery time left during battery operation

C. Selectable Input Contacts

1. The UPS shall have these available selectable input contacts:
   a. On Generator
   b. Fast Power Off
   c. MBB Auxiliary Contacts
   d. Start Battery Test
   e. Fault Acknowledge
   f. Bypass and Inverter Off

g. Stop Battery Test

D. Alarm Messages

1. The following alarm messages shall be displayed:
   a. Mains Voltage Abnormal
   b. Mains Undervoltage
   c. Mains Freq. Abnormal
   d. Charger Fault
   e. Battery Reversed
   f. No Battery
   g. Control Power 1 Fail
   h. Parallel Comm. Fail
   i. Bypass Unable To Track
   k. Bypass Abnormal
   l. Inverter Asynchronous
   m. Fan Fault
   n. Control Power 2 Fail
   o. Unit Over Load
   p. System Over Load
   q. Bypass Phase Reversed
   r. Transfer Time-Out
   s. Load Sharing Fault
   t. Parallel Connect Fault
   u. Bypass Over Current
   v. Output Ground Fault

E. Status Messages

1. The following UPS status messages shall be displayed:
   a. Rectifier (Off / Soft Start / Main Input On / Battery Input On)
   b. Input Supply (Normal Mode / Battery Mode / All Off)
   c. Battery Self Test (True / False)
   d. Input Disconnect (Open / Closed)
   e. EPO (True / False)
   f. Charger (On / Off)
   g. Output Disconnect (Open / Closed)
   h. Maint. Disconnect (Open / Closed)
   i. Bypass Disconnect (Open / Closed)
   j. Inverter (Off / Soft Start / On)
   k. Bypass (Normal / Unable To Trace / Abnormal)
   l. Output Supply (All Off / Bypass Mode / Inverter Mode / Output Disable)
   m. Inverter On (Enable / Disable)

F. Controls

1. UPS startup, shutdown and maintenance bypass operations shall be accomplished through pushbutton controls on the front panel. Menu-driven user prompts shall be provided to guide the operator through system operation without the use of additional manuals. Pushbuttons shall be provided to display the status of the UPS and to test and reset visual and audible

alarms. A mimic screen shall be available on the LCD to depict a single-line diagram of the UPS with switch positions and power flow.

G. On-Line Battery Test

1. The UPS shall be provided with a menu-driven On-Line Battery Test feature. The test shall ensure the capability of the battery to supply power to the inverter while the load is supplied power in the normal mode.

2.6 STATIC TRANSFER SWITCH

A. General

1. A static transfer switch and bypass circuit shall be provided as an integral part of the UPS. The static switch shall be a naturally commutated high-speed static (SCR-type) device rated to conduct full load current continuously. The switch shall have an overload rating to clear a 20-ampere load branch circuit breaker.

2. The static transfer switch control logic shall contain an automatic transfer control circuit that senses the status of the inverter logic signals and operating and alarm conditions. This control circuit shall provide an uninterrupted transfer of the load to an alternate bypass source without exceeding the transient limits specified herein, when an overload or malfunction occurs within the UPS or to bypass the UPS for maintenance.

B. Uninterrupted Transfer

1. The transfer control logic shall automatically turn on the static transfer switch, transferring the critical AC load to the bypass source, after the transfer logic senses any of the following conditions:
   a. Inverter overload capacity exceeded
   b. Critical AC load overvoltage or undervoltage
   c. UPS fault condition

2. The transfer control logic shall inhibit an automatic transfer of the critical load to the bypass source if any of the following conditions are present:
   a. Bypass frequency out of limits
   b. Bypass out-of-synchronization range with inverter output

C. Uninterrupted Retransfer

1. Retransfer of the critical AC load from the bypass source to the inverter output shall be automatically initiated unless inhibited by manual control. The transfer control logic shall inhibit an automatic retransfer of the critical load to the inverter if one of the following conditions exists:
   a. Bypass out of synchronization range with inverter output
   b. Inverter/bypass voltage difference exceeding preset limits
   c. Overload condition exists in excess of inverter full load rating
   d. UPS fault condition present

2.7 MAINTENANCE BYPASS SWITCH

A. General

1. A manually operated maintenance bypass switch shall be incorporated into the UPS cabinet to directly connect the critical load to the bypass AC input power source, bypassing the rectifier/charger, inverter and static transfer switch.

B. Battery Cabinet

1. The battery cabinet shall include ten (10) year design life, valve-regulated, lead-acid battery cells housed in a separate cabinet that matches the UPS cabinet styling to form an integral system lineup. All battery cell inter-connects shall utilize bolted connections, and all batteries shall include copper, inserted terminal posts allowing connector torque of 110 in-lb (12.4 Nm). Battery cells shall be mounted on slide-out trays for ease of maintenance. A battery disconnect circuit breaker shall be included for isolation of the battery pack from the UPS module. Casters and leveling feet shall also be provided with the battery cabinet for ease of installation. When the application calls for the battery cabinet to be bolted to the UPS cabinet, an interconnecting cable kit will be available, precut and pre-lugged.

2.8 ACCESSORIES

A. Liebert IntelliSlot® Web Card (ISWEB-LB)

1. Provides communication outputs to indicate a change of status of the UPS. Outputs are provided for:
   a. SNMP
   b. HTML - Web page
   c. .Allow use of Liebert Nform™ and or network management systems

B. Matching Maintenance Bypass and Distribution Cabinet

1. A make-before-break maintenance bypass with Solenoid Key Release Unit (SKRU) interlock shall be available in a cabinet that matches and may be bolted up to the UPS. Installation of the cabinet shall not affect the cooling ability of the UPS. Thermal-magnetic breakers shall be provided for bypass and maintenance isolation.

C. Remote Alarm Panel

1. The remote alarm panel shall have LED alarm lights. An audible alarm shall sound upon any alarm condition. The surface- or flush-mounted NEMA 1 enclosed panel shall indicate:
   a. Load on UPS LED
   b. Load on Bypass LED
   c. Battery Discharging LED
   d. Low Battery Warning LED
   e. UPS Alarm Condition LED
   f. New Alarm Condition LED (For a Second UPS Alarm Condition)
   g. Audible Alarm with Reset pushbutton
   h. Lamp Test/Reset pushbutton

PART 3 - EXECUTION

3.1 TRAINING

A. The Contractor shall provide a training session for up to five (5) owner's representatives for 2 normal workdays at a job site location determined by the owner.

B. The training session shall be conducted by a manufacturer's qualified representative. The training program shall consist of the instruction on the operation of the assembly, circuit breakers, and major components within the assembly.

3.2 FIELD QUALITY CONTROL

A. The following inspections and test procedures shall be performed by factory-trained field service personnel during the UPS startup.

B. Visual Inspection

1. Inspect equipment for signs of damage.
2. Verify installation per drawings.
3. Inspect cabinets for foreign objects.
4. Verify neutral and ground conductors are properly sized and configured.
5. Inspect battery cases.
6. Inspect battery for proper polarity.
7. Verify all printed circuit boards are configured properly.

C. Mechanical Inspection

1. Check all control wiring connections for tightness.
2. Check all power wiring connections for tightness.
3. Check all terminal screws, nuts and/or spade lugs for tightness.

D. Electrical Inspection

1. Check all fuses for continuity.
2. Confirm input voltage and phase rotation is correct.
3. Assure connection and voltage of the battery string(s).

3.3 MANUFACTURER'S FIELD SERVICE

A. Service Personnel

1. The UPS manufacturer shall directly employ a nationwide service organization consisting of factory-trained field service personnel dedicated to the startup and maintenance of UPS and power equipment.
2. The manufacturer shall provide a national dispatch center to coordinate field service personnel schedules. One toll-free number shall reach a qualified support person 24 hours a day, 7 days a week, 365 days a year. If emergency service is required, on-site response time shall be four hours or less within 150 miles of an Emerson Network Power Liebert Services center.
3. Two local customer engineers shall be assigned to the site with a regional office as a backup. Escalation procedures shall be in place to notify Power Technical Support if a site is not functioning within 24 hours.

B. Replacement Parts Stocking

1. Parts shall be available through an extensive network to ensure round-the-clock parts availability throughout the country.
2. Spare parts shall be stocked by local field service personnel with backup available from national parts center and the manufacturing location. A national parts center Customer Support Parts Coordinator shall be on call 24 hours a day, 7 days a week, 365 days a year for immediate parts availability.

C. Maintenance Contracts

1. A complete offering of preventive and full-service maintenance contracts for both the UPS system and battery system shall be available.

D. Automated Site Monitoring

1. The UPS manufacturer shall provide as an option an automated site-monitoring service. This service shall be staffed by a qualified support person 24 hours a day, 7 days a week, 365 days a year. At the detection of an alarm within the UPS, the controls shall initiate communications with the monitoring service. The monitoring service shall be capable of interpreting the communicated alarms to allow dispatch of a service engineer.

END OF SECTION 26 33 53

SECTION 26 33 54 – THREE- PHASE UNINTERRUPTIBLE POWER SYSTEM 277/480VAC SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. This specification defines the electrical and mechanical characteristics and requirements for a continuous-duty three-phase, solid-state, scalable (field-upgradable) uninterruptible power system (UPS). The UPS shall provide high-quality AC power for sensitive electronic equipment.

B. Related Requirements:

1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.2 STANDARDS

A. The UPS shall be designed in accordance with the applicable sections of the current revision of the following documents. Where a conflict arises between these documents and statements made herein, the statements in this specification shall govern.

1. UL Standard 924.
2. CSA 22.2, No. 107.1
3. FCC Part 15, Class A
4. IEC 61000-4-5
5. National Electrical Code (NFPA-70)
6. NEMA PE-1
7. ISTA_1H

B. The UPS shall be UL and cUL listed per UL Standard 1778.

1.3 SYSTEM DESCRIPTION

A. Design Requirements - UPS Module

1. Voltage. Input/output voltage specifications of the UPS shall be:
2. Rectifier Input: 277/480 volts, three-phase, 4-wire-plus-ground
3. Bypass Input: 277/480 volts, three-phase, 4-wire-plus-ground
4. Output: 277/480 volts, three-phase, 4-wire-plus-ground

B. Output Load Capacity. Specified output load capacity of the UPS shall be 24KW.

C. Scalable Output Capacity. UPS rated output capacity will be scalable by means of a software update which will require no hardware modifications to the UPS. Models will be available in capacity ranges of 40, 60, 80, 100, 120, 160 and 200kVA.

40kVA model will be scalable from 40k to 60kVA to 80kVA.

80kVA model will be scalable from 80kVA to 100kVA to 120kVA.

160kVA model will be scalable from 160kVA to 200kVA

D. Parallel Operation. Up to four (4) UPS module outputs may be connected together in parallel to provide up to 3X maximum output capacity with redundancy.

E. Current Sharing: When multiple UPS modules are connected in parallel and powering a common load, each UPS module output current will not differ by more than 5% of the rated full load current of one UPS module.

F. Design Requirements - Battery

1. Battery Cells: Valve-regulated, lead acid batteries.
2. Reserve Time: 90 minutes, with ambient temperature of 77°F (25°C). Unit shall provide terminal for connection of external batteries.
3. Recharge Time: to 95% capacity within ten (10) times discharge time.

G. Modes of Operation

1. The UPS shall be designed to operate as an on-line, double-conversion, reverse-transfer system with the following operating modes:

a. Normal - The critical AC load is continuously supplied by the UPS inverter. The rectifier/charger derives power from an AC source and supplies DC power to the inverter while simultaneously float-charging the reserve battery.

b. Emergency - Upon failure of utility AC power, the critical AC load is supplied by the inverter, which obtains power from the battery. There shall be no interruption in power to the critical load upon failure or restoration of the utility AC source.

c. Recharge - Upon restoration of utility AC power after a utility AC power outage, the rectifier/charger shall automatically restart and assume the inverter and battery recharge loads.

d. Bypass - If the UPS must be taken out of service for maintenance or repair or if the inverter overload capacity is exceeded, the static transfer switch shall perform a reverse transfer of the load from the inverter to the bypass source with no interruption in power to the critical AC load.

e. Eco-Mode - When this mode is enabled by service personnel the UPS will power the critical load through the UPS static bypass. If the bypass source becomes unqualified the UPS will switch to Normal mode of operation as defined above. Utility power is considered unqualified when either the input voltage varies more than +10% of rated voltage or the input frequency varies beyond +10% of 60Hz. Ten (10) minutes after the bypass source becomes qualified the UPS will automatically transfer to Eco-Mode of operation.

H. Performance Requirements

1. AC Input to UPS

a. Voltage Configuration for Standard Units: 480V, three-phase, three-wire plus ground

b. Voltage Range: +15%, -20% of nominal without derating

c. Frequency: 57-66 Hz

d. Power Factor: >0.99 at nominal input voltage and full-rated UPS output load,
>0.98 at nominal input voltage and half-rated UPS output load

e. Inrush Current: UPS inrush current not to exceed 1.5 times rated input current. Maintenance bypass and distribution cabinet inrush current not to exceed 8 times rated input current.

f. Current Limit: 140% of nominal AC input current maximum

g. Current Distortion: <3% reflected THD maximum at full load

h. Surge Protection: Sustains input surges without damage per criteria listed in IEC 1000-4-5

2. AC Output, UPS Inverter

a. Voltage Configuration: three-phase, 3-wire plus ground

b. Voltage Regulation:

i. ±1% three-phase RMS average for a balanced three-phase load for the combined variation effects of input voltage, connected load, battery voltage, ambient temperature and load power factor

ii. ±2% three-phase RMS average for a 100% unbalanced load for the combined variation effects of input voltage, connected load, battery voltage, ambient temperature and load power factor

3. Frequency: Nominal frequency ±0.05% for single unit, ±0.25% for paralleled units

4. Frequency Slew Rate: Selectable from 0.1Hz/sec to 3.0Hz/sec maximum for single unit; Fixed maximum of 0.2Hz/sec for paralleled units

5. Phase Displacement:

a. ±0.5 degree for balanced load

b. ±1.0 degrees for 100% unbalanced load

6. Bypass Line Sync Range:

a. ±2.0 Hz, field-selectable ±0.5 to 5.0 Hz

7. Voltage Distortion:

a. 1% total harmonic distortion (THD) for linear loads

b. <5% THD for 100% nonlinear loads (3:1 crest factor) without kVA/kW derating

8. Load Power Factor Range: 0.7 lagging to 1.0 leading without derating

9. Output Power Rating: Rated kVA at 0.9 lagging power factor

10. Overload Capability:

a. 110% for 1 hour

b. 125% for 10 minutes

c. 150% for 1 minute

11. Voltage Transient Response:

100% load step	±5.0%
Loss or return of AC input power	±1.0%

12. Transient Recovery Time: to within 2% of output voltage within one cycle

13. Voltage Unbalance: 100% unbalanced load, ±2%

1.4 ENVIRONMENTAL CONDITIONS

A. The UPS shall be able to withstand the following environmental conditions without damage or degradation of operating characteristics:

1. Operating Ambient Temperature

a. UPS Module: 32°F to 104°F (0°C to 40°C)

b. Battery: 77°F ±9°F (25°C ±5°C)

2. Storage/Transport Ambient Temperature

a. UPS Module: -13°F to 158°F (-25°C to 70°C)

b. Battery: -4°F to 92°F (-20°C to 33°C)

3. Relative Humidity 0 to 95%, non-condensing

4. Altitude

a. Operating: to 6,562 ft. (2000m) above mean sea level without derating. Linearly derated from 100% load at 6,562 ft. (2000m) to 88% load at 9,843 ft. (3000m).

b. Storage/Transport: to 40,000 ft. (12,200m) above mean sea level.

5. Audible Noise

a. Less than 61dB for 40-80kVA model

b. Less than 63dB for 100-120kVA model

c. Less than 69dB for 160-200kVA model

1.5 SUBMITTALS

A. Proposal Submittals

1. Submittals with the proposal shall include:

a. System configuration with single-line diagrams

b. Functional relationship of equipment including weights, dimensions and heat dissipation

c. Descriptions of equipment to be furnished, including deviations from these specifications

d. Size and weight of shipping units to be handled by installing contractor

e. Detailed layouts of customer power and control connections

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1. Submittals upon UPS delivery shall include a complete set of submittal drawings and one (1) set of instruction manuals that shall include a functional description of the equipment with block diagrams, safety precautions, instructions, step-by-step operating procedures and routine maintenance guidelines, including illustrations.

1.6 WARRANTY

A. UPS Module

1. The UPS manufacturer shall warrant the UPS module against defects in materials and workmanship for 24 months after initial startup.

B. Battery

1. The battery manufacturer's standard warranty shall be passed through to the end user.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications

1. A minimum of 20 years' experience in the design, manufacture and testing of solid-state UPS systems is required. The system shall be designed and manufactured according to world-class quality standards. The manufacturer shall be ISO 9001:2000 certified.

B. Factory Testing

1. Before shipment, the manufacturer shall fully and completely test the system to assure compliance with the specification.

PART 2 - PRODUCT

2.1 FABRICATION

A. Materials

1. All materials of the UPS shall be new, of current manufacture and high grade and shall not have been in prior service except as required during factory testing. All active electronic devices shall be solid-state. All power semi-conductors shall be sealed. Control logic and fuses shall be physically isolated from power train components to ensure operator safety and protection from heat. All electronic components shall be accessible from the front without removing sub-assemblies for service access.

B. Wiring

1. Wiring practices, materials and coding shall be in accordance with the requirements of the National Electrical Code, OSHA and applicable local codes and standards. All bolted connections of busbars, lugs and cables shall be in accordance with requirements of the National Electrical Code and other applicable standards. All electrical power connections shall be torqued to the required value and marked with a visual indicator.

2. Provisions shall be made in the cabinets to permit installation of input, output and external control cabling, using raceway or conduit. Provision shall be made for top and bottom access to input, output, bypass and DC connections. In conformance with NEC, connection cabinets shall provide for adequate wire bend radius. All copper busbars for customer power connections shall be tin plated for connection integrity.

C. Construction and Mounting

1. The UPS shall be in NEMA Type 1 enclosures, designed for floor mounting. The UPS shall be structurally adequate and have provisions for hoisting, jacking and forklift handling. Maximum cabinet height shall be 78.7 in. (2000mm).

D. Cooling

1. Cooling of the UPS shall be by forced air using a redundant fan configuration. Fan power shall be provided by the UPS.

2. The thermal design, along with all thermal and ambient sensors, shall be coordinated with the protective devices before excessive component or internal cabinet temperatures are exceeded. Air filters shall be located at the point of air inlet and be changeable.

2.2 COMPONENTS

Rectifier/Charger

A. General

1. The term rectifier/charger shall denote the solid-state equipment and controls necessary to convert AC to regulated DC for input to the inverter and for charging the battery.

B. AC Input Current Limiting

1. The rectifier/charger unit shall be provided with AC input current limiting whereby the maximum input current shall be limited to 140% of the full input current rating. Input current limit will be adjustable by service personnel to allow the UPS to be used with undersized feeder breakers.

C. DC Filter

1. The rectifier/charger shall have an output filter to minimize ripple current into the battery. The AC ripple voltage of the rectifier DC output shall not exceed 1% RMS of the float voltage. The filter shall be adequate to ensure that the DC output of the rectifier/charger will meet the input requirements of the inverter without the battery connected.

D. Automatic Rectifier Restart

1. Upon restoration of utility AC power, after a utility AC power outage and prior to a UPS automatic end-of-discharge shutdown, the rectifier/charger shall automatically restart and assume the inverter and battery recharge loads.

E. Battery Recharge

2. In addition to supplying power for the inverter load, the rectifier/charger shall be capable of producing battery charging current sufficient to replace 95% of the battery discharge power within ten (10) times the discharge time. After the battery is recharged, the rectifier/charger shall maintain the battery at full charge until the next emergency operation.

F. Overvoltage Protection

1. There shall be DC overvoltage protection so that if the DC voltage rises to the preset limit, the UPS will shut down automatically and initiate an uninterrupted load transfer to the static bypass line.

2.3 INVERTER

A. General

1. The term inverter shall denote the equipment and controls to convert DC from the rectifier/charger or battery to precise AC to power the load. The inverter shall be solid-state, capable of providing rated output power, and for increased performance the inverter shall be a pulse-width-modulated design and utilize insulated gate bipolar transistors (IGBTs).

B. Overload Capability

1. The inverter shall be capable of supplying current and voltage for overloads exceeding 100%. The inverter is to provide 150% of full load for 1 minute, 125% of full load for 10 minutes and 110% of full load for 1 hour. A status indicator and audible alarm shall indicate overload operation. The UPS shall transfer the load to bypass when overload capacity is exceeded.

C. Fault Clearing and Current Limit

1. The inverter shall be capable of supplying an overload current of 150% of its full-load rating for one minute. For greater currents or longer time duration, the inverter shall have electronic current-limiting protection to prevent damage to components. The critical load will be transferred to the static bypass automatically and uninterrupted. The inverter shall be self-protecting against any magnitude of connected output overload. Inverter control

logic shall sense and disconnect the inverter from the critical AC load without the requirement to clear protective fuses.

2.4 STEP LOAD RESPONSE

A. Voltage Distortion

1. Total harmonic distortion in the output voltage will not exceed 1% for 0% to 100% linear loads.
2. Total harmonic distortion in the output voltage will not exceed 4% for 0% to 100% non-linear loads.
3. Total harmonic distortion in the output voltage will not exceed 5% for 0% to 100% non-linear, unbalanced loads.

B. Phase Balance

1. Electronic controls shall be provided to regulate each phase so that an unbalanced loading will not cause the output voltage to go outside the specified voltage unbalance or phase displacement. With 100% load on one phase (and 0% load on the other two phases) or 100% load on two phases (and 0% load on the other phase), the voltage balance is to be within 2% and the phase displacement is to be 120 degrees within ±1.5 degrees.

C. Inverter Shutdown

1. For rapid removal of the inverter from the critical load, the inverter control electronics shall instantaneously turn off the inverter transistors. Simultaneously, the static transfer switch shall be turned on to maintain continuous power to the critical load.

D. Inverter DC Protection

1. The inverter shall be protected by the following disconnect levels:
   a. DC Overvoltage Shutdown
   b. DC Undervoltage Warning (Low Battery Reserve)—pre-warning time is adjustable
   c. DC Undervoltage Shutdown (End of Discharge)

E. Output Frequency

1. The output frequency of the inverter shall be controlled by a high-speed DSP capable of holding the inverter output frequency to within ±0.05% during steady state and transient conditions. Total deviation from the rated frequency, including short time fluctuations and drift, shall not exceed 0.05%.

2.5 Display and Controls

A. Monitoring and Control

1. The UPS shall be provided with a microprocessor-based unit status display and controls section designed for convenient and reliable user operation. A graphical liquid crystal display (LCD) shall be used to show a single-line diagram of the UPS and shall be provided as part of the monitoring and controls sections of the UPS. All operator controls and monitors shall be located on the front of the UPS cabinet. Monitoring functions such as metering, status and alarms shall be displayed on the graphical LCD. Additional features of the monitoring system shall include:
   a. Menu-driven display with pushbutton navigation
   b. Real-time clock (time and date)

c. Alarm history with time and date stamp
d. Memory with battery backup

B. Metering

1. The following parameters shall be displayed:
   a. Input AC voltage line-to-line
   b. Input AC current for each phase
   c. Input frequency
   d. Battery voltage
   e. Battery charge/discharge current
   f. Output AC voltage line-to-line
   g. Output AC current for each phase
   h. Output frequency
   i. Apparent power
   j. Active power
   k. Battery time left during battery operation

C. Selectable Input Contacts

1. The UPS shall have these available selectable input contacts:
   a. On Generator
   b. Fast Power Off
   c. MBB Auxiliary Contacts
   d. Start Battery Test
   e. Fault Acknowledge
   f. Bypass and Inverter Off
   g. Stop Battery Test

D. Alarm Messages

1. The following alarm messages shall be displayed:
   a. Mains Voltage Abnormal
   b. Mains Undervoltage
   c. Mains Freq. Abnormal
   d. Charger Fault
   e. Battery Reversed
   f. No Battery
   g. Control Power 1 Fail
   h. Parallel Comm. Fail
   i. Bypass Unable To Track
   j. Bypass Abnormal
   k. Inverter Asynchronous
   l. Fan Fault
   m. Control Power 2 Fail
   n. Unit Over Load
   o. System Over Load
   p. Bypass Phase Reversed

q. Transfer Time-Out
r. Load Sharing Fault
s. Parallel Connect Fault
t. Bypass Over Current
u. Output Ground Fault

E. Status Messages

1. The following UPS status messages shall be displayed:
   a. Rectifier (Off / Soft Start / Main Input On / Battery Input On)
   b. Input Supply (Normal Mode / Battery Mode / All Off)
   c. Battery Self Test (True / False)
   d. Input Disconnect (Open / Closed)
   e. EPO (True / False)
   f. Charger (On / Off)
   g. Output Disconnect (Open / Closed)
   h. Maint. Disconnect (Open / Closed)
   i. Bypass Disconnect (Open / Closed)
   j. Inverter (Off / Soft Start / On)
   k. Bypass (Normal / Unable To Trace / Abnormal)
   l. Output Supply (All Off / Bypass Mode / Inverter Mode / Output Disable)
   m. Inverter On (Enable / Disable)

F. Controls

1. UPS startup, shutdown and maintenance bypass operations shall be accomplished through pushbutton controls on the front panel. Menu-driven user prompts shall be provided to guide the operator through system operation without the use of additional manuals. Pushbuttons shall be provided to display the status of the UPS and to test and reset visual and audible alarms. A mimic screen shall be available on the LCD to depict a single-line diagram of the UPS with switch positions and power flow.

G. On-Line Battery Test

1. The UPS shall be provided with a menu-driven On-Line Battery Test feature. The test shall ensure the capability of the battery to supply power to the inverter while the load is supplied power in the normal mode.

2.6 STATIC TRANSFER SWITCH

A. General

1. A static transfer switch and bypass circuit shall be provided as an integral part of the UPS. The static switch shall be a naturally commutated high-speed static (SCR-type) device rated to conduct full load current continuously. The switch shall have an overload rating to clear a 20-ampere load branch circuit breaker.
2. The static transfer switch control logic shall contain an automatic transfer control circuit that senses the status of the inverter logic signals and operating and alarm conditions. This control circuit shall provide an uninterrupted transfer of the load to an alternate bypass source without exceeding the transient limits specified herein, when an overload or malfunction occurs within the UPS or to bypass the UPS for maintenance.

B. Uninterrupted Transfer

1. The transfer control logic shall automatically turn on the static transfer switch, transferring the critical AC load to the bypass source, after the transfer logic senses any of the following conditions:
   a. Inverter overload capacity exceeded
   b. Critical AC load overvoltage or undervoltage
   c. UPS fault condition
2. The transfer control logic shall inhibit an automatic transfer of the critical load to the bypass source if any of the following conditions are present:
   a. Bypass frequency out of limits
   b. Bypass out-of-synchronization range with inverter output

C. Uninterrupted Retransfer

1. Retransfer of the critical AC load from the bypass source to the inverter output shall be automatically initiated unless inhibited by manual control. The transfer control logic shall inhibit an automatic retransfer of the critical load to the inverter if one of the following conditions exists:
   a. Bypass out of synchronization range with inverter output
   b. Inverter/bypass voltage difference exceeding preset limits
   c. Overload condition exists in excess of inverter full load rating
   d. UPS fault condition present

2.7 MAINTENANCE BYPASS SWITCH

A. General

1. A manually operated maintenance bypass switch shall be incorporated into the UPS cabinet to directly connect the critical load to the bypass AC input power source, bypassing the rectifier/charger, inverter and static transfer switch.

B. Battery Cabinet

1. The battery cabinet shall include ten (10) year design life, valve-regulated, lead-acid battery cells housed in a separate cabinet that matches the UPS cabinet styling to form an integral system lineup. All battery cell inter-connects shall utilize bolted connections, and all batteries shall include copper, inserted terminal posts allowing connector torque of 110 in-lb (12.4 Nm). Battery cells shall be mounted on slide-out trays for ease of maintenance. A battery disconnect circuit breaker shall be included for isolation of the battery pack from the UPS module. Casters and leveling feet shall also be provided with the battery cabinet for ease of installation. When the application calls for the battery cabinet to be bolted to the UPS cabinet, an interconnecting cable kit will be available, precut and pre-lugged.

2.8 ACCESSORIES

A. Liebert IntelliSlot® Web Card (ISWEB-LB)

1. Provides communication outputs to indicate a change of status of the UPS. Outputs are provided for:
   a. SNMP
   b. HTML - Web page
   c. Allow use of Liebert Nform™ and or network management systems

B. Matching Maintenance Bypass and Distribution Cabinet

1. A make-before-break maintenance bypass with Solenoid Key Release Unit (SKRU) interlock shall be available in a cabinet that matches and may be bolted up to the UPS. Installation of the cabinet shall not affect the cooling ability of the UPS. Thermal-magnetic breakers shall be provided for bypass and maintenance isolation.

C. Remote Alarm Panel

1. The remote alarm panel shall have LED alarm lights. An audible alarm shall sound upon any alarm condition. The surface- or flush-mounted NEMA 1 enclosed panel shall indicate:
   a. Load on UPS LED
   b. Load on Bypass LED
   c. Battery Discharging LED
   d. Low Battery Warning LED
   e. UPS Alarm Condition LED
   f. New Alarm Condition LED (For a Second UPS Alarm Condition)
   g. Audible Alarm with Reset pushbutton
   h. Lamp Test/Reset pushbutton

PART 3 - EXECUTION

3.1 TRAINING

A. The Contractor shall provide a training session for up to five (5) owner's representatives for 2 normal workdays at a job site location determined by the owner.

B. The training session shall be conducted by a manufacturer's qualified representative. The training program shall consist of the instruction on the operation of the assembly, circuit breakers, and major components within the assembly.

3.2 FIELD QUALITY CONTROL

A. The following inspections and test procedures shall be performed by factory-trained field service personnel during the UPS startup.

1. Visual Inspection
   a. Inspect equipment for signs of damage.
   b. Verify installation per drawings.
   c. Inspect cabinets for foreign objects.
   d. Verify neutral and ground conductors are properly sized and configured.
   e. Inspect battery cases.
   f. Inspect battery for proper polarity.
   g. Verify all printed circuit boards are configured properly.

2. Mechanical Inspection
   a. Check all control wiring connections for tightness.
   b. Check all power wiring connections for tightness.
   c. Check all terminal screws, nuts and/or spade lugs for tightness.

3. Electrical Inspection
   a. Check all fuses for continuity.
   b. Confirm input voltage and phase rotation is correct.
   c. Assure connection and voltage of the battery string(s).

3.3 MANUFACTURER'S FIELD SERVICE

A. Service Personnel

1. The UPS manufacturer shall directly employ a nationwide service organization consisting of factory-trained field service personnel dedicated to the startup and maintenance of UPS and power equipment.
2. The manufacturer shall provide a national dispatch center to coordinate field service personnel schedules. One toll-free number shall reach a qualified support person 24 hours a day, 7 days a week, 365 days a year. If emergency service is required, on-site response time shall be four hours or less within 150 miles of an Emerson Network Power Liebert Services center.
3. Two local customer engineers shall be assigned to the site with a regional office as a backup. Escalation procedures shall be in place to notify Power Technical Support if a site is not functioning within 24 hours.

B. Replacement Parts Stocking

1. Parts shall be available through an extensive network to ensure round-the-clock parts availability throughout the country.
2. Spare parts shall be stocked by local field service personnel with backup available from national parts center and the manufacturing location. A national parts center Customer Support Parts Coordinator shall be on call 24 hours a day, 7 days a week, 365 days a year for immediate parts availability.

C. Maintenance Contracts

1. A complete offering of preventive and full-service maintenance contracts for both the UPS system and battery system shall be available.

D. Automated Site Monitoring

1. The UPS manufacturer shall provide as an option an automated site-monitoring service. This service shall be staffed by a qualified support person 24 hours a day, 7 days a week, 365 days a year. At the detection of an alarm within the UPS, the controls shall initiate communications with the monitoring service. The monitoring service shall be capable of interpreting the communicated alarms to allow dispatch of a service engineer.

END OF SECTION 26 33 54

SECTION 26 41 13 - LIGHTNING PROTECTION FOR STRUCTURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes lightning protection for structures, structure elements.

B. It shall be sole responsibility of the contractor to provide complete design for lightning protection system and obtain all required permit.

C. Provide lighting protection for the entire building including existing building to remain.

D. Related sections

1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 MRc2: CONSTRUCTION WASTE MANAGEMENT

A. No less than the specified minimum proportion of all construction waste from the project shall be diverted from disposal in a landfill and/or incineration in accordance with the project requirements for Construction Waste Management. See Section 018113 Sustainable Design Requirements.

B. EQc4.1: LOW-EMITTING MATERIALS – SEALANTS AND ADHESIVES

All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the project requirements for Low-Emitting Materials – Sealants and Adhesives. See Section 018113 Sustainable Design Requirements.

Contractor shall provide LEED credit verification as per Section 013300 Submittal Procedures.

C. EQc4.2: LOW-EMITTING MATERIALS – PAINTS AND COATINGS

All paints and coatings used in the building interior comply with the project requirements for Low-Emitting Materials – Paints and Coatings. See Section 018113 Sustainable Design Requirements.

Contractor shall provide LEED credit verification as per Section 013300 Submittal Procedures.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For air terminals and mounting accessories.

1. Layout of the lightning protection system, along with details of the components to be used in the installation.
2. Include indications for use of raceway, data on how concealment requirements will be met, and calculations required by NFPA 780 for bonding of grounded and isolated metal bodies.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer and manufacturer. Include data on listing or certification by UL.

B. It shall be sole responsibility of the contractor to provide complete design for lightning protection system duly sealed and signed by Professional Engineer and obtain all required permit.

C. Certification, signed by Contractor, that roof adhesive is approved by manufacturer of roofing material.

D. Field quality-control reports.

E. Comply with recommendations in NFPA 780, Annex D, "Inspection and Maintenance of Lightning Protection Systems," for maintenance of the lightning protection system.

F. Other Informational Submittals: Plans showing dimensioned as-built locations of grounding features, including the following:

1. Ground rods.
2. Ground loop conductor.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Certified by UL and LPI as a Master Installer/Designer, trained and approved for installation of units required for this Project.

B. System Certificate:

1. UL Master Label.
2. LPI System Certificate.
3. UL Master Label Recertification.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 780, "Definitions" Article.

1.7 COORDINATION

A. Coordinate installation of lightning protection with installation of other building systems and components, including electrical wiring, supporting structures and building materials, metal bodies requiring bonding to lightning protection components, and building finishes.

B. Coordinate installation of air terminals attached to roof systems with roofing manufacturer and Installer.

C. Flashings of through-roof assemblies shall comply with roofing manufacturers' specifications.

1.8 WARRANTY

A. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 LIGHTNING PROTECTION SYSTEM COMPONENTS

A. Comply with UL 96 and NFPA 780.

B. Roof-Mounted Air Terminals: NFPA 780, Class II, aluminum unless otherwise indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. East Coast Lightning Equipment Inc.
b. ERICO International Corporation.
c. Harger.
d. Heary Bros. Lightning Protection Co. Inc.
e. Independent Protection Co.
f. Preferred Lightning Protection.
g. Robbins Lightning, Inc.
h. Thompson Lightning Protection, Inc.

2. Air Terminals More than 24 Inches Long: With brace attached to the terminal at not less than half the height of the terminal.
3. Single-Membrane, Roof-Mounted Air Terminals: Designed specifically for single-membrane roof system materials. Comply with requirements in Division 07 roofing Sections.

C. Main and Bonding Conductors: Aluminum.

D. Ground Loop Conductor: The same size and type as the main conductor except tinned.

E. Ground Rods: Copper-clad 3/4 inch diameter and 10 feet long.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install lightning protection components and systems according to UL 96 A and NFPA 780.

B. Install conductors with direct paths from air terminals to ground connections. Avoid sharp bends.

C. Conceal the following conductors:

1. System conductors.
2. Down conductors.
3. Interior conductors.
4. Conductors within normal view of exterior locations at grade within 200 feet of building.

D. Cable Connections: Use exothermic-welded connections for all conductor splices and connections between conductors and other components.

1. Exception: In single-ply membrane roofing, exothermic-welded connections may be used only below the roof level.

E. Air Terminals on Single-Ply Membrane Roofing: Comply with roofing membrane and adhesive manufacturer's written instructions.

F. Bond lightning protection components with intermediate-level interconnection loop conductors to grounded metal bodies of building at 60-foot intervals.

3.2 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies.

3.3 CORROSION PROTECTION

A. Do not combine materials that can form an electrolytic couple that will accelerate corrosion in the presence of moisture unless moisture is permanently excluded from junction of such materials.

B. Use conductors with protective coatings where conditions cause deterioration or corrosion of conductors.

3.4 FIELD QUALITY CONTROL

A. Notify Architect at least 48 hours in advance of inspection before concealing lightning protection components.

B. UL Inspection: Meet requirements to obtain a UL Master Label for system.

C. LPI System Inspection: Meet requirements to obtain an LPI System Certificate.

END OF SECTION 264113

SECTION 26 43 13 - SURGE PROTECTIVE DEVICES (SPDs) - LOW VOLTAGE AC SURGE PROTECTION FOR ELECTRICAL DISTRIBUTION SYSTEMS

PART 1 GENERAL

1.1 SCOPE

A. The Contractor shall furnish and install the Surge Protective Device (SPD) equipment having the electrical characteristics, ratings, and modifications as specified herein and as shown on the contract drawings. To maximize performance and reliability and to obtain the lowest possible let-through voltages, the ac surge protection shall be integrated into electrical distribution equipment such as switchgear, switchboards, panelboards, busway (integrated within bus plug), or motor control centers. Refer to related sections for surge requirements in:

1.2 RELATED SECTIONS

A. Section – Metal Enclosed Drawout Switchgear (Magnum DS) – Low Voltage

B. Section – Panelboards

C. Related Requirements:

1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 REFERENCES

A. SPD units and all components shall be designed, manufactured, and tested in accordance with the latest applicable UL standard (ANSI/UL 1449 3rd Edition).

1.4 SUBMITTALS – FOR REVIEW/APPROVAL

A. The following information shall be submitted to the Engineer:

1. Provide verification that the SPD complies with the required ANSI/UL 1449 3rd Edition listing by Underwriters Laboratories (UL) or other Nationally Recognized Testing Laboratory (NRTL). Compliance may be in the form of a file number that can be verified on UL’s website or on any other NRTL’s website, as long as the website contains the following information at a minimum: model number, SPD Type, system voltage, phases, modes of protection, Voltage Protection Rating (VPR), and Nominal Discharge Current (I_n).
2. For sidemount mounting applications (SPD mounted external to electrical assembly), electrical/mechanical drawings showing unit dimensions, weights, installation instruction details, and wiring configuration.

B. Where applicable the following additional information shall be submitted to the engineer:
   1. Descriptive bulletins
   2. Product sheets

1.5 SUBMITTALS – FOR CONSTRUCTION

A. The following information shall be submitted for record purposes:
   1. Final as-built drawings and information for items listed in Section 1.04 and shall incorporate all changes made during the manufacturing process

1.6 QUALIFICATIONS

A. The manufacturer of the assembly shall be the manufacturer of the major components within the assembly.

B. For the equipment specified herein, the manufacturer shall be ISO 9001 or 9002 certified.

C. The manufacturer of this equipment shall have produced similar electrical equipment for a minimum period of five (5) years. When requested by the Engineer, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.

D. The SPD shall be compliant with the Restriction of Hazardous Substances (RoHS) Directive 2002/95/EC.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of surge suppressors that fail in materials or workmanship within specified warranty period.

   1. Warranty Period: Five years from date of Substantial Completion.

1.8 DELIVERY, STORAGE AND HANDLING

A. Equipment shall be handled and stored in accordance with manufacturer’s instructions. One (1) copy of manufacturer’s instructions shall be included with the equipment at time of shipment.

1.9 OPERATION AND MAINTENANCE MANUALS

A. Operation and maintenance manuals shall be provided with each SPD shipped.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Eaton / Cutler-Hammer products

B. General Electric

C. Siemens

The listing of specific manufacturers above does not imply acceptance of their products that do not meet the specified ratings, features, and functions. Manufacturers listed above are not relieved from meeting these specifications in their entirety. Products in compliance with the specification and manufactured by others not named will be considered only if pre-approved by the Engineer ten (10) days prior to bid date.

2.2 VOLTAGE SURGE SUPPRESSION – GENERAL

A. Electrical Requirements

1. Unit Operating Voltage – Refer to drawings for operating voltage and unit configuration.
2. Maximum Continuous Operating Voltage (MCOV) – The MCOV shall not be less than 115% of the nominal system operating voltage.
3. The suppression system shall incorporate thermally protected metal-oxide varistors (MOVs) as the core surge suppression component for the service entrance and all other distribution levels. The system shall not utilize silicon avalanche diodes, selenium cells, air gaps, or other components that may crowbar the system voltage leading to system upset or create any environmental hazards.
4. Protection Modes – The SPD must protect all modes of the electrical system being utilized. The required protection modes are indicated by bullets in the following table:

	Protection Modes			
Configuration	L-N	L-G	L-L	N-G
Wye	●	●	●	●
Delta	N/A	●	●	N/A
Single Split Phase	●	●	●	●
High Leg Delta	●	●	●	●

5. Nominal Discharge Current (I_n) – All SPDs applied to the distribution system shall have a 20kA I_n rating regardless of their SPD Type (includes Types 1 and 2) or operating voltage. SPDs having an I_n less than 20kA shall be rejected.
6. ANSI/UL 1449 3rd Edition Voltage Protection Rating (VPR) – The maximum ANSI/UL 1449 3rd Edition VPR for the device shall not exceed the following:

Modes	208Y/120	480Y/277	600Y/347
L-N; L-G; N-G	700	1200	1500
L-L	1200	2000	3000

B. SPD Design

1. Maintenance Free Design – The SPD shall be maintenance free and shall not require any user intervention throughout its life. SPDs containing items such as replaceable modules, replaceable fuses, or replaceable batteries shall not be accepted. SPDs requiring any maintenance of any sort such as periodic tightening of connections shall not be accepted. SPDs requiring user intervention to test the unit via a diagnostic test kit or similar device shall not be accepted.
2. Balanced Suppression Platform – The surge current shall be equally distributed to all MOV components to ensure equal stressing and maximum performance. The surge suppression platform must provide equal impedance paths to each matched MOV. Designs incorporating replaceable SPD modules shall not be accepted.
3. Electrical Noise Filter – Each unit shall include a high-performance EMI/RFI noise rejection filter. Noise attenuation for electric line noise shall be up to 50 dB from 10 kHz to 100 MHz using the MIL-STD-220A insertion loss test method. Products unable able to meet this specification shall not be accepted.
4. Internal Connections – No plug-in component modules or printed circuit boards shall be used as surge current conductors. All internal components shall be soldered, hardwired with connections utilizing low impedance conductors.
5. Monitoring Diagnostics – Each SPD shall provide the following integral monitoring options:
   a. Protection Status Indicators - Each unit shall have a green / red solid-state indicator light that reports the status of the protection on each phase.
      i. For wye configured units, the indicator lights must report the status of all protection elements and circuitry in the L-N and L-G modes. Wye configured units shall also contain an additional green / red solid-state indicator light that reports the status of the protection elements and circuitry in the N-G mode. SPDs that indicate only the status of the L-N and L-G modes shall not be accepted.
      ii. For delta configured units, the indicator lights must report the status of all protection elements and circuitry in the L-G and L-L modes.
      iii. The absence of a green light and the presence of a red light shall indicate that damage has occurred on the respective phase or mode. All protection status indicators must indicate the actual status of the protection on each phase or mode. If power is removed from any one phase, the indicator lights must continue to indicate the status of the protection on all other phases and protection modes. Diagnostics packages that simply indicate whether power is present on a particular phase shall not be accepted.
   b. Remote Status Monitor – The SPD must include Form C dry contacts (one NO and one NC) for remote annunciation of its status. Both the NO and NC contacts shall change state under any fault condition.
   c. Audible Alarm and Silence Button – The SPD shall contain an audible alarm that will be activated under any fault condition. There shall also be an audible alarm silence button used to silence the audible alarm after it has been activated.
   d. Surge Counter – The SPD shall be equipped with an LCD display that indicates to the user how many surges have occurred at the location. The surge counter shall trigger each time a surge event with a peak current magnitude of a minimum of 50 ± 20A occurs. A reset pushbutton shall also be standard, allowing the surge counter to be zeroed. The reset button shall contain a mechanism to prevent accidental resetting of the counter via a single, short-duration button press. In order to

prevent accidental resetting, the surge counter reset button shall be depressed for a minimum of 2 seconds in order to clear the surge count total.

i. The ongoing surge count shall be stored in non-volatile memory. If power to the SPD is completely interrupted, the ongoing count indicated on the surge counter's display prior to the interruption shall be stored in non-volatile memory and displayed after power is restored. The surge counter's memory shall not require a backup battery in order to achieve this functionality.

6. Overcurrent Protection
   a. The unit shall contain thermally protected MOVs. These thermally protected MOVs shall have a thermal protection element packaged together with the MOV in order to achieve overcurrent protection of the MOV. The thermal protection element shall disconnect the MOV(s) from the system in a fail-safe manner should a condition occur that would cause them to enter a thermal runaway condition.
7. Fully Integrated Component Design – All of the SPD's components and diagnostics shall be contained within one discrete assembly. SPDs or individual SPD modules that must be ganged together in order to achieve higher surge current ratings or other functionality shall not be accepted.
8. Safety Requirements
   a. The SPD shall minimize potential arc flash hazards by containing no user serviceable / replaceable parts and shall be maintenance free. SPDs containing items such as replaceable modules, replaceable fuses, or replaceable batteries shall not be accepted. SPDs requiring any maintenance of any sort such as periodic tightening of connections shall not be accepted. SPDs requiring user intervention to test the unit via a diagnostic test kit or similar device shall not be accepted.
   b. SPDs designed to interface with the electrical assembly via conductors shall require no user contact with the inside of the unit. Such units shall have any required conductors be factory installed.
   c. Sidemount SPDs shall be factory sealed in order to prevent access to the inside of the unit. Sidemount SPDs shall have factory installed phase, neutral, ground and remote status contact conductors factory installed and shall have a pigtail of conductors protruding outside of the enclosure for field installation.

2.3 SYSTEM APPLICATION

A. The SPD applications covered under this section include distribution and branch panel locations, busway, motor control centers (MCC), switchgear, and switchboard assemblies. All SPDs shall be tested and demonstrate suitability for application within ANSI/IEEE C62.41 Category C, B, and A environments.

B. Surge Current Capacity – The minimum surge current capacity the device is capable of withstanding shall be as shown in the following table:

Minimum surge current capacity based on ANSI / IEEE C62.41 location category			
Category	Application	Per Phase	Per Mode
C	Service Entrance Locations (Switchboards, Switchgear, MCC, Main Entrance)	250 kA	125 kA
B	High Exposure Roof Top Locations (Distribution Panelboards)	160 kA	80 kA
A	Branch Locations (Panelboards, MCCs, Busway)	120 kA	60 kA

C. SPD Type – all SPDs installed on the line side of the service entrance disconnect shall be Type 1 SPDs. All SPDs installed on the load side of the service entrance disconnect shall be Type 1 or Type 2 SPDs.

2.4 LIGHTING AND DISTRIBUTION PANELBOARD REQUIREMENTS

A. The SPD application covered under this section includes lighting and distribution panelboards. The SPD units shall be tested and demonstrate suitability for application within ANSI/IEEE C62.41 Category B environments.

1. The SPD shall not limit the use of through-feed lugs, sub-feed lugs, and sub-feed breaker options.
2. SPDs shall be installed immediately following the load side of the main breaker. SPDs installed in main lug only panelboards shall be installed immediately following the incoming main lugs.
3. The panelboard shall be capable of re-energizing upon removal of the SPD.
4. The SPD shall be interfaced to the panelboard via a direct bus bar connection. Alternately, an SPD connected to a 30A circuit breaker for disconnecting purposes may be installed using short lengths of conductors as long as the conductors originate integrally to the SPD. The SPD shall be located directly adjacent to the 30A circuit breaker.
5. The SPD shall be included and mounted within the panelboard by the manufacturer of the panelboard.
6. The SPD shall be of the same manufacturer as the panelboard.
7. The complete panelboard including the SPD shall be UL67 listed.

B. Sidemount Mounting Applications Installation (SPD mounted external to electrical assembly)

1. Lead length between the breaker and suppressor shall be kept as short as possible to ensure optimum performance. Any excess conductor length shall be trimmed in order to minimize let-through voltage. The installer shall comply with the manufacturer's recommended installation and wiring practices.

C. Switchgear, Switchboard, MCC and Busway Requirements

1. The SPD application covered under this section is for switchgear, switchboard, MCC, and busway locations. Service entrance located SPDs shall be tested and demonstrate suitability for application within ANSI/IEEE C62.41 Category C environments.
2. The SPD shall be of the same manufacturer as the switchgear, switchboard, MCC, and busway

3. The SPD shall be factory installed inside the switchgear, switchboard, MCC, and/or bus plug at the assembly point by the original equipment manufacturer
4. Locate the SPD on the load side of the main disconnect device, as close as possible to the phase conductors and the ground/neutral bar.
5. The SPD shall be connected through a disconnect (30A circuit breaker). The disconnect shall be located in immediate proximity to the SPD. Connection shall be made via bus, conductors, or other connections originating in the SPD and shall be kept as short as possible.
6. The SPD shall be integral to switchgear, switchboard, MCC, and/or bus plug as a factory standardized design.
7. All monitoring and diagnostic features shall be visible from the front of the equipment.

2.5 ENCLOSURES

A. All enclosed equipment shall have NEMA 1 general purpose enclosures, unless otherwise noted. Provide enclosures suitable for locations as indicated on the drawings and as described below:
   1. NEMA 1 – Constructed of a polymer (units integrated within electrical assemblies) or steel (sidemount units only), intended for indoor use to provide a degree of protection to personal access to hazardous parts and provide a degree of protection against the ingress of solid foreign objects (falling dirt).
   2. NEMA 4 – Constructed of steel intended for either indoor or outdoor use to provide a degree of protection against access to hazardous parts; to provide a degree of protection of the equipment inside the enclosure against ingress of solid foreign objects (dirt and windblown dust); to provide a degree of protection with respect to the harmful effects on the equipment due to the ingress of water (rain, sleet, snow, splashing water, and hose directed water); and that will be undamaged by the external formation of ice on the enclosure. (sidemount units only)
   3. NEMA 4X – Constructed of stainless steel providing the same level of protection as the NEMA 4 enclosure with the addition of corrosion protection. (sidemount units only)

PART 3 EXECUTION

3.1 EXAMINATION

3.2 FACTORY TESTING

A. Standard factory tests shall be performed on the equipment under this section. All tests shall be in accordance with the latest version of NEMA and UL standards.

3.3 INSTALLATION

A. The Contractor shall install all equipment per the manufacturer's recommendations and the contract drawings.

3.4 WARRANTY

A. The manufacturer shall provide a full five (5) year warranty from the date of shipment against any SPD part failure when installed in compliance with manufacturer's written instructions and any applicable national or local code.

END OF SECTION 26 43 13

SECTION 26 51 00 - INTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Interior lighting fixtures, lamps, and ballasts.

2. Interior solid-state luminaires that use LED technology
3. Emergency lighting units.
4. Exit signs.
5. Lighting fixture supports.

B. Related Requirements:

1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color Rendering Index.

C. Fixture: See "Luminaire."

D. IP: International Protection or Ingress Protection Rating.

E. LED: Light-emitting diode.

F. Lumen: Measured output of lamp and luminaire, or both.

G. Luminaire: Complete lighting unit, including lamp, reflector, and housingF: Ballast factor.

1.4 MRc2: CONSTRUCTION WASTE MANAGEMENT

A. No less than the specified minimum proportion of all construction waste from the project shall be diverted from disposal in a landfill and/or incineration in accordance with the project requirements for Construction Waste Management. See Section 018113 Sustainable Design Requirements.

B. EQc4.1: LOW-EMITTING MATERIALS – SEALANTS AND ADHESIVES

All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the project requirements for Low-Emitting Materials – Sealants and Adhesives. See Section 018113 Sustainable Design Requirements.

Contractor shall provide LEED credit verification as per Section 013300 Submittal Procedures.

C. EQc4.2: LOW-EMITTING MATERIALS – PAINTS AND COATINGS

All paints and coatings used in the building interior comply with the project requirements for Low-Emitting Materials – Paints and Coatings. See Section 018113 Sustainable Design Requirements.

Contractor shall provide LEED credit verification as per Section 013300 Submittal Procedures.

1.5 SUBMITTALS

A. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:

1. Physical description of lighting fixture including dimensions.
2. Emergency lighting units including battery and charger.
3. Energy-efficiency data.
4. Life, output (lumens, CCT, and CRI), and energy-efficiency data.
5. Photometric data and adjustment factors based on laboratory tests, complying with IESNA Lighting Measurements Testing & Calculation Guides, of each lighting fixture type. .

B. Installation instructions.

C. Field quality-control reports.

D. Operation and Maintenance Data: For lighting equipment and fixtures to include in emergency, operation, and maintenance manuals.

1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

E. Warranty: Sample of special warranty.

1.6 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by manufacturers' laboratories that are accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.

B. Comply with NFPA 70.

1.7 COORDINATION

A. Coordinate layout and installation of lighting fixtures and suspension system with other construction that penetrates ceilings or is supported by them, including HVAC equipment, fire-suppression system, and partition assemblies.

1.8 WARRANTY

A. Warranty Period for Ballast and lamps, batteries: Five years from date of Substantial Completion.

1.9 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Lamps: 10 for every 100 of each type and rating installed. Furnish at least one of each type.
2. Plastic Diffusers and Lenses**:** One for every 100 of each type and rating installed. Furnish at least one of each type.
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1.10 COMMISSIONING

A. The materials, components and systems described in this section are subject to the Commissioning process. Contractor must comply with all Commissioning Requirements. Commissioning Requirements are described in Section 019113 General Commissioning Requirements and in Division 36 Commissioning. Division 36 provides an individual Commissioning specification section for each Division 2 through Division 33 specification section requiring Commissioning.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide available products that may be incorporated into the Work include, but are not limited to, products indicated on Drawings.

1. Lithonia Lighting

2. Day-Brite Lighting

3. Cooper Lighting

4. Mobern

5. GE

6. Failsafe

2.2 GENERAL REQUIREMENTS FOR LIGHTING FIXTURES AND COMPONENTS

A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.

B. Metal Parts: Free of burrs and sharp corners and edges.

C. Sheet Metal Components: Steel unless otherwise indicated. Form and support to prevent warping and sagging.

D. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

E. Diffusers and Globes:

1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

a. Lens Thickness: At least 0.125 minimum unless otherwise indicated.
b. UV stabilized.

2. Glass: Annealed crystal glass unless otherwise indicated.

F. Electromagnetic-Interference Filters: Factory installed to suppress conducted electromagnetic interference as required by MIL-STD-461E. Fabricate lighting fixtures with one filter on each ballast indicated to require a filter.

G. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

H. Bulb shape complying with ANSI C79.1.

I. Lamp base complying with **ANSI C81.61**.

J. Rated lamp life of **35,000**hours.

K. Lamps dimmable from 100 percent to 0 percent of maximum light output.

L. Internal driver.

2.3 EXIT SIGNS

A. General Requirements for Exit Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.

B. Internally Lighted Signs:

1. Lamps for AC Operation: Fluorescent, two for each fixture, 20,000 hours of rated lamp life.
2. Lamps for AC Operation: LEDs, 50,000 hours minimum rated lamp life.
3. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.

a. Battery: Sealed, maintenance-free, nickel-cadmium type.
b. Charger: Fully automatic, solid-state type with sealed transfer relay.
c. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
d. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
e. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.

2.4 DOWNLIGHT

A. Minimum allowable efficacy of **80** lumens per watt.

B. Universal mounting bracket.

C. Integral junction box with conduit fittings.

2.5 RECESSED LINEAR

A. Minimum **1,500** lumens. Minimum allowable efficacy of **85** lumens per watt.

B. Integral junction box with conduit fittings.

2.6 HID LAMPS

2.7 LIGHTING FIXTURE SUPPORT COMPONENTS

A. Comply with Division 26 Section "Hangers and Supports for Electrical Systems" for channel- and angle-iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.

C. Twin-Stem Hangers: Two, 1/2-inch steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.

D. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage

E. Wires for Humid Spaces: ASTM A 580/A 580M, Composition 302 or 304, annealed stainless steel, 12 gage.

F. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.

G. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Lighting fixtures:

1. Set level, plumb, and square with ceilings and walls unless otherwise indicated.
2. Install lamps in each luminaire.

B. Lay-in Ceiling Lighting Fixtures Supports: Use grid as a support element.

1. Install ceiling support system wires**,** independent of the ceiling suspension devices**,** for each fixture. Locate not more than 6 inches from lighting fixture corners.
2. Support Clips: Fasten to lighting fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.
3. Install at least one independent support rod or wire from structure to a tab on lighting fixture. Wire or rod shall have breaking strength of the weight of fixture at a safety factor of 3.

C. Suspended Lighting Fixture Support:

1. Pendants and Rods: Where longer than 48 inches (1200 mm), brace to limit swinging.
2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.
4. Do not use grid as support for pendant luminaires. Connect support wires or rods to building structure.

D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.2 IDENTIFICATION

A. Install labels with panel and circuit numbers on concealed junction and outlet boxes. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

3.3 FIELD QUALITY CONTROL

A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.

B. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

END OF SECTION 265100

SECTION 26 56 00 - EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Exterior solid-state luminaires that are designed for and exclusively use LED lamp technology.
2. Luminaire supports.
3. Luminaire-mounted photoelectric relays.

B. Related Sections:

1. Division 26 Section "Interior Lighting" for exterior luminaires normally mounted on exterior surfaces of buildings.

C. Related Requirements:

1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color-rendering index.

C. LER: Luminaire efficacy rating.

D. Luminaire: Complete lighting fixture including lamp, reflector, and housing .

E. Standard: Same definition as "Pole" above.

1.4 MRc2: Construction Waste Management

A. No less than the specified minimum proportion of all construction waste from the project shall be diverted from disposal in a landfill and/or incineration in accordance with the project requirements for Construction Waste Management. See Section 018113 Sustainable Design Requirements.

1.5 SUBMITTALS

A. Product Data: For each luminaire, pole, and support component, arranged in order of lighting unit designation. Include data on features, accessories, finishes, and the following:

1. Physical description of luminaire, including materials, dimensions, effective projected area, and verification of indicated parameters.
2. Details of attaching luminaires and accessories.
3. Details of installation and construction.
4. Luminaire materials.
5. Photometric data based on laboratory tests of each luminaire type, complete with indicated lamps, ballasts, and accessories.
6. Photoelectric relays.
7. Lamps, including life, output, CCT, CRI, lumens, and energy-efficiency data.
8. Materials, dimensions, and finishes of poles.
9. Means of attaching luminaires to supports, and indication that attachment is suitable for components involved.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Design calculations, certified by a qualified professional engineer, indicating strength of screw foundations and soil conditions on which they are based.
3. Wiring Diagrams: For power, signal, and control wiring.

C. Qualification Data: For qualified agencies providing photometric data for lighting fixtures.

D. Field quality-control reports.

E. Operation and Maintenance Data: For luminaires

1.6 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with IEEE C2, "National Electrical Safety Code."

D. Comply with NFPA 70.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace products that fail in materials or workmanship; that corrode; or that fade, stain, perforate, erode, or chalk due to effects of weather or solar radiation within specified warranty period. Manufacturer may exclude lightning damage, hail damage, vandalism, abuse, or unauthorized repairs or alterations from special warranty coverage.

1. Warranty Period for Luminaires: Five years from date of Substantial Completion.
2. Warranty Period for Metal Corrosion: Five years from date of Substantial Completion.
3. Warranty Period for Color Retention: Five years from date of Substantial Completion.

1.8 COMMISSIONING

A. The materials, components and systems described in this section are subject to the Commissioning process. Contractor must comply with all Commissioning Requirements. Commissioning Requirements are described in Section 019113 General Commissioning Requirements and in Division 36 Commissioning. Division 36 provides an individual Commissioning specification section for each Division 2 through Division 33 specification section requiring Commissioning.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide product indicated on Drawings.

2.2 GENERAL REQUIREMENTS FOR LUMINAIRES

2.3 LUMINAIRE-MOUNTED PHOTOELECTRIC RELAYS

A. Comply with UL 773 or UL 773A.

2.4 LUMINAIRE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. NRTL Compliance: Luminaires shall be listed and labeled for indicated class and division of hazard by an NRTL.

C. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.

D. UL Compliance: Comply with UL 1598 **and listed for wet location**.

E. Lamp base complying with **ANSI C81.61**.

F. Bulb shape complying with ANSI C79.1.

G. CRI of **minimum 65**.

H. L70 lamp life of **35,000** hours.

I. Lamps dimmable from 100 percent to 0 percent of maximum light output.

J. Internal driver.

K. Nominal Operating Voltage: **120 V ac, 277 V ac**.

L. Lamp Rating: Lamp marked for outdoor use**.**

M. Source Limitations: Obtain luminaires from single source from a single manufacturer.

N. Source Limitations: For luminaires, obtain each color, grade, finish, type, and variety of luminaire from single source with resources to provide products of consistent quality in appearance and physical properties.

2.5 LUMINAIRE TYPES

A. Area and Site:
1. Luminaire Shape: Square
2. Mounting: Pole, Building.
3. Distribution: Type III.

2.6 TIME CLOCK

A. Electronic Time Switches: Solid state, programmable, with alphanumeric display; complying with UL 917.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2. Contact Configuration: SPST
3. Contact Rating: 30-A inductive or resistive, 480-V
4. Programs: Two on-off set points on a 24-hour schedule and an annual holiday schedule that overrides the weekly operation on holidays.
5. Circuitry: Allow connection of a photoelectric relay as substitute for on-off function of a program.
6. Astronomic Time: All channels.
7. Automatic daylight savings time changeover.
8. Battery Backup: Not less than seven days reserve, to maintain schedules and time clock.

2.7 Photo cell

A. Photo control shall have relay type switching action and have rating of 480V, 20A. The control shall be failsafe, wherein the lighting load remain on in event of controlcircuit failure.

PART 3 - EXECUTION

3.1 LUMINAIRE INSTALLATION

A. Install lamps in each luminaire.

B. Fasten luminaire to indicated structural supports.

1. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.

C. Adjust luminaires that require field adjustment or aiming.

3.2 CORROSION PREVENTION

A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.

3.3 FIELD QUALITY CONTROL

A. Inspect each installed fixture for damage. Replace damaged fixtures and components.

B. Illumination Observations: Verify normal operation of lighting units after installing luminaires and energizing circuits with normal power source.

1. Verify operation of photoelectric controls.

END OF SECTION 265600

SECTION 27 15 00 - COMMUNICATIONS HORIZONTAL CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Coaxial cable.
2. Cable connecting hardware, patch panels, and cross-connects.
3. Cabling system identification products.
4. Cable management system.

B. Related Requirements:

1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 DEFINITIONS

A. BICSI: Building Industry Consulting Service International.

B. EMI: Electromagnetic interference.

C. IDC: Insulation displacement connector.

D. Outlet/Connectors: A connecting device in the work area on which horizontal cable or outlet cable terminates.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordinate layout and installation of telecommunications cabling with Owner's telecommunications and LAN equipment and service suppliers.

B. Coordinate telecommunications outlet/connector locations with location of power receptacles at each work area.

1.5 MRc2: Construction Waste Management

A. No less than the specified minimum proportion of all construction waste from the project shall be diverted from disposal in a landfill and/or incineration in accordance with the project requirements for Construction Waste Management. See Section 018113 Sustainable Design Requirements.

B. EQc4.1: LOW-EMITTING MATERIALS – SEALANTS AND ADHESIVES

All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the project requirements for Low-Emitting Materials – Sealants and Adhesives. See Section 018113 Sustainable Design Requirements.

Contractor shall provide LEED credit verification as per Section 013300 Submittal Procedures.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For coaxial cable, include the following installation data for each type used:

a. Nominal OD.
b. Minimum bending radius.
c. Maximum pulling tension.

B. Shop Drawings:

1. System Labeling Schedules: Electronic copy of labeling schedules, in software and format selected by Owner.
2. Cabling administration drawings and printouts.
3. Wiring diagrams to show typical wiring schematics, including the following:

a. Cross-connects.

C. Samples: For workstation outlets, jacks, jack assemblies, in specified finish, one for each size and outlet configuration and faceplates for color selection and evaluation of technical features.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer**,** qualified layout technician, installation supervisor, and field inspector.

B. Source quality-control reports.

C. Field quality-control reports.

1.8 CLOSEOUT SUBMITTALS

A. Maintenance Data: For splices and connectors to include in maintenance manuals.

B. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.
2. Program Software Backup: On magnetic media or compact disk, complete with data files.
3. Device address list.
4. Printout of software application and graphic screens.

1.9 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Connecting Blocks: One of each type.
2. Device Plates: One of each type.

1.10 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.

1. Layout Responsibility: Preparation of Shop Drawings and Cabling Administration Drawings, Cabling Administration Drawings, and field testing program development by an RCDD.
2. Testing Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

1.11 COMMISSIONING

A. The materials, components and systems described in this section are subject to the Commissioning process. Contractor must comply with all Commissioning Requirements. Commissioning Requirements are described in Section 019113 General Commissioning Requirements and in Division 36 Commissioning. Division 36 provides an individual Commissioning specification section for each Division 2 through Division 33 specification section requiring Commissioning.

PART 2 - PRODUCTS

2.1 HORIZONTAL CABLING DESCRIPTION

A. Horizontal cable and its connecting hardware provide the means of transporting signals between the telecommunications outlet/connector and the horizontal cross-connect located in the communications equipment room. This cabling and its connecting hardware are called a "permanent link," a term that is used in the testing protocols.

1. TIA/EIA-568-B.1 requires that a minimum of two telecommunications outlet/connectors be installed for each work area.
2. Horizontal cabling shall contain no more than one transition point or consolidation point between the horizontal cross-connect and the telecommunications outlet/connector.
3. Bridged taps and splices shall not be installed in the horizontal cabling.

B. A work area is approximately 100 sq. ft., and includes the components that extend from the telecommunications outlet/connectors to the station equipment.

C. The maximum allowable horizontal cable length is 295 feet This maximum allowable length does not include an allowance for the length of 16 feet to the workstation equipment or in the horizontal cross-connect.

2.2 PERFORMANCE REQUIREMENTS

A. General Performance: Horizontal cabling system shall comply with transmission standards in TIA/EIA-568-B.1 when tested according to test procedures of this standard.

B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 450 or less.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Grounding: Comply with J-STD-607-A.

E. Splitters shall be 2, 4, or 8-way, utilized as required in the distribution system. Splitters shall be Blonder Tongue SXRS or SCVS series shall be capable of 5 to 1000MHz frequency range.

F. One, two and four-way directional tap-offs shall be provided as required for the distribution system. These taps shall be suitable for use from 5 to 1000MHz minimum, rated for CATV' MATV distribution. Taps shall be Blonder Tongue SRT Series, or approved equal.

G. Single Outlet Taps shall be provided as shown on the drawings for connection to standard TV receivers. Mounting height shall be 18" unless otherwise noted on the drawings. Outlets shall be designed for 75 ohm systems, with a "G/F" push-on/screw-on connector on the outside and an "F" connector on the tap side. Connectors shall be mounted on stainless steel plates such as PICO MACOM #WPSS (1- port plate with female to female F-type coupler) or approved equal.

H. Connectors shall be provided as required. Connectors shall be coaxial solder less type, 75 ohm impedance and be designed for the specific type of cable used. All connectors shall be one-piece Compression style type "F" for RG-6U Quad shield cable and RG-I1Quad shield cabling. Connectors shall be ICM FS6U (for RG-6) and FS11V (for RG-II), or approved equal.
   1. When plenum cable is installed, appropriate connector for that specific cable must be used. Consult with the cable supplier for the correct connector.
   2. West Penn cable may require AIM connectors, due to smaller dielectric diameter.
   3. The appropriate connector must be used for the specific cable installed. ALL connectors shall be installed in a manner consistent with standard and proper installation procedures of cable television distribution systems.

I. System Main Trunk Cable to be used for all purposes other than drop cables, shall be RG-ll/U type w/l00% foil shield + 90% foil braid minimum. RG-ll cable shall be Commscope #2287.

J. Coaxial Drop Cables for us in making connections to room outlets shall be RG-6/U type w/100% foil shield + 90% braid minimum. RG-6 cable shall be Commscope #2227V

K. All coaxial cable must be prepared for connections using Cable-Prep Drop Cable Stripping Tools. Tool designation: CPT-110 (Blue) shall be used for RG-11/U cables and Tool CPT-6590 (Yellow) shall be used for RG-6/U cables.

L. Broadband indoor distribution amplifiers shall be Blonder Tongue QDAX-870-43-2W with RA-16 return amp Series, or approved equal.

M. All system taps and their associated input, output, and tap-off cables must be secured to the building structure in a manner to prohibit accidental disconnect from the tap. **No splices are permitted in the trunk lines or tap-off cables**. Provide taps with loss values established in the video distribution system design submittal. Install taps at Main Head-end on plywood backboard.

N. All cables shall be labeled on both ends with length and room destinations

O. All terminators shall be Blonder-Tongue Stock #4670BTF-TP or Gilbert GTR-59A, and be installed on all unused ports.

2.3 BACKBOARDS

A. Backboards: Plywood, fire-retardant treated, 3/4 by 48 by 96 inches . Comply with requirements in Division 06 Section "Rough Carpentry" for plywood backing panels.

2.4 COAXIAL CABLE

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Alpha Wire Company.
2. Belden Inc.
3. Coleman Cable, Inc.
4. CommScope, Inc.
5. Draka Cableteq USA.

B. NFPA and UL compliance, listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 1655 and with NFPA 70 "Radio and Television Equipment" and "Community Antenna Television and Radio Distribution" Articles. Types are as follows:

1. CATV Cable: Type CATV.
2. CATV Plenum Rated: Type CATVP, complying with NFPA 262.
3. CATV Riser Rated: Type CATVR], complying with UL 1666.
4. CATV Limited Rating: Type CATVX.

2.5 COAXIAL CABLE HARDWARE

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Emerson Network Power Connectivity Solutions.
2. Leviton Commercial Networks Division.
3. Siemon Co. (The).

B. Coaxial-Cable Connectors: Type BNC, 75 ohms.

2.6 GROUNDING

A. Comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems" for grounding conductors and connectors.

B. Comply with J-STD-607-A.

2.7 IDENTIFICATION PRODUCTS

A. Comply with TIA/EIA-606-A and UL 969 for labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

B. Comply with requirements in Division 26 Section "Identification for Electrical Systems."

2.8 CABLE MANAGEMENT SYSTEM

A. Manufacturers: Subject to compliance with requirements available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

1. iTRACS Corporation, Inc.
2. TelSoft Solutions.
3.

B. Description: Computer-based cable management system, with integrated database and graphic capabilities.

C. Document physical characteristics by recording the network, TIA/EIA details, and connections between equipment and cable.

D. Information shall be presented in database view**,** schematic plans, or technical drawings.

1. AutoCAD drawing software shall be used as drawing and schematic plans software.

E. System shall interface with the following testing and recording devices:

1. Direct upload tests from circuit testing instrument into the personal computer.
2. Direct download circuit labeling into labeling printer.

2.9 SOURCE QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to evaluate cables.

B. Factory test UTP and optical fiber cables on reels according to TIA/EIA-568-B.1.

C. Factory test UTP cables according to TIA/EIA-568-B.2.

D. Factory test multimode optical fiber cables according to TIA-526-14-A and TIA/EIA-568-B.3.

E. Factory-sweep test coaxial cables at frequencies from 5 MHz to 1 GHz. Sweep test shall test the frequency response, or attenuation over frequency, of a cable by generating a voltage whose frequency is varied through the specified frequency range and graphing the results.

F. Cable will be considered defective if it does not pass tests and inspections.

G. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 ENTRANCE FACILITIES

A. Coordinate backbone cabling with the protectors and demarcation point provided by communications service provider.

3.2 WIRING METHODS

A. Install cables in pathways and cable trays except within consoles, cabinets, desks, and counters[and except in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Conceal pathways and cables except in unfinished spaces.

1. Install plenum cable in environmental air spaces, including accessible ceilings.

B. Wiring within Enclosures:

1. Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.
2. Install lacing bars and distribution spools.
3. Install conductors parallel with or at right angles to sides and back of enclosure.

3.3 INSTALLATION OF CABLES

A. Comply with NECA 1.

B. General Requirements for Cabling:

1. Comply with TIA/EIA-568-B.1.
2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."

3. Terminate conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
4. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
5. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
6. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Install lacing bars and distribution spools.
7. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
8. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
9. In the communications equipment room, install a 10-foot- long service loop on each end of cable.
10. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.

C. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

D. Installation of Cable Routed Exposed under Raised Floors:

1. Install plenum-rated cable only.
2. Install cabling after the flooring system has been installed in raised floor areas.
3. Coil cable 6 feet long not less than 12 inches in diameter below each feed point.

E. Outdoor Coaxial Cable Installation:

1. Install outdoor connections in enclosures complying with NEMA 250, Type 4X. Install corrosion-resistant connectors with properly designed O-rings to keep out moisture.
2. Attach antenna lead-in cable to support structure at intervals not exceeding 36 inches.

F. Group connecting hardware for cables into separate logical fields.

G. Separation from EMI Sources:

1. Comply with BICSI TDMM and TIA-569-B for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:

a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches.
b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches..
c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches..

3. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches.

3.4 FIRESTOPPING

A. Comply with requirements in Division 07 Section "Penetration Firestopping."

B. Comply with TIA-569-B, Annex A, "Firestopping."

C. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.5 GROUNDING

A. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.

B. Comply with J-STD-607-A.

C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall allowing at least 2-inch clearance behind the grounding bus bar. Connect grounding bus bar with a minimum No. 4 AWG grounding electrode conductor from grounding bus bar to suitable electrical building ground.

D. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

3.6 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."
1. Color-code cross-connect fields. Apply colors to voice and data service backboards, connections, covers, and labels.

B. Using cable management system software specified in Part 2, develop Cabling Administration Drawings for system identification, testing, and management. Use unique, alphanumeric designation for each cable and label cable, jacks, connectors, and terminals to which it connects with same designation. At completion, cable and asset management software shall reflect as-built conditions.

C. Comply with requirements in Division 09 Section "Interior Painting" for painting backboards. For fire-resistant plywood, do not paint over manufacturer's label.

D. Cable Schedule: Post in prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.

E. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, backbone pathways and cables, entrance pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors. Follow convention of TIA/EIA-606-A. Furnish electronic record of all drawings, in software and format selected by Owner.

F. Cable and Wire Identification:

1. Label each cable within 4 inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
2. Each wire connected to building-mounted devices is not required to be numbered at device if color of wire is consistent with associated wire connected and numbered within panel or cabinet.
3. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 50 feet .
4. Label each terminal strip and screw terminal in each cabinet, rack, or panel.

    a. Individually number wiring conductors connected to terminal strips, and identify each cable or wiring group being extended from a panel or cabinet to a building-mounted device shall be identified with name and number of particular device as shown.
    b. Label each unit and field within distribution racks and frames.

5. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.
6. Uniquely identify and label work area cables extending from the MUTOA to the work area. These cables may not exceed the length stated on the MUTOA label.

G. Labels shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA/EIA-606-A.

1. Cables use flexible vinyl or polyester that flex as cables are bent.

3.7 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Visually inspect UTP and optical fiber cable jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA/EIA-568-B.1.
2. Coaxial Cable Tests: Conduct tests according to Division 27 Section "Master Antenna Television System."

B. Document data for each measurement. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.

C. End-to-end cabling will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.8 DEMONSTRATION

A. Train Owner's maintenance personnel in cable-plant management operations, including changing signal pathways for different workstations, rerouting signals in failed cables, and keeping records of cabling assignments and revisions when extending wiring to establish new workstation outlets**.**

B. Refer Division 01 for administrative and procedural requirements for demonstration and training.

END OF SECTION 271500

SECTION 27 41 33 - MASTER ANTENNA TELEVISION SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. MATV equipment using cable television service, direct broadcast satellite service, an off-air antenna system as the signal source.
2. Off-air antennas.
3. MATV head-end components.
4. Distribution components.

B. Related Sections:

1. Division 27 Section "Communications Horizontal Cabling" for coaxial, UTP, and fiber-optic cables and connectors.

C. Related Requirements:

1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

1.3 DEFINITIONS

A. Agile Receiver: A broadband receiver that can be tuned to any desired channel.

B. A/V: Audio/Visual.

C. Broadband: For the purposes of this Section, wide bandwidth equipment or systems that can carry signals occupying in the frequency range of 54 to 1002 MHz. A broadband communication system can simultaneously accommodate television, voice, data, and many other services.

D. Carrier: A pure-frequency signal that is modulated to carry information. In the process of modulation, the signal is spread out over a wider band. The carrier frequency is the center frequency on any television channel.

E. CATV: Community antenna television. A communication system that simultaneously distributes several different channels of broadcast programs and other information to customers via a coaxial cable.

F. CCTV: Closed-circuit television.

G. CEA: Consumer Electronics Association.

H. dBmV: Decibels relative to 1 mV across 75 ohms. Zero dBmV is defined as 1 mV across 75 ohms. dBmV = 20 log $10(V_1/V_2)$ where V_1 is the measurement of voltage at a point having identical impedance to V_2 (0.001 V across 75 ohms).

I. Headend: The control center of the MATV system, where incoming signals are amplified, converted, processed, and combined into a common cable along with any locally originated television signals, for transmission to user-interface points. It is also called the "central retransmission facility."

J. I/O: Input/Output.

K. MATV: Master antenna television. A small television antenna distribution system usually restricted to one or two buildings.

L. RF: Radio frequency.

1.4 SYSTEM DESCRIPTION

A. System shall consist of cable television service, direct broadcast satellite service, an off-air antenna system and a coaxial cable distribution system.

1. Headend equipment shall consist of receiving antennas, satellites, and associated signal distribution amplification and equalization as shown on drawings.
2. Distribution of direct broadcast satellite-service signals, which includes coordinating with Owner's selected service provider for installation of its dish-type antennas and processing the signals as needed to provide specified services combined into a single-feed point ready for connection into the distribution system. Obtain signal levels and noise and distortion characteristics from service provider as the point of departure for system layout and final equipment selection.
3. Distribution of cable television service signals, which includes coordinating with Owner's selected service provider for installation of cable to the service point ready for connection into the distribution system. Obtain signal levels and noise and distortion characteristics from service provider as the point of departure for system layout and final equipment selection.
4. Cable distribution system consisting of coaxial cables, user interfaces, signal taps and splitters, RF amplifiers, signal equalizers, power supplies, and required hardware, complying with CEA-310-E and CEA-2032 and resulting in performance parameters specified in this Section. System shall be capable of distributing television channels according to CEA-542-B.

B. Hardware Requirements: Use plug-in, modular, solid-state electronic components. Mount amplifiers and other powered equipment in standard 19-inch (483-mm) cabinet complying with CEA-310-E.

C. Off-Air Stations: Install antennas for the reception and distribution of selected stations.

1.5 PERFORMANCE REQUIREMENTS

A. Minimum acceptable performance of distribution system at all user-interface points shall be as follows:

1. RF Video-Carrier Level: Between 3 and 12 dBmV.
2. Relative Video-Carrier Level: Within 3 dB to adjacent channel.
3. Carrier Level Stability, Short Term: Level shall not change more than 0.5 dB during a 60-minute period.
4. Carrier Level Stability, Long Term: Level shall not change more than 2 dB during a 24-hour period.
5. Channel Frequency Response: Across any 6-MHz channel in the 54- to 220-MHz frequency range, referenced to video; signal amplitude shall be plus or minus 1 dB, maximum.
6. Carrier-to-Noise Ratio: 45 dB or more.
7. RF Visual Signal-to-Noise Ratio: 43 dB or more.
8. Antenna Combiner Insertion Loss: 40 dB maximum.
9. Signal Power Splitter and Isolation Tap Return Loss: 17 dB maximum.
10. Cable Connectors Attenuation: Less than 0.1 dB.
11. Cross Modulation: Less than minus 50 dB.
12. Carrier-to-Echo Ratio: More than 40 dB.
13. Composite Triple Beat: Less than minus 53 dB.
14. Second Order Beat: Less than minus 60 dB.
15. Terminal Isolation from Television to Television: 25 dB, minimum.
16. Terminal Isolation between Television and FM: 35 dB, minimum.
17. Hum Modulation: 2 percent, maximum.
18. RF FM Carrier Level: 13 to 17 dB below video-carrier level.
19. FM Frequency Response: More than in the 88- to 108-MHz frequency range; signal amplitude is plus or minus 0.75 dB, maximum.
20. FM Carrier-to-Noise Ratio: More than 24 dB.

1.6 MRc2: Construction Waste Management

A. No less than the specified minimum proportion of all construction waste from the project shall be diverted from disposal in a landfill and/or incineration in accordance with the project requirements for Construction Waste Management. See Section 018113 Sustainable Design Requirements.

B. EQc4.1: LOW-EMITTING MATERIALS – SEALANTS AND ADHESIVES

All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the project requirements for Low-Emitting Materials – Sealants and Adhesives. See Section 018113 Sustainable Design Requirements.

Contractor shall provide LEED credit verification as per Section 013300 Submittal Procedures.

1.7 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For headend and distribution system. Include plans, elevations, sections, details, and attachments to other work.

1. Show fabrication and installation details for television equipment.
2. Functional Block Diagram: Show single-line interconnections between components for headend and distribution system to user-interface points. Show cable types and sizes.
3. Dimensioned Plan and Elevations of Headend Equipment: Show access and workspace requirements.
4. Wiring Diagrams: For power, signal, and control wiring. For UTP or fiber-optic cable, include cross connects, patch panels, and patch cords.

C. Samples: Full size for each outlet device plate in required colors and textures.

D. Design Calculations: Calculate signal attenuation budget and show calculated line and equipment losses for the system based on the functional block diagram, to show that proposed system layout can be expected to perform up to specification. Calculate signal strength from sources to headend input points for each antenna, satellite dish, and CATV grouping. Allowable losses between components and user interface shall be used to determine size and type of coaxial cable.

E. Coordination Drawings: Include dimensioned plan and elevation views of components and enclosures. Show access and workspace requirements.

F. Equipment List: Include each piece of equipment and include model number, manufacturer, serial number, location, and date of original installation. Insert testing record of each piece of adjustable equipment, listing name of person testing, date of test, and description of as-left set points.

G. Field quality-control reports.

H. Operation and Maintenance Data: For headend and distribution system to include in emergency, operation, and maintenance manuals.

1.8 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.9 PROJECT CONDITIONS

A. Environmental Limitations: System components shall be equipped and rated for the environments in which they are installed.

B. Environmental Conditions: Capable of withstanding the following environmental conditions without mechanical or electrical damage or degradation of operating capability:

1. Interior, Controlled Environment: System components, except central-station control unit, installed in temperature-controlled interior environments shall be rated for continuous operation in ambient conditions of 36 to 122 deg F dry bulb and 20 to 90 percent relative humidity, noncondensing.

2. Exterior Environment: System components installed in locations exposed to weather shall be rated for continuous operation in ambient conditions of minus 30 to plus 122 deg F dry bulb and 20 to 90 percent relative humidity, condensing. Rate for continuous operation when exposed to rain as specified in NEMA 250, winds up to 85 mph and snow cover up to 24 inches thick.

1.10 COORDINATION

A. Coordinate size and location of raceway system and provisions for electrical power to equipment specified in this Section.

B. Coordinate Work of this Section with requirements of cable television service, direct broadcast satellite service, an off-air antenna system.

C. Coordinate sizes and locations of concrete bases with actual equipment provided.

D. Coordinate installation of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

1.11 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, provide three years full maintenance by skilled employees of MATV system Installer. Include quarterly adjusting as required for optimum system performance. Provide parts and supplies the same as those used in the manufacture and installation of original equipment.

B. Continuing Maintenance Proposal: From Installer to Owner, in the form of a standard yearly (or other period) maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.

1.12 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents. Provide no fewer than one of each item listed below. Deliver extra materials to Owner.

1. Fuses: One for every 10 of each type and rating.
2. Splitters: One for every 10 installed.
3. MATV Distribution Power Amplifiers: One for every 10 of each type installed.
4. MATV Signal Traps: One for every 10 of each type used.
5. MATV Attenuators: One for every 10 of each type used.
6. Cable: 100 feet of each type used.

1.13 COMMISSIONING

A. The materials, components and systems described in this section are subject to the Commissioning process. Contractor must comply with all Commissioning Requirements. Commissioning Requirements are described in Section 019113 General Commissioning Requirements and in Division 36 Commissioning. Division 36 provides

an individual Commissioning specification section for each Division 2 through Division 33 specification section requiring Commissioning.

PART 2 - PRODUCTS

2.1 SYSTEMS REQUIREMENTS

A. Components: Plug-in, modular, heavy-duty, industrial- or commercial-grade units.

B. Equipment: Silicon-based, solid-state, integrated circuit devices.

C. Power Supply Characteristics: Devices shall be within specified parameters for ac supply voltages within the range of 105 to 130 V.

D. Protect signal cables and connected components against transient-voltage surges by suppressors and absorbers designed specifically for that purpose. Comply with requirements in Division 26 Section "Transient-Voltage Suppression for Low-Voltage Electrical Power Circuits."

E. Provide ac-powered equipment with integral surge suppressors complying with UL 1449.

F. RF and Video Impedance Matching: Signal-handling components, including connecting cable, shall have end-to-end impedance-matched signal paths. Match and balance devices used at connections where it is impossible to avoid impedance mismatch or mismatch of balanced circuits to unbalanced circuits.

2.2 MATV EQUIPMENT

A. Description: Signal-source components, signal-processing and amplifying equipment, distribution components, and interconnecting wiring. System shall receive, amplify, process, and distribute signals to outlets for receiving sets. Equipment shall translate UHF channels to VHF channels before distribution to outlets.

B. Identification of Signal Sources Distributed:

1. Insert signal sources and basic service selection.

C. MATV System Qualitative and Quantitative Performance Requirements: Reception quality of color-television program transmissions at each system outlet from each service and source shall be equal to or superior than that obtained with performance checks specified in "Field Quality Control" Article, using standard, commercial, cable-ready, multiple A/V input color-television receivers.

D. Provide as required the following VHF/ UHF antennas Blonder Tongue:

E. BTY-LP-BB Broadband VHF Antenna Covers chs-2-6 and 7-13.

F. BTY-UHF-BB Broadband UHF Antenna Covers chs-14-83.

G. Provide preamps and power supplies as required PS-1526-or PS-1536.

H. Provide (1) 16 Port Blonder Tongue OC-16 Passive Combiner.

I. Provide Blonder Tongue model # MIRC-12 Micro Modulator Rack Chassis (1)

J. Provide Blonder Tongue model # MIPS-12 Power supply (1) required per chassis.

K. Provide Blonder Tongue model # AMCM-860 Agile Micro Mod (1) per modulated channel

L. Provide Blonder Tongue model # DHDC-DV DIG & HDTV Down converter(1)per channel

M. Provide Blonder Tongue model # DHDC-UV DIG & HDTV Up converter(1)per channel

N. Provide (1) enclosed cabinet with front and rear door Blonder Tongue model # RMX-7019-24

O. Provide (2) 6 port Tripp-lite power strips RS-0615-R.

P. The Contractor shall provide whatever preamplifiers, power supplies, attenuators, and band pass filters or traps that are required to produce reception acceptable to the Owner's representative.

2.3 MATV/SATV/CATV RF DISTRIBUTION :

A. Splitters shall be 2, 4, or 8-way, utilized as required in the distribution system. Splitters shall be Blonder Tongue SXRS or SCVS series shall be capable of 5 to 1000MHz frequency range...

B. One, two and four-way directional tap-offs shall be provided as required for the distribution system. These taps shall be suitable for use from 5 to 1000MHz minimum, rated for CATV' MATV distribution. Taps shall be Blonder Tongue SRT Series, or approved equal.

C. Single Outlet Taps shall be provided as shown on the drawings for connection to standard TV receivers. Mounting height shall be 18" unless otherwise noted on the drawings. Outlets shall be designed for 75 ohm systems, with a "G/F" push-on/screw-on connector on the outside and an "F" connector on the tap side. Connectors shall be mounted on stainless steel plates such as PICO MACOM #WPSS (1- port plate with female to female F-type coupler) or approved equal.

D. Connectors shall be provided as required. Connectors shall be coaxial solder less type, 75 ohm impedance and be designed for the specific type of cable used. All connectors shall be one-piece Compression style type "F" for RG-6U Quad shield cable and RG-l1Quad shield cabling. Connectors shall be ICM FS6U (for RG-6) and FS11V (for RG-II), or approved equal.

E. When plenum cable is installed, appropriate connector for that specific cable must be used. Consult with the cable supplier for the correct connector.

F. West Penn cable may require AIM connectors, due to smaller dielectric diameter.

G. The appropriate connector must be used for the specific cable installed. ALL connectors shall be installed in a manner consistent with standard and proper installation procedures of cable television distribution systems.

H. System Main Trunk Cable to be used for all purposes other than drop cables, shall be RG-ll/U type w/l00% foil shield + 90% foil braid minimum. RG-ll cable shall be Commscope #2287.

I. Coaxial Drop Cables for us in making connections to room outlets shall be RG-6/U type w/100% foil shield + 90% braid minimum. RG-6 cable shall be Commscope #2227V

J. All coaxial cable must be prepared for connections using Cable-Prep Drop Cable Stripping Tools. Tool designation: CPT-110 (Blue) shall be used for RG-11/U cables and Tool CPT-6590 (Yellow) shall be used for RG-6/U cables.

K. Broadband indoor distribution amplifiers shall be Blonder Tongue QDAX-870-43-2W with RA-16 return amp Series, or approved equal.

L. All system taps and their associated input, output, and tap-off cables must be secured to the building structure in a manner to prohibit accidental disconnect from the tap. No splices are permitted in the trunk lines or tap-off cables. Provide taps with loss values established in the video distribution system design submittal. Install taps at Main Head-end on plywood backboard.

M. All cables shall be labeled on both ends with length and room destinations

N. All terminators shall be Blonder-Tongue Stock #4670BTF-TP or Gilbert GTR-59A, and be installed on all unused ports.

2.4 VIDEO SYSTEM PERFORMANCE

A. Upon completion of the video system installation, it shall be the responsibility of the Contractor to perform the necessary adjustments to achieve the system design parameters. All equalizers shall be adjusted so that all signals across the band are' equal, plus or minus 3 DB, at the input to each amplifier. Amplifier gains shall be adjusted to designated output levels.

B. Should the demonstration of performance show that the Contractor has not properly balanced the system and that picture degradation is present or that the output is not as specified, the Contractor shall immediately make all necessary changes or adjustments, at no charge to the owner, and a second performance demonstration conducted.

C. The Contractor shall test and submit test reports for the following:

D. Test all coaxial cables for open, short and ground.

E. Test all coaxial cable for end to end signal performance.

F. Test picture quality at each video outlet.

G. Test all coaxial cable for frequency response and insertion loss at 5-800 MHZ.

H. Test all coaxial cable to show conformance with manufacturer’s Specifications, the National Cable Television Standards, and FCC Standards.

I. Provide test as required to show compliance with performance Specifications below, test equipment utilized, and reports shall be generated by test equipment as manufactured by Wavetek Stealth.

J. The Contractor shall provide a video distribution system in compliance with the following performance specifications:

K. Each video outlet shall receive a MATV/ CATV broadcast for a bandwidth through 860 MHZ.

L. The equipment output video carrier to noise ratio shall be 50 dB minimum.

M. The off-air received signal to noise ratio at each video outlet shall be 47 dB minimum.

N. Picture quality tested at each video location shall be of equal quality as the video head-in equipment picture quality.

O. Picture quality at each location shall be the same regardless of the number of TV monitors connected to the system.

P. The Contractor shall, after the system is installed and adjusted, notify the engineer(s) to arrange for an acceptance test at a mutually convenient time. At this time, the Contractor shall have documentation indicating the installation meets FCC Cumulative Leakage Index (CLI) requirements of five (5) microvolts per meter at ten (10) feets.

Q. The Contractor shall provide that reception quality at any outlet selected by the Engineer(s) is equal to or better than the reception normally available in that geographical area and that the signal strength measured at that system outlet is within specification.

R. The system shall deliver a minimum of minus three (-3) dBmv and a maximum of plus four (+4) dBmv signal strength to each system outlet. This condition shall be met regardless of the number of televisions (receivers) connected. The signal level at each video outlet shall be 6 dBmv.

S. The system shall provide the highest regard to system integrity and meet FCC, NCTA and SCTE requirements for signal leakage.

T. The system shall pass all channels without noticeable degradation of intelligence and color fidelity

U. The system shall consist of UL approved equipment and be capable of continuous unattended operation.

V. Each video outlet shall be tested for continuity, shorts and grounds.

W. The signal measured by a signal strength meter at any video outlet in the school shall be between +2dB and +8dB. All video outlets in the school shall be tested end-to-end between the video jack in a room and the video head-end equipment.

X. The system shall provide the highest regard to system integrity and meet FCC, NCTA and SCTE requirements for signal leakage.

2.5 Satv Headend equipment and Dish Required:

A. QTY Per Drawing D-12 Direct TV Satellite Receiver

B. RR-6/8 RX UNIVERSAL 19" Rackmount Receiver Chassis holds 6or8 D-12

C. TSMS2150X-8 Multi-switch 8 way

D. DISH Kit patriot part # 62100050 Antenna 1.0M W/ 2- 3/8"ODWith 611613101 2-3/8" AZ/EL Mount & 610006850 LNBF Bushing kit.

E. (1) DTV32 LNBF-DUAL 30 MM Throat

F. (1) CHA-WR238 WALL/ROOF MNT 2-3/8"

G. Provide Blonder Tongue model # AMCM-860 Agile Micro Mod (1) per modulated channel

2.6 DISTRIBUTION COMPONENTS

A. Signal Power Splitters and Isolation Taps: Metal-enclosed directional couplers with brass connector parts. Where installed in signal circuits used to supply cable-powered amplifiers, power throughput capacity shall exceed load by at least 25 percent.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Canare Corp.
    b. Leviton Manufacturing Co., Inc.; Leviton Voice & Data Division.
    c. Motorola, Inc.; Connected Home Solutions.
    d. Quality RF Services, Inc.; a member company of ATX Networks.
    e. Scientific-Atlanta, Inc.; a subsidiary of Cisco Systems, Inc.

2. Return Loss: 17 dB.
3. RFI Shielding: 100 dB.
4. Isolation: 25 dB.
5. I/O Impedance: 75 ohms.

B. Distribution System Amplifiers: Powered by coaxial cable system and equipped with surge protection device and external test points to allow convenient signal monitoring.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Canare Corp.
    b. Leviton Manufacturing Co., Inc.; Leviton Voice & Data Division.
    c. Motorola, Inc.; Connected Home Solutions.
    d. Quality RF Services, Inc.; a member company of ATX Networks.
    e. Scientific-Atlanta, Inc.; a subsidiary of Cisco Systems, Inc.

C. Cable System Power Supplies: Plug-in, modular construction, with surge, short-circuit, and overload protection.

D. Signal Traps: Packaged filters tuned to interference frequencies encountered in Project.

E. Attenuators: Passive, of fixed value, and used to balance signal levels.

F. Terminating Resistors: Enclosed units rated 0.5 W and matched for coaxial impedance.

G. User-Interface Device: Flush, female-type outlets, designed to mimic power duplex outlet; for mounting in standard outlet box; with metallic parts of anodized brass, beryllium copper, or phosphor bronze. Cable connector mounting shall be semirecessed so its protrusion is flush with the plane of device plate.[Feed-through-type cable connection shall not be used] [except in area housing a single tenant] [except within a single-dwelling unit].

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Canare Corp.
    b. Leviton Manufacturing Co., Inc.; Leviton Voice & Data Division.
    c. Motorola, Inc.; Connected Home Solutions.
    d. Quality RF Services, Inc.; a member company of ATX Networks.
    e. Scientific-Atlanta, Inc.; a subsidiary of Cisco Systems, Inc.

2. Cable Connector: Female, Type F.
3. Wall Plates: Match materials and finish of power outlets in same space.
4. Attenuation: Less than 0.1 dB.
5. Voltage Standing-Wave Ratio: Less than 1.15 to 1.

2.7 ENCLOSURES

A. Enclosures for Interior, Controlled Environments: NEMA 250, Type 1.

B. Enclosures for Exterior Environments: NEMA 250, Type 3R.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for antenna to verify actual locations of cable connections before antenna installation.

B. Examine walls, floors, roofs, equipment bases, and roof supports for suitable conditions where television equipment is to be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install signal line surge suppressors on coaxial cables entering headend equipment space and at antenna-mounted amplifiers. Comply with requirements in Division 26 Section "Transient-Voltage Suppression for Low-Voltage Electrical Power Circuits."

B. Install antenna towers, masts, and mountings on concrete bases. Comply with requirements for concrete bases specified in Division 03 Section "Cast-in-Place Concrete."

1. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor bolts to elevations required for proper attachment to supported equipment.

3.3 ANTENNA AND HEADEND INSTALLATION

A. Mount headend equipment in electronic-equipment cabinets recommended by manufacturer. Group related items in methodical sequence.

B. Arrange equipment to facilitate access for maintenance and to preserve headroom and passage space. Parts that require periodic service or maintenance shall be readily accessible. Headend components that require tuning adjustments shall be accessible from the front of equipment cabinets.

C. Align antenna elements to achieve maximum signal level and quality.

D. Antenna-Supporting Structure: Increase antenna height as required to obtain signal strength needed for specified system performance.

1. Attachment to Building: Use 0.375-inch- (minimum expansion anchors for masonry, and place anchors clear of grout or mortar joints.
2. Attachment to Building: Use 0.375-inch- minimum lag bolts for attachment to wood.
3. Lightning Protection: Comply with requirements in Division 26 Section "Lightning Protection for Structures."

E. Antenna Cable Entrance: Use weatherproof entrance fittings, and seal at penetrations of the building envelope.

3.4 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

B. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

C. Inspection: Verify that units and controls are properly installed, connected, and labeled, and that interconnecting wires and terminals are identified.

D. Tests and Inspections:

1. Align and adjust system and pretest components, wiring, and functions to verify that they comply with specified requirements.
2. Replace malfunctioning or damaged items.
3. Retest until satisfactory performance and conditions are achieved.
4. Prepare television equipment for acceptance and operational testing.
5. Use an agile receiver and signal strength meter or spectrum analyzer for testing.
6. Off-Air, Mast-Mounted Antenna Sources: Connect receiver to the down-lead of a 10-element, single-channel antenna, tuned and oriented to optimize reception for the channel and placed at system antenna's location. Alternatively, connect receiver to a single-channel video amplifier connected to the down-lead of the above single-channel antenna.
7. CATV Sources: Connect receiver to an agile demodulator or CATV set-top converter at CATV service entrance to the facility.
8. Satellite Earth-Station System Sources: Adapt receiver to the output of satellite-television receiver.
9. CCTV Sources: Connect receiver to the output of each CCTV signal source or the distribution amplifier associated with it.
10. Test Schedule: Schedule tests after pretesting has successfully been completed and system has been in normal functional operation for at least 14 days. Provide a minimum of 10 days' notice of test schedule.
11. Operational Tests: Perform tests of operational system to verify that system complies with Specifications. Include all modes of system operation. Test equipment for proper operation in all functional modes.
12. Distribution System Acceptance Tests:

    a. Field-Strength Instrument: Rated for minus 40-dBmV measuring sensitivity and a frequency range of 54 to 812 MHz, minimum. Provide documentation of recent calibration against recognized standards.
    b. Signal Level and Picture Quality: Use a field-strength meter or spectrum analyzer, and a standard television receiver to measure signal levels and check picture quality at all user-interface outlets.

        1) Test the signal strength in dBmV at 55and 750 MHz.
        2) Minimum acceptable signal level is 0 dBmV (1000 mV).
        3) Maximum acceptable signal level over the entire bandwidth is 15 dBmV.
        4) Television receiver shall show no evidence of cross-channel intermodulation, ghost images, or beat interference.

13. Signal-to-Noise-Ratio Test: Use a field-strength meter to make a sequence of measurements at the output of the last distribution amplifier or of another agreed-on location in system. With system operating at normal levels, tune meter to the picture carrier frequency of each of the designated channels in turn and record the level. With signal removed and input to corresponding headend amplifier terminated at 75 ohms, measure the level of noise at same tuning settings. With meter correction factor added to last readings, differences from first set must not be less than 45 dB.
14. Qualitative and Quantitative Performance Tests: Demonstrate reception quality of color-television program transmissions at each user interface from each designated channel and source. Quality shall be equal to or superior than that obtained with performance checks specified below, using a standard,

commercial, cable-ready, color-television receiver. Level and quality of signal at each outlet and from each service and source shall comply with the following Specifications when tested according to 47 CFR 76:

a. RF video-carrier level.
b. Relative video-carrier level.
c. Carrier level stability, during 60-minute and 24-hour periods.
d. Broadband frequency response.
e. Channel frequency response.
f. Carrier-to-noise ratio.
g. RF visual signal-to-noise ratio.
h. Antenna combiner insertion loss.
i. Signal power splitter loss.
j. Cable connector attenuation.
k. Cross modulation.
l. Carrier-to-echo ratio.
m. Composite triple beat.
n. Second order beat.
o. Terminal isolation.
p. Terminal isolation between television and FM.
q. Hum modulation.
r. RF FM carrier level.
s. FM frequency response.
t. FM carrier-to-noise ratio.

E. Headend and distribution system will be considered defective if they do not pass tests and inspections.

F. Prepare test and inspection reports.

G. For fiber-optic- and UTP-cable performance test, see Division 27 Section "Communications Horizontal Cabling."

H. Cap all unused connectors and seal weathertight.

3.6 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain MATV equipment.

1. Train Owner's maintenance personnel on procedures and schedules for troubleshooting, servicing, and maintaining equipment.
2. Demonstrate methods of determining optimum alignment and adjustment of components and settings for system controls.
3. Demonstrate programming and tuning of satellite receivers.

B. Refer Division 01 for administrative and procedural requirements for demonstration and training.

END OF SECTION 274133

SECTION 27 52 23 – NURSE CALL SYSTEM

PART 1 - GENERAL

1.1 OVERVIEW

A. Furnish and install all equipment, accessories, and materials in accordance with these specifications and drawings to provide a complete and operating Nurse/Patient Communications System for the Youth Detention Center.

B. All bids shall be based on the equipment as specified herein. The catalog numbers, model designations and descriptions are those of the RAULAND-BORG CORPORATION. Any alternate system must be approved in advance by the specifying authority. Final approval of the alternate system shall be determined at the time of job completion. Failure to provide the "precise functional equivalent" shall result in the removal of the alternate system at the contractor's expense.

1.2 SCOPE OF WORK

A. Furnish and install a Nurse / Patient Communications System comprised of nurse consoles, patient stations, dome lights, entertainment cords, call cords, pull cord stations, emergency push button stations, bed side-rail interfaces, pocket page interfaces, computer interfaces, printer interfaces, wireless/telephone network interfaces and wiring as shown on the drawings

B. The Nurse/Patient Communications System shall be installed initially in the specified areas and then be expanded in the future to additional areas. Systems provided in the initial area shall have the capacity to expand to provide seem-less service to the entire facility.

C. All necessary equipment required to meet the intent of these specifications, whether or not enumerated within these specifications, shall be supplied and installed to provide a complete and operating nurse/patient communications network.

1.3 REFERENCES

A. Underwriter's Laboratories Standard 1069 (UL1069)

B. Canadian Standards Association

C. National Electrical Code

D. U.S. Dept. of Labor / Occupational Safety and Health Administration

E. State Hospital Code / Joint Commission of Hospitals - Nurses Call Requirements

F. European Union's *DIRECTIVE 2002/95/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 27 January 2003*, commonly known as the RoHS Directive

G. European Union Medical Device Directive 93/42/EEC (MDD)

H. CE Marking for Conformity of Medical Devices (Article 17, 93/42/EEC)

I. CE Marking for Conformity (Council Directive 93/68/EEC)

J. 21 CFR 820 Part 820 Quality Systems Regulations (FDA)

1.4 SYSTEM SUPPLIER QUALIFICATIONS

A. The System Supplier shall be an established communications and electronics contractor that has had and currently maintains a locally run and operated business for at least five years. The System Supplier shall hold all applicable state and local licenses.

B. The System Supplier shall be an Authorized Distributor for the product proposed with full manufacturer's warranty privileges.

C. The System Supplier shall employ technicians who have attended and successfully completed the manufacturer's technical certification classes for the proposed system.

D. The System Supplier shall show satisfactory evidence, upon request, that he maintains a fully equipped service organization capable of furnishing adequate inspection and service to the system on a 24-hour / 7-day basis. The System Supplier shall maintain at his facility the necessary spare parts in the proper proportion as recommended by the manufacturer to maintain and service the equipment being supplied.

1.5 SUBMITTALS / PRIOR APPROVAL

A. System Suppliers wishing to submit equipment other than that specified shall submit to the specifying authority, at least 10 days prior to bid opening, the equipment proposed to provide a precise functional equivalent system to meet specifications. Bidder shall provide adequate information prior to bid date such as specification sheets, working drawings, shop drawings, and a demonstration of the system. Alternate supplier-contractor must also provide a list to include six installations of the identical system proposed which have been in operation for a period of two or more years.

B. Prior to commencement of work, the supplying contractor shall submit six (6) complete submittal sets. These sets are to be submitted in a three ring binder, a continuous spiral binder, or plastic binding that allows the booklet to lie flat while open. Each booklet shall consist of the following:

Page 1: Name of System Supplier and project name

Page 2: In the following order, a listing of: component quantities, equipment manufacturer, model number, and description of each component being supplied. If equipment being supplied is not the specified equipment manufacturer's model, alongside the submitted model number and description, list the specification paragraph that corresponds to the equivalent specified model. Failure to provide this information will result in the rejection of submittals.

Page 3: Recently dated (within one year from submittal date) support letter from manufacturer stating that the supplying contractor is an Authorized Distributor of the product being supplied.

Page 4: Statement of warranty policy from manufacturer.

Page 5: Copy of the installing technician(s) certificate of completion from the manufacturer's training school for the equipment being proposed.

Page 6: Statement by System Supplier of how and when they will complete In-Service Training, including the exact number of hours being provided per system, procedures they will follow, what training aids are provided (manuals, video tapes, etc.) and how contractor will conduct training.

Page 7: Statement from System Supplier of exactly how they will test installed equipment and wiring, including recommendations by manufacturer, prior to commissioning of system.

Page 8: Provide a list of recommended spare parts to maintain all systems specified after the warranty period. Also provide the purchase price and turn around cost associated with each item. List separately the cost of an annual maintenance contract based on service levels outlined in WARRANTY paragraph of this section. Show the hourly, purchased labor rates for both regular and emergency service. State any additional charges that may accompany labor charges such as travel charges.

Pages 9+: One catalog sheet per product of equipment listed on page 2; in the exact order as listed on page 2. Each catalog sheet shall describe, mechanical, electrical and functional equipment specifications. The catalog sheet must also include a photograph of the product. Photocopy duplications of the manufacturer's original equipment catalog sheets will be allowed as long as they provide adequate clarity of both the printed word and graphics/pictures. Submittals that are not of adequate clarity or content may be rejected and re-submission may not be allowed.

Last Page(s) or Separate: Provide all inter-equipment wiring diagrams and drawings necessary to install the equipment being supplied. These drawings will show all wiring types by wire gauge, conductors and wire manufacturer. These drawings must be updated prior to completion of any work to reflect changes that may have been made during actual installation.

B. In the event the specifying authority deems it necessary to reject the submittals of a System Supplier, the specifying authority may ask the System Supplier to re-submit if the discrepancies are minor. Otherwise rejection of submittals means the specified product must be supplied.

1.7 SYSTEM DEMONSTRATIONS

A. It may be necessary to utilize demonstration equipment to test the functional operation of the System Supplier's submitted equipment. System Supplier will be notified of any demonstration dates and times. If such demonstrations are utilized, it will be the sole judgment of the owner and specifying authority to decide whether a contractor/manufacturer meets or exceeds the specification.

B. All demonstrated equipment must be that of a standard single manufacturer and meet the same required testing and conditions that are applicable to the manufactured equipment. Custom or modified equipment that is not of standard, current manufacture cannot be demonstrated.

C. If necessary, owner and/or specifying authority may visit manufacturer's facility to view functioning equipment or demonstrations and witness equipment manufacturing techniques and/or testing procedures.

1.8 SAMPLES

A. The owner/specifying authority reserves the right to request samples of terminal (station) equipment for the purpose of coordinating colors, aesthetics, trimplate sizing, etc. These samples would be supplied at no cost to the owner.

1.9 SCHEDULING

A. It is the responsibility of the System Supplier to coordinate all work with the other trades for scheduling, rough-in, and finishing all work specified. The owner will not be liable for any additional costs due to missed dates or poor coordination of the supplying contractor with other trades.

1.10 WARRANTY

A. The System Supplier shall provide a warranty on the system which shall include all necessary labor and equipment to maintain the system(s) in full operation for a period of one year from the date of acceptance.

B. In addition, the equipment (parts) warranty for all core system components including control / switching equipment, power supplies, patient stations, sub-stations, and nurse consoles shall extend to a total of at least five (5) years. Warranty for ancillary devices such as pillow speakers and call cords shall extend to a total of at least two (2) years.

C. Manufacturer shall provide, free of charge, product firmware/software upgrades throughout the warranty period for any product feature enhancements.

D. After the acceptance of the system(s) service shall be provided on the following basis:

Emergency Service -	Provided **24 hours a day**. When a **total or catastrophic failure** of equipment is reported to contractor, within **2 hours of notification**, a service person will be on site. (An example of a catastrophic failure would be a hub failure or a nurse console failure.)
Routine Service -	Provided **within 4 business hours** (9 a.m. to 5 p.m., Monday through Friday, excluding holidays) **of notification**. When a minor failure or equipment is reported to contractor, a service person will be on site within 24 hours of notification. (An example of a minor failure includes peripheral equipment such as control stations, entertainment speakers, corridor lights, pull-cord stations, etc. which normally affect only one patient or patient room.)

1.11 MAINTENANCE

A. Provide necessary spare parts, noted on Page 8 of submittal (see 1.05A), after commissioning of system(s) and prior to final payment.

B. The owner may choose to have the supplying contractor maintain the system(s). The level of service provided during the maintenance contract period would be the same as the warranty period for routine and emergency service. All labor and equipment costs would be covered under this contract. Supplying contractor must state exact billing amounts, billing periods and all costs associated with this maintenance agreement and list any items that would not be covered under the service/maintenance agreement.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. The equipment specified herein is that of the RAULAND-BORG CORPORATION, SKOKIE, ILLINOIS.

B. The intent is to establish a standard of quality, function and features. It is the responsibility of the bidder to ensure that the proposed product meets or exceeds every standard set forth in these specifications.

C. The functions and features specified are vital to the operation of this facility, therefore, inclusion in the list of acceptable manufacturers does not release the System Supplier from strict compliance with the requirements of this specification.

2.2 QUALITY ASSURANCE

A. The nurse / patient communications system shall be listed by Underwriter's Laboratories under UL Standard 1069 - 6th Edition (published March, 2001). Underwriter's Laboratories shall be the only acceptable NRTL for system listing.

B. The nurse / patient communications system shall be compliant with European Union Medical Device Directive 93/42/EEC (MDD).

C. The nurse / patient communications system shall be compliant with CE Marking for Conformity of Medical Devices, in compliance with Article 17 of Medical Device Directive 93/42/EEC (MDD), and EU Council Directive 93/68/EEC.

D. The nurse / patient communications system shall be supplied by an FDA-registered medical device manufacturer, and shall list their device in accordance with the provisions set forth in 21CFR Part 890.3710 or 890.3725, Class II Medical Device.

E. The nurse / patient communications system shall be in compliance with European Union's *DIRECTIVE 2002/95/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 27 January 2003*, commonly known as the RoHS Directive.

2.3 SYSTEM WIRING

A. System wiring and equipment installation shall be in accordance with good engineering practices as established by the EIA and the NEC. Wiring shall meet all state and local electrical codes.

1. Contractor shall terminate all wiring with manufacturer approved connectors. The use of wire nuts is prohibited.

2. System shall employ a structured cable system consisting of standard 4-pair Category 5 cable to service all corridor lamps, and consoles.

3. All wiring shall test free from all grounds and shorts.

4. Wiring shall be UL listed, NEC and NFPA 70, Article 25 approved.

5. Nurse / Patient Communications System wiring shall not be run in the same conduit with other systems (i.e. Class 1 AC power distribution, fire alarm, entertainment systems, lighting controls, etc.).

2.4 SYSTEM FIRMWARE / SOFTWARE MAINTENANCE

A. The System Manufacturer shall provide, free of charge, product firmware / software upgrades for a period of five years from date of installation for any product feature enhancements. Installation of system upgrade software shall be by the System Supplier and shall be per the labor warranty specified elsewhere.

1. System firmware / software upgrades shall be downloaded to the system by data connection. Upgrades shall be accomplished system-wide from a single point of connection.

2. Systems requiring local programming of individual network components / sub-systems at multiple physical locations or which do not allow for remote download of component firmware or which require the exchange of components, will not be accepted.

2.5 HEAD-END CONTROL EQUIPMENT

A. Power Supplies – Provide ample power for control equipment, consoles, patient stations, sub-stations, and corridor lamps. All system power supplies must be UL1069 listed as an integral part of the core system. Power supplies which carry only component listings or are otherwise not part of the core system UL listing are not acceptable.

B. Battery Back-up – Provide battery back-up with ample reserve power to operate the entire system for a minimum of 10 minutes without operational limitations or loss of system function.

C. Furnish as needed in each area a nurse/patient communications network hub controller. The system as a whole shall be capable of supporting at least 25 hub controllers. Each hub controller shall provide the following:

1. Support for at least 10 console clusters consisting of standard LCD consoles or annunciate panels.

2. Support for at least 150 rooms.

D. It shall be possible for network hub to act as stand alone controller should loss of network communication occur.

E. System Audio – The system shall be designed to provide audio meeting the minimum standards detailed by the National Electrical Manufacturers Association standard for nurse call system audio.

1. The system shall utilize 25 Volt balanced signal distribution between head end equipment and room stations.

2. Audio transmission between hub controllers shall be digital.

2.6 CALL ROUTING / PROCESSING

A. Call Routing – The system shall support the routing of patient calls to any console, pager, phone or other annunciating device anywhere in the facility or to any combination of the above regardless of the location of the calling station. Calls may be routed and processed based on location, priority or combination.

1. The system shall support the ability to swing any individual room or any group of rooms by touching one labeled touch point. Room(s) and consoles may be located anywhere within hospital nurse/patient communications network.

2. The system shall allow a console to capture an individual nursing unit, selected units, or all units in hospital by touching single custom labeled touch point.

B. Call Priorities – The system shall support a minimum of 200 unique, user-definable call priorities.

1. Each call priority shall be reported via a user-defined mnemonic of up to 14 alphanumeric characters.

2. Selectable call-in tone type, level, and corridor light behavior for each type of call priority.

2.7 STAFF REGISTRATION

A. The system shall support staff registration. Staff members may, by pressing a dedicated button when entering a room, indicate their presence to the system. Staff presence in the room shall be indicated by illuminating the room's green corridor lamp.

1. Users may review the location of staff members using an LCD Console and / or an Annunciate Panel.

2. If a call or service requirement is present in the room when a staff member registers into the room, the system shall automatically cancel the call(s).

3. If a call is placed from a room in which a staff member is already registered, the system shall be capable of automatically upgrading the priority of that call to indicate the need for staff assistance.

2.8 SERVICE REQUIREMENTS

A. The system shall support service requirement reminders. Staff members may, by pressing a button on the console, initiate a service requirement reminder.

1. Service Requirements shall be indicated on the corridor lamp by a flashing lamp.

2. Users may review the location of service requirements using an LCD Console and / or an Annunciate Panel.

3. If a service requirement remains unanswered for a pre-determined period of time, an overtime call shall automatically be initiated.

2.9 STAFF FOLLOW

A. The system shall support manual or automatic Staff Follow functions. When Staff Follow is enabled, call-tones for a prescribed area will automatically be forwarded to the room station speaker where staff members are located. Staff location may be determined manually by entering the room number into the console or automatically using staff register stations. Pressing the call button on that station shall silence the tones. When a new call is placed, the tones shall automatically be restored.

2.10 ROOM MONITORING

A. The system shall allow staff members to audibly monitor selected rooms.

B. Manual Monitor – Staff members may listen in to a selected room.

C. Sequential Monitor – Staff Members may enter a selected group of rooms for monitoring. The system will automatically switch from room to room allowing the staff member to sequentially monitor the rooms.
1. During monitoring, the staff member may press a button on the console to stop on the current room to listen longer and then press Resume to restart the sequencing.

2. The staff member may adjust the time that the system spends on each room.

3. During Sequential Monitoring, the number of the room currently being monitored shall appear on the console.

2.11 ROOM PRIVACY

A. The system shall allow staff members to place a room in Privacy Mode to prevent unauthorized or accidental audible monitoring of the room.

B. Rooms may be entered into or removed from Privacy by staff members using the console.

C. When a room that is in Privacy is dialed from a console or telephone, the staff member may speak into the room but they may not listen to the room.

1. Privacy in the room may be temporarily suspended to allow two-way communications by pressing the call-in button in the room. When the conversation is terminated, Privacy shall automatically be restored.

2. If a call-in is placed from the room, the call may be answered from the console as normal using two-way communications.

D. The rooms in privacy may be reviewed from the LCD console.

1. During the review process, rooms may be removed from Privacy mode.

2.12 AUDIO PAGING

A. The system shall support audio paging from selected consoles.

B. All Page - Paging announcements may be made from a console to all room stations in the system.

C. Group Page – Announcements may be made to all room stations within a console’s coverage area.

D. Staff Page – Announcements may be made to rooms in which staff members are registered.

E. Paging Announcements may be made to overhead speakers via a connection to the facility Public Address System.

F. To facilitate a low noise patient environment, the system will support the ability to block paging from selected consoles.

1. Consoles equipped with dial pads may be configured to allow password protection of the paging function to only allow authorized access to audio paging.

2.13 CONSOLES / ANNUNCIATOR PANELS

A. System consoles shall be provided as indicated on the plans and drawings. All system consoles shall be UL1069 listed as an integral part of the core system. Telephones, personal computers or other devices which carry only component listings or are otherwise not part of the core system UL listing are not acceptable.

B. LCD consoles:

1. The LCD console shall be a small self-contained unit, which shall not occupy more than 87 square inches of desk space. The console shall include an easy-to-read 4-line / 80-character backlit LCD display.

2. The console shall provide function selector buttons and a telephone-style 12-button dial pad. Selector buttons may be used to access user-configured 24-function menu.

3. The console may display up to three incoming calls each with an individual elapsed timer indicating how long the call has been pending. Ability to scroll to see additional pending calls.

4. While idle, the console shall display the time of day. Time may be displayed in 12 or 24-hour format. Time display shall be consistent system wide.

5. Console shall include capabilities for both open voice (speaker / microphone) and telephone style handset. Audio direction (talk / listen) for speaker / microphone and handset may be accomplished via automatic voice switching (VOX) or manually via a Push-to-Talk button.

6. The highest priority (or longest pending) call may be answered automatically by lifting the handset or by pressing the Push-to-Talk button. Calls may be answered out of sequence using line selector buttons or by dialing the desired room number.

7. Console shall provide independent volume controls for day/night call-in tones. A Mute button shall be provided to temporarily suppress tones for pending calls.

8. The console may be desk or wall mounted.

9. The console shall employ a modular quick-disconnect connector. It shall be possible to remove and / or replace the console without removing power from the system.

2.14 CORRIDOR LAMPS / ROOM CONTROLLERS / ZONE LAMPS

A. Corridor Lamps shall be provided as indicated on the plans and drawings.

B. High Security Corridor Lamps (1-lamp, 2-lamp, and 3-lamp style)

1. 11-gauge stainless steel faceplate with a mar-resistant brushed finish

2. Corridor Lamp shall include one, two, or three bulb(s) whose color(s) may be established using a colored filter.

   a. The corridor lamp shall make use of multiple colors and programmable flash rates and patterns to indicate pending calls, service requirements and staff presence.

   b. Lamp colors are established by colored filter, so that only one common replacement bulb is required.

3. Corridor Lamp shall include tamper-proof mounting hardware.

4. The High Security Corridor lamp shall operate in conjunction with a solid-state relay output controller and a domeless controller that serves as the hub for all room wiring.

2.15 HIGH SECURITY ROOM STATIONS

A. Room Stations (single or dual) shall be provided as indicated on the plans and drawings.

B. Room Stations shall be equipped with:

1. 11-gauge stainless steel construction.

2. Heavy-duty, tamper-proof ¼ inch jack style receptacle(s) for call cord.

3. Stations in areas requiring two-way communication shall be equipped with a speaker microphone with level matching transformer.

a. Vandal-proof speaker mounting design

b. Minimum speaker size shall be 3.0” / 7.6 cm

4. Heavy-duty, tamper-proof Reset Button to cancel pending calls. Reset button shall be able to cancel calls from other stations in the room if desired.

5. Green LED to indicate that audio to the station is active.

6. Red LED(s) to indicate call placement from one or both of the call points.

C. Room Station functions shall include:

1. Removing a call cord shall place a Cord Out call.

a. Cord Out calls may be cancelled locally using the Cancel Button. No Dummy Plugs shall be required.

D. Room Stations shall employ modular connectors. It shall be possible to service Room Stations without removing power from the system.

E. Room Stations shall have the capabilities to interface with the patient bed. Interface shall allow lighting and nurse call controls via the patient bed rails.

F. Patient station shall interface with patient room low voltage lighting controller for control of patient light via the patient bed rail controls and/or the patient pillow speaker.

2.16 SUB-STATIONS

A. Provide Sub-stations as indicated on the plans and drawings. Sub-station types shall include:

B. High Security Single Call Pushbutton Stations – High Security Single Call Pushbutton stations shall be equipped with a call button and reset button.

1. Heavy-duty, tamper-proof Call Button shall be red in color and shall be large (minimum 1.25” / 3.2 cm) for easy use.

2. Heavy-duty, tamper-proof Reset button shall be able to cancel calls from other stations in the room if desired.

3. Station shall be water-resistant for shower and bath applications.

4. Station shall be constructed with 11-gauge stainless steel.

2.17 PATIENT CALL CORDS

A. Patient Call Cords shall be provided as indicated on the plans and drawings. All Patient Call Cords shall be UL1069 listed as an integral part of the core system. Devices which carry only component listings or are otherwise not part of the core system UL listing are not acceptable.

1. Standard Call Cords – Standard Call Cords shall be pendant type with a single easy to activate call button, DIN style male plug and sheet clip. Cable shall be a minimum of 10' / 300cm. One (1) standard call cord shall be provided for each bed with an additional 10% provided as spares.

2.18 POCKET PAGE INTEGRATION

A. The Nurse / Patient Communications System shall be integrated with the facility pocket page system (specified elsewhere) to provide messaging from the system to pagers.

B. Integration / connection shall be accomplished serially via RS-232C using the Telocator Alphanumeric Protocol (TAP) Version 1.8. Should the distance between the Nurse / Patient Communications System and the Pocket Page encoder exceed 50' / 15m, provide short haul modems to ensure signal transmission integrity.

C. Automatic Mode Operation – The system shall support Automatic Mode Operation. In this mode, patient calls shall be routed directly to the pocket pager of the designated staff member. Room number, bed number and call priority shall be sent with the page message.

D. Semi-automatic Mode Operation – The system shall support Semi-automatic Mode Operation. In this mode, a console operator may answer patient call, determine the patient need and then dispatch an appropriate staff member.

1. Dispatching the staff member shall be accomplished by establishing a service requirement. The page will then be sent to the pager of the designated staff member. It shall not be necessary to enter pager numbers to route the page message. When sent by Semi-automatic mode, the page message shall include the room number, bed number, call priority plus an indication that a Service Requirement has been set.

E. Pagers shall be able to run in both Automatic Mode and Semi-automatic Mode simultaneously.

F. Equipment Trouble Pagers – The system shall support up to 10 pagers that receive a message whenever there is trouble in the system such as a console off-line or station off-line.

2.19 WIRED / WIRELESS TELEPHONE INTEGRATION

A. The Nurse / Patient Communications System shall be integrated with the facility telephone system to provide connectivity with wired and / or wireless telephones. Integration shall include the ability to display information on telephone displays as well as the ability to establish audio communications between the telephone and the patient room station.

B. The system shall be capable of providing standard Type II ICLID (Caller ID) signaling for connection to ICLID enabled telephone systems or Caller ID single / multi-line telephones.

C. The system shall also support connection to telephone systems using a serial data (RS-232C) connection. The Telocator Alphanumeric Protocol (TAP) Version 1.8 shall serve as the integration standard. Should the distance between the nurse / patient Communications System and the Pocket Page encoder exceed 50' / 15m, provide short-haul modems to ensure signal transmission.

2.20 REPORTING SOFTWARE

A. Reporting Software shall be provided with the system to allow for recording and reporting of system activity.

B. The Reporting Software shall be installed on a Personal Computer which shall in turn be connected to the Nurse / Patient Communications System.

C. Reporting Software shall support real time system activity display.

1. Real time call waiting display with the ability to filter by call types and nursing units. Call information shall be displayed and call-in tones shall be sounded.

2. Real time Nurse Communications Network service reminder display and staff locations.

3. Should the connection between the nurse / patient communications system and the Reporting Software PC be lost, a warning signal shall be generated by the Reporting Software.

D. Reporting Software shall allow users to generate / print reports on system activity. Access to reports shall be controlled based on user name and password. Reports shall be capable of indicating call priority, room number and patient information, call placed time, service reminder set, staff registration.

1. Reporting Detailed Analysis of Call Data by Area

2. Analysis of Call Data by Area

3. Analysis of Call Data by Room/Bed

4. Analysis of Call Data by Resident

5. Resident Check-In Exception

E. Reporting Software shall support a networked operation in which the Management Software PC is connected to the hospital LAN. Users with access to the LAN can then generate reports from local work stations.

2.21 CHASSIS FAULT, POWER MONITOR, AND SUPERVISED CODE

A. Provide a separate chassis short / power fault monitor to monitor integrity of network wiring for short(s) to earth ground and to notify staff of loss of power. An audible alert tone shall sound if short or loss of power is detected. Provide test button to test operation.

2.22 SYSTEM DIAGNOSTICS

A. The system shall provide continuous self-diagnostics. The system shall also support advanced computer diagnostics by local or remote technical personnel.

B. All components in the system shall be continuously supervised for both power and signal to ensure proper operation and in the case of system faults to aid in troubleshooting.

C. The system shall have the ability to diagnose all network active components, controllers, control stations, and sub-station operation from any designated network data interface location, on or off site. Network administrator shall be able to:

1. Review system faults reported (i.e. station failure)

D. The system shall provide the ability to automatically notify maintenance personnel via pocket page in the event of a system trouble or failure.

2.23 LOW VOLTAGE LIGHTING CONTROLLER

A. Low voltage controller shall be Vista model 90676-NRF. Low voltage controller shall integrated solid state unit. The low voltage controller shall be suitable for 120/277VAC. Low voltage controller shall allow control of line voltage devices through low voltage switching devices. Low voltage controller shall be suitable for momentary switch operation with the option to operate the relays in a sequential mode or individual mode.

PART 3 - EXECUTION

3.1 SUPERVISION

A. System shall be installed, maintained and serviced by or under the supervision of manufacturer certified technicians

3.2 IN-SERVICE TRAINING

A. The System Supplier shall provide thorough training of all nursing staff assigned to those nursing units receiving new nurse/patient communications equipment. This training shall be developed and implemented to address two different types of staff. Floor nurses/staff shall receive training from their perspective, and likewise, unit secretaries (or any person whose specific responsibilities include answering patient calls and dispatching staff) shall receive operational training from their perspective. A separate training room will be set up that allows this type of individualized training utilizing in-service training unit, prior to cut over of the new system.

3.4 ELECTRICAL POWER CONNECTIONS

A. It shall be the responsibility of the facility to provide a dedicated 120 VAC, 60 HZ conduit feed into the equipment cabinet. This power feed shall not have any other devices connected directly to it. A 20 AMP circuit breaker located in the electrical sub-panel labeled “nurse call” will control this circuit. This electrical circuit will be connected to the facility’s emergency power system for automatic power switch over during loss of utility power.

B. Connect all network system power supplies and equipment cabinets to a common earth ground utilizing a 14 AWG, or larger, solid conductor which is at minimum the same conductor size as the AC feed wires.

3.6 PROTECTION OF NETWORK DEVICES

A. Contractor shall protect network devices during unpacking and installation by wearing manufacturer approved ESD wrist straps tied to chassis ground. The wrist strap shall meet OSHA requirements for prevention of electrical shock, should technician come in contact with high voltage.

3.7 CLEANING AND PATCHING

A. It shall be the responsibility of the System Supplier to keep their work area clear of debris and to clean the area at completion of work each day.

B. It shall be the responsibility of the contractor to patch and paint any wall or surface that has been disturbed by the execution of this work.

3.8 DRAWINGS

A. Provide as built drawings of all installed network components and associated wiring on building plans. Final payment for work will not be authorized unless these drawings are supplied.

END OF SECTION

SECTION 28 05 00 - COMMON WORK RESULTS FOR ELECTRONIC SECURITY

PART 1 GENERAL

1.1 DESCRIPTION OF WORK

A. Provide all labor, equipment, supplies and materials for the complete installation of a fully functional Security Control System in accordance with the Contract Documents. Security Systems include but are not limited to:

1. Backbone and Horizontal Cabling
2. Grounding and Bonding
3. Cabinets and Enclosures
4. Video Surveillance System
5. PLC/GUI Hardware and Software
6. Access Control System
7. Intercom System
8. Miscellaneous Systems

B. The work includes the following, as well as work not listed below but described elsewhere as it applies to Security Systems:

1. Coordination with division 26
2. Field device installation and termination
3. Headend equipment installation and termination
4. Programming
5. Start up, testing, de-bugging and commissioning
6. Documentation and training
7. Maintenance and service

C. Interpretation of Contract Documents

1. This section of the specifications describes general provisions applicable to all Division 28 Security Systems.
2. Although such work is not specifically indicated, furnish and install all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation.
3. Mention in these specifications or indications and/or reasonable implications whereby articles, materials, operation or methods related to execution of the work are noted, specified, drawn or described, thereby requires execution of each such item of work and provision of all labor, materials, equipment and accessories required for execution thereof.
4. No exclusions from, or limitations in the language used in the specifications shall be interpreted as meaning that the accessories necessary to complete any required system or item of equipment are to be omitted.
5. The use of words in the singular shall not be considered as limiting where other indications denote that more than one item is referred to.

6. Furnish and install all materials for complete and functioning systems, resulting upon completion, in functioning systems in compliance with the performance requirements specified. The omission of express reference to any parts necessary for, or reasonably incidental to a complete installation shall not be construed as a release from furnishing such parts. This reference shall apply to all systems and sub-systems specified herein or otherwise included in these contract documents.
7. Drawings are diagrammatic and indicate general arrangement of system and equipment, except when specifically dimensioned or detailed. They are to show size, capacity, approximate location, direction and general relationship of one work phase to another, but not exact detail or arrangement.
8. Refer to dimensioned architectural/structural drawings for exact, locations of building elements.
9. Field verification of measurements take priority over dimensioned drawings.
10. Dimensions indicated anywhere, are limiting dimensions.
11. The Owner reserves the right to make any reasonable change in location of devices and equipment prior to rough installation without involving additional expense. All changes from the drawings as are necessary to make the work of the Security Electronics Contractor conform to the building as constructed shall be included and installed without extra cost.

1.2 SCOPE AND RESPONSIBILITY

A. Provide full time on site field representation for Division 28 Security Control Systems series scope for work for the duration of installation and prior to turn over. This requirement shall commence upon the start of the installation of field wiring and device installation.

B. Include detailed scheduling information for Security Electronics systems installation and testing in the construction schedule. Provide detailed Gantt chart construction schedule showing all tasks referenced in the project phasing plans. Include:

1. Engineering
2. Shop Drawing Preparation
3. Software Programming
4. Shop Fabrication
5. Equipment Installation
6. Electrical Work
7. Testing, Commissioning, and training.
8. This schedule must be submitted fourteen (14) calendar days after receipt of contract. The duration of this schedule must also comply with the completion dates of the construction schedule contained in the contract documents.
9. Provide coordination to ensure that rooms housing security electronics head end electronics are completed, clean and have conditioned air as early as possible to facilitate completion of control wiring and terminations. **Space shall be free of air-borne particles prior to installation of any Security Electronics Equipment. The Architect Engineer shall inspect and approve the condition of these rooms prior to the installation of any active equipment.**
10. Work with the General Contractor to schedule/conduct periodic coordination meetings between Trade Contractors to make everyone aware of critical areas of construction. Distribute the meeting minutes and attendance to the Owner Representative, the Architect Engineer, General Contractor and the Owner in a timely fashion.
11. Security Electronics Contractor shall provide coordination of mechanical and electrical installation requirements with the General Contractor - and the Electrical Contractor.
12. Provide coordination of the Security Electronics System installation.

13. Provide coordination as required to complete the inspection described in paragraph 3.1 INSPECTION.
14. When on-site inspect conduit raceway system including back boxes, junction boxes, and mortar boxes for all Security Systems, and other furnished work provided by other sections. Notify the Architect Engineer of any discrepancies immediately.
    a. Furnish and install all equipment racks and cabinets.
    b. Furnish and install all required surge protection field devices.
    c. Provide all required circuit protection internal to the head end equipment racks.
    d. All security electronics systems cabling shall be installed in conduit from the field device to the secured equipment rooms.
    e. Furnish and install all devices, equipment, and appurtenances resulting in complete, functional, and fully operational systems as specified herein, indicated on the drawings and listed below:

        1) Section 28 05 10 – Maintenance, Service, and Warranty for Electronic Security
        2) Section 28 05 11 – Backbone System Cabling for Electronic Security
        3) Section 28 05 12 – Horizontal Cabling for Electronic Security
        4) Section 28 05 13 – Conductors and Cables for Electronic Security
        5) Section 28 05 26 – Grounding and Bonding for Electronic Security
        6) Section 28 11 16 – Cabinets and Enclosures for Electronic Security
        7) Section 28 13 00 – Access Control System
        8) Section 28 23 13 – Video Surveillance System
        9) Section 28 46 19 – PLC Hardware for Electronic Security
        10) Section 28 46 20 – PLC Software for Electronic Security
        11) Section 28 50 00 – Miscellaneous Systems
        12) Section 28 51 23 – Integrated Intercom/Paging System for Electronic Security

    f. Furnish and install the Security equipment.
    g. Coordinate with division 26 all requirements of the security electronics signal cable plant including video surveillance, PLC/GUI, intercom/paging, and miscellaneous systems per NEC, as shown in the project documents.
    h. Coordinate with Division 11 for all electro-mechanical lock requirements, tamper proof fasteners and other areas where the two trades integrate with each other.
    i. Furnish and install all miscellaneous systems equipment and materials as required for a complete and fully functional security system as specified and/or indicated on the drawings.
    j. Prior to fabrication, coordinate exact location and installation of security electronic devices.
    k. Provide coordination to complete the inspection described in Paragraph 3.1 INSPECTION.
    l. Provide complete system test, operational certification and Owner training as called for in the contract documents.
    m. Provide complete factory certified training to the Owner.
    n. Coordinate the work of this Section with the General Contractor and that of other Sections to ensure that the entire work of this Project will be carried out in an orderly, complete and coordinate fashion.

1.3 RELATED DOCUMENTS

A. General

1. Drawings, specifications and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this

section. The Security Electronics Contractor and all subcontractors are responsible for locating information pertaining to required items of work specified or indicated elsewhere in the Contract Documents.

B. Related Work Specified Elsewhere

1. Division 00 - BIDDING REQUIREMENTS
2. Division 01 - GENERAL REQUIREMENTS
3. Division 08 - DOORS AND WINDOWS
4. Division 11 - DETENTION EQUIPMENT
5. Division 26 - ELECTRICAL

C. Reference Specifications, Materials, and/or Codes

1. Submit all items necessary to obtain all required permits to the appropriate Regulatory Agencies, obtain all required permits and pay all required fees.
2. All work shall conform to the National Electrical Code (NEC) and to applicable National Fire Protection Association (NFPA) codes.
3. All work shall conform to all Federal, State and local ordinances.
4. Where applicable, all fixtures, equipment and materials shall be as approved or listed by the following:

    a. Factory Mutual Laboratories (FM).
    b. Underwriters Laboratories, Inc. (UL).
    c. National Electrical Manufacturers Association (NEMA).

5. References to the National Electrical Code and National Fire Protection Association (NFPA) are a minimum installation requirement standard. Design drawings and specification sections shall govern in those instances where requirements are greater than those specified in the NEC and NFPA.
6. All material and equipment shall be listed, labeled or certified by Underwriters' Laboratories, Inc. where such standards have been established. Equipment and material which are not covered by UL Standard will be accepted provided equipment and material are listed, labeled, certified or otherwise determined to meet safety requirements of a nationally recognized testing laboratory. Equipment of a class, which no nationally recognized testing laboratory accepts, certifies, lists, labels, or determines to be safe will be considered, if inspected or tested in accordance with national industrial standards such as NEMA, ICEA or ANSI. Evidence of compliance shall include certified test reports and definitive shop drawings. NOTE: It is not required that the final installed system be UL listed as a single product.
7. All work shall meet or exceed the standards and procedures of the following:

    a. National Fire Protection Association (NFPA): NFPA 70, NFPA 72, NFPA 90A
    b. National Electrical Code (NEC)
    c. American National Standards Institute (ANSI)
    d. National Electrical Manufacturers Association (NEMA)
    e. American Society of Testing Materials (ASTM)
    f. Institute of Electronic & Electrical Engineers (IEEE)
    g. Underwriters Laboratory (UL)
    h. Americans With Disabilities Act (ADA)

8. Include all items of labor and material required to comply with such standards and codes. Where quantity, sizes or other requirements indicated on the drawings or herein specified are in excess of the standard or code requirements, the specifications or drawings, respectively, shall govern.

1.4 QUALITY ASSURANCE

A. General

1. Furnish and install only new equipment and materials required (less than 1 year from manufacture), unused without blemish or defect.
2. Each major component of equipment shall have the manufacturer's name, address, model number and rating on a plate securely affixed in a conspicuous place. The nameplate of a distributing agent is not permitted. NEMA Code Ratings, UL label, or other data which is die-stamped into the surface of the equipment shall be stamped in a location easily visible. Performance as delineated in schedules and in the specifications shall be interpreted as minimum performance. In many cases, equipment is oversized to allow for pickup loads which cannot be delineated under the minimum performance.
3. All equipment of the same type shall be the product of one manufacturer.
4. The original factory condition of manufactured equipment shall not be modified without the written approval of the Architect Engineer.
5. If it is determined that the Security Electronics Contractor has not complied completely with the specified turnover of the “NON-PROPIETARY” code for the Owner as well as provided all “NON-PROPRIETARY” equipment, the Security Electronics Contractor bonds will be called and all costs associated with this non-performance will be borne solely by the Security Electronics Contractor.
6. Provide only non-proprietary software. Proprietary software is not permitted. For software and software vendors to be considered non-proprietary they must have a minimum of five system manufacturers proficient in the programming, integration and maintenance of the manufactured software. All software logic shall be developed in the Wonderware or Omron InduSoft environment and not developed in third party software or provided in a compiled DLL, EXE file format or other encrypted file format/extension. Any software approach that is found to be provided with proprietary approach shall be removed and the Security Electronics Contractors bond shall be “called”. All costs to remove and rewrite the software shall be the Security Electronics Contractors responsibility.

B. The Security Electronics Contractor shall participate in a MANDATORY PRE-SUBMITTAL MEETING.

1. Location: Project Job Site
2. Time Line: Sixty (60) days after award of contract
3. Participants:

    a. Architect / Engineer
    b. General Contractor
    c. Electrical Contractor
    d. Security Electronics Contractor

        1) Project Manager
        2) Project Estimator

4. The initial assembly of submittal materials as described herein shall be submitted for review.

C. Bill of Materials

1. Provide complete bill of materials for all major components, accessories, and hardware to be provided in order to assemble a complete functioning system.
2. Bill of Materials shall include-

a. Manufacturer Name
b. Model
c. Version
d. Quantity

D. Unless stated differently in the Bidding General Provisions, provide six (6) copies of submittals as called for below.

E. The formal submittal shall be transmitted 30 days after Pre-Submittal Meeting.

F. Product Submittal

1. Submittal must consist of a complete package, bound in a three ring binder, including, Product Data for each Section of the Division 28 Security Systems series specifications, and Shop Drawings as applicable. PARTIAL OR INCOMPLETE SUBMITTALS ARE NOT ACCEPTABLE. The Submittal shall include the following:
2. A Title Page complete with the following required information:

   a. Project name.
   b. Date.
   c. Name and address of the Architect / Engineer.
   d. Name and address of the General Contractor -
   e. Name and address of the Electrical Contractor
   f. Name and address of any Subcontractors.

3. An Index Page complete with the following required information:

   a. Name of the Supplier.
   b. Name of the Manufacturer.
   c. Title, section and paragraph of the Specification Sections. (Example section 281116, paragraph 2.4)
   d. Products in order as specified in PART 2 of the related specification.

4. Each Specification section shall be separated, collated in order, and complete with the following information:

   a. Title sheet.
   b. Descriptive purpose of the system, stating how each product is to function.

5. Each Data Sheet shall have the specific reference to the Specification it is to be used for, noting the section and paragraph.
6. Product Data showing multiple products, models, or options shall be clearly marked identifying the specific product, model, and options which are submitted for review. Unmarked submittals or facsimile copies shall not be acceptable.
7. Submit product data for all equipment showing:

   a. Original Data Sheets Only. Fax copies are not acceptable.
   b. Product performance, mechanical and electrical specifications.
   c. Manufacturer's installation instructions.
   d. Certification from the submitted manufacturers that the Security Electronics Contractor's designated personnel are trained on the installation of the system. Include installer's name, experience and responsibility.
   e. Product test compliance certificates if required.

G. Shop Drawings

1. Submittals consisting of reproduced copies of the original bidding documents will be rejected. The Security Electronics Contractor is required to develop a complete set of drawings specific to the final configuration of the system based on the manufacture and models of all components included. Shop drawings are to include all changes noted in addenda, as well as any changes included in architects special instructions or change orders issued prior to the submittal of the shop drawings.
2. Shop drawings shall be submitted with product data.
3. Electronics files of floor plans and reflected ceiling plans are available from the ARCHITECT/ENGINEER (see spec 013300, 1.4). Detail sheets, block diagrams, and riser sheets are not available.
4. All drawings shall be created using an industry recognized computer aided design program. Recognized programs include AutoDesk Revit, and Auto Cad. All drawings are to be made using the latest software release available.
5. Submit shop drawings for all equipment showing:

    a. Location and layout of all field equipment on floor plans.
    b. Large scale (minimum ¼"=1') floor plan and elevation view drawings of all security electronics rooms and control rooms depicting all racks, consoles, cabinets, equipment, outlets, etc.
    c. Size and spacing of all anchors, wall penetrations, joinery construction, etc., required for complete system installation.
    d. Sizes, shapes, thickness and finishes of all materials and equipment surfaces.
    e. Electrical riser diagrams identifying all signal, power and ground circuitry.
    f. Block diagram(s) depicting system integration details.
    g. Scaled elevations of all security equipment racks showing equipment mounting locations (front and rear if any equipment is rear-mounted).
    h. Wall elevations showing mounting of cabinets and enclosures, conduit routing, etc.
    i. Wire management details for the installation of cable harnesses inside racks, equipment cabinets, consoles, control panels and other areas of exposed cable.
    j. Wiring diagrams for all equipment and devices (active and passive).

        1) Wiring diagrams are required to show point-to-point connection of all terminations for all devices.
        2) Indicate wire type used for connection.
        3) Indicated type of termination to be made. (i.e. terminal strip, euro block, XLR, etc.)
        4) Indicate wire tag number.

    k. Scaled layout of all custom integrated control system graphic user interface panels.
    l. Installation detail of all surface or flush mounted devices including but not limited to speakers, cameras, readers, etc. Detail to show all required mounting and suspension hardware, as well as connection made to structure. Provide front, side, and top views.
    m. Installation detail of all suspended devices including but not limited to speaker systems, projection systems, etc. Detail to show all required mounting and suspension hardware, as well as connection made to structure. Provide front, side, and top views.
    n. Functional and operational written reports of all security systems.

H. Samples

1. Provide samples as requested for review and approval of substitutions or as specified in Division 28 Security Systems specification.
2. Submit for each type of tamper-proof fastener. Indicate materials, finish, head design, strength, corrosion resistance, and installation/removal methods.
3. Submit four (4) samples of each type of tamper proof fastener proposed for use

I. Test Plan and Documentation

1. Submit a complete testing plan for all systems for approval with the shop Drawing/Product Data submittal.
2. Plan submitted must include shop and field-testing of each and every field device and control function.
3. Plan submitted must include examples of testing documentation. Shop testing documentation must be submitted for approval prior to control system shipment to job site. Field-testing documentation must be submitted when requesting final Demonstration/Inspection (described below).
4. Detailed testing agenda and testing documentation forms for all systems. Detailed agenda outlining the "hands-on" training sessions to be provided to the User. The operation, programming/debugging, troubleshooting, repair and maintenance of all systems shall be covered.

J. Training Plan and Documentation

1. Submit a complete training plan for all systems for approval.
2. As a minimum, the plan submitted must include individualized training paths for the following personnel on all aspects of the Security Electronics system.

    a. Administrators
    b. Supervisors
    c. Operators
    d. Maintenance Personnel

3. As a minimum, the plan submitted must include the following:

    a. Proposed classes or sessions.
    b. Recommended attendees for each class or session.
    c. Proposed class or session objectives.
    d. Proposed class or session agenda and duration.
    e. Proposed supporting materials for each class or session.
    f. Proposed testing procedure for evaluation purposes.
    g. Proposed documentation of testing and evaluation.

4. Do not commence training until the Architect Engineer has approved the plan.
5. Plan submittal must include names of technical instructors. Security Electronics Contractor must provide technician responsible for project as instructor. Security Electronics Contractor instructor shall submit evidence of factory training on system provided.
6. Co-ordinate with spec 017900.

K. Operating and Maintenance Data

1. Provide a bound and illustrated control console operator’s manual. One copy shall be provided for each control station.
2. The operator’s manual shall be written in laymen’s language and printed so as to become a permanent reference document for the operators, describing all control panel icon

operations, graphic symbol definitions, and all indicating functions and a complete explanation of all software.

3. Provide a bound and illustrated service manual. Three copies of the manual shall be provided.
4. The service manual shall be written in laymen's language and printed so as to become a permanent reference document for maintenance personnel, describing how to run internal self-diagnostic software programs, troubleshoot head-end hardware and field devices with a complete scenario simulation of all possible system malfunctions and the appropriate corrective measures.
5. Provide three (3) copies of each Operating and Maintenance manual for each Division 28 Security Systems, and six (6) copies in electronic form – Disc. Manuals shall be bound in "D-ring" binders with a detailed table of contents.
6. The O & M manuals shall be cross-referenced to the Record Documents and contain the following information for all systems:

    a. Product catalog cut sheets and specifications of all equipment.
    b. "Hands-on" operational description of all equipment and performance features in each system using clear and understandable terminology.
    c. Detailed programming instructions for all systems and all software programs.
    d. Printed copy of all equipment settings.
    e. Copy of all software programs required. Copy shall include most recent version of manufacturer's software, and all final programming settings. Software shall be stored on CD/DVD and USB thumb drive. Provide one CD/DVD copy for each O&M Manual, and one USB thumb drive that is to be left in the rear of the equipment rack.
    f. Troubleshooting procedures to diagnose malfunctions in each system.
    g. Repair procedures for all equipment.
    h. Preventative maintenance procedures for all equipment.
    i. Table listing the model numbers for all equipment in each system including the names and phone numbers of the manufacturer and their representative directly responsible for this project.

L. Record Documents

1. Submit three (3) black line prints, and six (6) electronic copies (disc form) of the "As-built" condition of all systems including:

    a. A set of updated shop drawings showing all Contract changes.
    b. A set of updated product data showing all Contract changes.
    c. "Hands-on" operational description of all equipment and performance features in each system using clear and understandable terminology.
    d. Floor plan showing conduit raceway routing including all equipment rack, cabinet and pull box locations, and conduit sizes.
    e. Complete point-to-point wiring diagrams showing ALL equipment, devices, wire and cable (Signal, power and ground). This document shall also include all terminal block designations, abbreviations and color-coding.
    f. Provide report showing results of all tests required and outlined in individual Div 28 series specifications.
    g. Three (3) copies of approved training session DVD.
    h. Transmittal letter listing delivery and acceptance of complete spare parts inventory.
    i. Copy of warranty statement
    j. Procedures for addressing warranty/repair issues.
    k. Co-ordinate with 017839.

1.5 ADDITIONAL CONSTRUCTION ADMINISTRATION SERVICES BY THE ARCHITECT ENGINEER

A. The Trade Contractor (TC) shall be obligated to reimburse the Owner/User for reasonable costs for the following additional professional services for which the Owner will be required to compensate the Architect Engineer. Reimbursement shall be on an hourly basis at the Architect Engineers standard rates, plus reasonable reimbursable expenses billed at a rate of 1.1 times the actual cost to the Architect Engineer. A deductive change order to the Security Electronics Contract sum will be processed periodically for the cost of such services incurred by the Owner.

1. More than two reviews of the same submittal.
2. Responding to multiple “Requests for Information” (RFI) for which the answer is readily obtainable in the Contract Documents.
3. Preparation and follow up review of more than one “Punch List” for the same items of work.
4. Construction administration services that extend more than 60 days past the initial date of Substantial Completion. These services include, but are not limited to, all work associated with the following: attending pay/progress meetings, on-site observation, and processing the Application and Certification for Payment.

    a. The Architect Engineer will endeavor to notify the Owner and the Security Electronics Contractor prior to performing any work that will result in the aforementioned additional services; and to review any proposed modifications to the contract. Contract modification shall not be contingent, however, upon issuance of any such notice or prior review.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Refer to Section 016000 – Product Requirements

B. All products shall be new (less than one year from manufacture and unused and without blemish or defect).

2.2 SUBSTITUTIONS

A. Submit substitutions in accordance with Section 016000 – Product Requirements. No other method of substitution is acceptable.

B. Deviations from specifications

1. Any deviations from the specifications must be approved 10 calendar days prior to the bid date. This includes changes to the scope of work, equipment substitutions, and changes to the general provision.
2. Changes to the scope of work in the bid proposal are not acceptable. Any proposed change is to be submitted to the Architect Engineer for review. Any approved changes will be listed by addendum prior to the bid opening.
3. Any proposed equipment substitution must be submitted 10 calendar days prior to the bid date. Accompany the request, the contractor must provide manufactures product

specifications for the exact model be substituted. This literature must clearly state all specifications called for in the bidding documents, as well as performance characteristics not specified but inherent to the product listed in the specifications. Any items approved for substitution will be listed by addendum prior to the bid opening. Substitutions after the award of bid will only be allowed in case of discontinued equipment, or if an item of equal or better quality is available and will not affect the contract cost of the system.

4. Changes to the general provisions are not acceptable. Any proposed change is to be submitted to the Architect Engineer for review. Any approved changes will be only listed by addendum prior to the bid opening.
5. When a specified item is found to be discontinued or obsolete by the manufacturer, the Security Electronics Contractor is required to substitute the manufacturer recommended equivalent for that product. If an equivalent is not available, the contractor is instructed to notify the Architect in writing prior to bid time.
6. Where specific products are sole source specified, no substitutions will be allowed.

2.3 MANUFACTURED PRODUCTS

A. Materials and equipment furnished shall be of current production by manufacturers regularly engaged in the manufacture of such items, for which replacement parts are available.

B. Equipment Assemblies and Components

1. All components of an assembled unit need not be products of the same manufacturer; however, all components must be acceptable to the Architect Engineer.
2. Manufacturers of equipment assemblies, which include components made by others, shall assume complete responsibility for the final assembled unit.
3. When more than one unit of the same class of equipment or material is required, such units shall be the products of a single manufacturer.
4. Components shall be compatible with each other and with the total assembly for the intended service.
5. Constituent parts which are similar shall be the product of a single manufacturer.
6. Moving parts of any element of equipment of the unit normally requiring lubrication shall have means provided for such lubrication, and shall be adequately lubricated at the factory prior to delivery.

    a. All factory wiring shall be identified on or provided with the equipment being furnished and on all wiring diagrams and included with O & M manuals.
    b. When factory testing is specified:

7. The Architect Engineer / Owner shall have the option of witnessing factory tests. The Security Electronics Contractor shall notify the General Contractor and the Architect Engineer / Owner a minimum of 15 working days prior to the manufacturer making the factory tests.
8. Four copies of certified test reports containing all test data shall be furnished to the Architect Engineer prior to final inspection and not more than 90 days after completion of tests.
9. When equipment fails to meet factory test and re-inspection is required, the Security Electronics Contractor shall be liable for all additional expenses.

2.4 EQUIPMENT IDENTIFICATION

A. In addition to the requirements of the National Electrical Code, install an identification sign that clearly indicates information required for use and maintenance of items such as cabinets, control devices and other significant equipment.

B. Nameplates shall be laminated black phenolic resin with a white core and engraved lettering, a minimum of 1/4-inch high. Nameplates that are furnished by manufacturer, as a standard catalog item, or where other methods of identification are herein specified, are exceptions.

C. All inputs and outputs are to be clearly labeled. Inputs to include the source location and signal type. Outputs should indicate location signal is sent to.

D. All custom input plates labeling shall be engraved and paint filled or laser etched with a contrasting color as shown on the specification.

E. Any and all user serviceable devices shall be clearly labeled

PART 3 EXECUTION

3.1 INSPECTION

A. Before installing electronic equipment, carefully inspect the installed Work of all other Trades. Verify that all such Work is complete to the point where the installation of electronic equipment may properly commence. Verify that the security electronic closets are free of airborne contaminants prior to the installation of electronic equipment.

B. Verify that all equipment is installed in accordance with all pertinent codes and regulations, the original design, and the referenced standards.

C. In the event of discrepancy, immediately notify the Architect Engineer.

D. Do not proceed with installation in areas of discrepancy until such discrepancies have been fully resolved.

E. Return to original (preconstruction) condition any work disturbed during system installation.

3.2 INSTALLATION

A. Install all equipment in strict accordance with the manufacturer's recommendations, reviewed shop drawings and all applicable codes and standards.

B. Do not attach electrical materials to roof decking, removable or knockout panels, or temporary walls and partitions, unless indicated otherwise.

C. Secure equipment with fasteners suitable for the use, materials and loads encountered. If requested, submit evidence proving suitability.

D. National Electrical Code requirements are applicable to all work.

E. Working spaces shall be not less than specified in the National Electrical Code for all voltages specified.

F. Where the Architect Engineer determines that the Security Electronics Contractor has installed equipment not conveniently accessible for operation and maintenance, equipment shall be removed and reinstalled as directed at no additional cost to the Owner. "Conveniently accessible" is defined as being capable of being reached without the use of ladders, or without climbing or crawling under or over obstacles such as motors, pumps, belt guards, transformers, piping, and duct work.

G. All programming of control panels and recording/storage devices shall be performed in the Security Electronics Contractors shop prior to delivery to the job site. All equipment is to be fully tested.

H. All equipment racks are to be fully assembled and wired in the Security Electronics Contractors shop prior to delivery to the job site. All electronics are to be full tested prior to installation.

3.3 WORK PERFORMANCE

A. Coordinate location of equipment with other trades to minimize interferences.

B. Holes through concrete and masonry in new and existing structures shall be cut with a diamond core drill or concrete saw. Pneumatic hammer, impact electric, hand or manual hammer type drills shall not be allowed, except where permitted by the Architect Engineer as required by limited working space.

C. Holes shall be located so as not to affect structural sections such as ribs or beams.

D. Holes shall be laid out in advance. The Architect Engineer shall be advised prior to drilling through structural sections for determination of proper layout.

E. Any holes created in walls, floors, or ceilings by the Security Electronics Contractor are to be firestopped according to Section – 078413 – Firestopping and all national, state, and local codes.

F. Hangers and other supports shall support only equipment and materials. Provide not less than a safety factory of 5, which shall conform to any specific requirements in the Construction Documents.

G. The Security Electronics Contractor is responsible for repairing and or replacing any damage caused by their workforce at no additional cost to the Owner.

3.4 PROTECTION AND CLEANING OF SYSTEMS AND EQUIPMENT

A. Protect all materials and equipment from damage during storage at the Site and throughout the construction period. Equipment and materials shall be protected during shipment and storage against physical damage, dirt, moisture, cold and rain.

B. Damage from rain, dirt, sun and ground water shall be prevented by storing the equipment on elevated supports and covering them on all sides with securely fastened protective rigid or flexible waterproof coverings.

C. Piping shall be protected by storing it on elevated supports and capping the ends with suitable closure material to prevent dirt accumulation in the piping.

D. All conduits in the slab will be duct taped closed off to avoid water collection, during freezes, snow, rain, and foreign objects entering the conduits.

E. During construction, cap the top of all conduits and raceway installed vertically.

F. During installation, protect equipment against entry of foreign matter on the inside, and vacuum clean both inside and outside before testing and operating.

G. Damaged equipment, as determined by the Architect Engineer, shall be replaced.

H. Painted surfaces shall be protected with removable heavy craft paper, sheet vinyl or equal, installed at the factory and removed prior to final inspection.

I. Repaint damaged “FINISH” paint on equipment and materials with painting equipment and finished with same quality of paint and workmanship as used by the original manufacturer so repaired areas are not obvious.

J. Conduit back boxes, floor boxes, and poke thru’s shall be vacuumed clean prior to the installation of cable.

3.5 IDENTIFICATION

A. Nameplates shall be laminated black phenolic resin with a white core and engraved lettering, a minimum of 1/4-inch high. Nameplates that are furnished by manufacturer, as a standard catalog item, or where other methods of identification are herein specified, are exceptions.

B. Uppercase letters of uniform height; centered on device, cover plate, or enclosure; engraved letters filled with a contrasting color; and all characters made clearly and distinctly.

C. Use abbreviations defined in the contract documents whenever possible. Use plan designations for labeling unless indicated otherwise.

3.6 LABELING

A. All cables shall be properly identified using a high quality thermal transfer-labeling device such as the Kroy K4100 or equal.

B. Cable

1. Provide typewritten labels on both ends of all security electronics system cabling. Locate label within 2” of cable termination. Cover label with clear heat shrink tubing.
2. Label designation to consist of letter indicating type of cable (i.e. V for video, C Control, M for Master Station etc.) and a number. Numerical designations shall be sequential.

    a. Power Outlets

3. Power outlet labels are to be mechanically generated.
4. All power outlets designated for security equipment shall be labeled “SECURITY ELECTRONICS EQUIPMENT ONLY”. On top.
5. Provide a second label on the bottom of the outlet cover plate indicating service panel number and circuit breaker number.
6. Text lettering to be 1/8” high.

C. Rack Mounted Electronic Components

1. Electronic component labels are to be mechanically generated.
2. All inputs are to be labeled identifying source location of signal.
3. All outputs are to be labeled identifying signal destination.
4. Provide ¼" diameter indicator dot showing level setting for all rotary knobs, sliders, and pushbutton switches.
5. Power switches shall be clearly labeled indicating switch is to be left in the on position at all times.

3.7 CABLE TERMINATIONS AND DRESS

A. Installation of signal, video, communication, and control conductors shall adhere to the following:

1. Cables shall be installed in Panduit wire duct (or approved equal) in all cabinets, racks and/or at control panels and consoles for all wire and cable management.
2. Cables shall be secured to equipment cabinet backboards, console members or to other system components using Panduit wire duct (or approved equal). Security Electronics Contractor shall furnish and install cable support posts, cable clamps or wraps, if required, to facilitate system installation where plastic wire duct use is not possible.
3. All cables and/or conductors shall be terminated with approved cable termination connectors compatible with the specific termination.
4. Label all cables on both ends and on all termination points. Refer to section 3.6.B.1.

3.8 CLEANING

A. Refer to Section 017419 – Construction Waste Management and Disposal

B. Daily during construction and prior to User acceptance of the building, remove from the premises and dispose of all packing material and debris caused by work performed under Division 28 Security Systems.

C. Remove all dust and debris from interiors and exteriors of electrical equipment and related junction boxes, floor boxes, and other associated devices. Clean accessible current carrying elements prior to being energized.

D. Upon completion of the work, remove excess debris, materials, equipment, apparatus, tools and the like and leave the premises clean, neat and orderly.

E. All bright metal or plated work shall be thoroughly polished. All pasted labels, dirt and stains shall be removed from the devices.

3.9 COMPLETION

A. Results Expected

1. All equipment and materials shall be in place, all controls shall be set and calibrated, all programming shall be installed and debugged, and all systems shall be demonstrated to be operationally complete.
2. All testing, start-up and cleaning work shall be complete.

3. All documented testing results are submitted and approved by the Architect Engineer. The security electronics contractor at no additional cost shall replace any component of the system that fails to meet the performance as specified.
4. All O & M Manuals and Record Documents are reviewed and accepted.
5. Substantial Completion inspection is performed and granted. The Substantial Completion inspection punch list is completed by the Security Electronics Contractor.
6. All facility training shall be complete and the DVD of the training session is accepted.
7. All warranties are received.
8. Transmittal letter listing delivery and receipt of complete spare parts inventory.
9. Special test equipment is received.

3.10 DEMONSTRATION/INSPECTION

A. Upon completion of approved testing procedure and submittal of testing documentation as described above, the Security Electronics Contractor shall notify the Architect Engineer, who will visit the project for a demonstration of the systems and an inspection of the completed work in conformance with the Construction Documents. It is mandatory for a representative from the Security Electronics Contractor and the Owner directly responsible for the project to be present during demonstration and inspection periods.

B. Items which do not comply with the Contract Documents, or which function incorrectly, will be listed and the list will be submitted by the Architect to the Contractor.

C. After all corrections have been made, the Security Electronics Contractor shall notify the Architect Engineer who will recheck the system for compliance of all items listed. **IF THE ARCHITECT ENGINEER OR OWNER IS REQUIRED TO AGAIN RETURN TO THE SITE FOR FURTHER INSPECTIONS, THE SECURITY ELECTRONICS CONTRACTOR SHALL REIMBURSE ALL LABOR AND TRAVEL EXPENSES**.

3.11 TRAINING

A. Provide training after all final tests and adjustments have been completed. Instruct the User's personnel according to the approved Training Plan specified above in "Training Plan and Documentation." Training shall cover all aspects of systems operation, maintenance and programming, and shall be provided by the responsible Security Electronics Contractor technical representatives.

B. Provide written operating instructions specific to the basic operation of the system. Basic instructions should cover all operational aspects of the system required for basic operation including system powering, signal patching and routing, and level control. These instructions are to be laminated and located with the main system power control.

C. Schedule training sessions to meet the needs of facility personnel as determined by the Owner. Provide training during second and third shifts.

D. Record all training sessions. Submit an edited DVD copy to the Architect Engineer for review and approval. Present all materials used in the training session on the video. Any DVD found to be inferior in recording or material content shall be reproduced at no cost until an acceptable tape is submitted.

E. Provide a minimum of 32 hours of training. All training is to be completed during the time frame established during scheduling with the Owner. Training may not necessarily be in continuous periods.

F. Refer to individual sections for system specific training requirements.

G. Shake Down Period:

1. The SEC shall provide 3 days of system shakedown, which shall include providing a fully trained employee of the SEC who shall provide additional training, system repairs and alterations prior to, during and after the transfer of inmates into the facility. The system shall be fully operational and certified prior to the shakedown period beginning.
2. This person shall be on-site during the 1st shift and be available or on-call during 2nd and 3rd shift.

3.12 MAINTENANCE MATERIALS

A. All special tools for proper operation and maintenance of the equipment provided under this Specification shall be delivered in conformance with Section 017700 Closeout Procedures.

B. Provide spare materials as indicated in Contract Documents and as required for proper maintenance of the Security Systems.

3.13 WARRANTY, WARRANTY SERVICE AND MAINTENANCE

A. Refer to Section 280510 – Maintenance Service and Warranty for Electronic Security

END OF SECTION 28 05 00

SECTION 280510 - MAINTENANCE, SERVICE, AND WARRANTY FOR ELECTRONIC SECURITY

PART 1 GENERAL

1.1 SYSTEM DESCRIPTION

A. Furnish and install all equipment, materials and labor necessary to complete the installation of specific systems described herein and integration of all systems as indicated, specified herein or both. The work includes the following, as well as work not listed below but described elsewhere:

1. Scheduled Maintenance
2. Non-Scheduled Maintenance
3. Documentation of Maintenance
4. Spare Parts Inventory
5. Future Staff Training
6. Third Party Service Contracts

B. It is the intent of this Section to define maintenance services to support all systems included in the 280500 series specifications (excluding conduit and boxes furnished by others but including final connections).

C. The Security Electronics Contractor shall provide maintenance and service as part of the Contract during the two-year guarantee period. The guarantee period shall begin with Owner acceptance of the systems as “complete as specified” not at Substantial completion.

D. Six months prior to the end of the two year guarantee period, the Security Electronics Contractor shall provide a proposal for a three (3) year continued maintenance contract for the complete Security Electronics System. If accepted, the maintenance contract shall take effect at the completion of the initial two (2) year guarantee period.

1.2 PRODUCTS

A. All products used in parts replacement shall meet the specifications for the original equipment. The Architect Engineer must approve any substitutions.

1.3 SPARE PARTS

A. Two GUI including touch screen monitor, CPU, Keyboard and mouse.

B. One case of paper and four replacement cartridges for printer specified.

C. 10 spares of each type of relay used on this project.

D. Two Surveillance camera of each type used

E. 25 fuses of each type used

F. One spare PLC CPU

G. One spare PLC Module of each type used

H. Two spare PLC power supply

I. One spare linier power supply of each type used

J. One spare surveillance desktop monitor

K. One spare intercom master station

L. One spare intercom call station of each type used

M. One spare card reader

1.4 SOFTWARE SERVICE

A. Update software to latest version at project completion.

1. Install and program software upgrades that become available within one year from date of substantial completion.
2. Upgrading software shall include the operating system.
3. Upgrade shall include new or revised licenses for use of software.
4. All upgrades shall include spares.

B. Provide (30) days notice to Owner to allow scheduling and access to system and to allow Owner to upgrade computer equipment if necessary.

PART 2 EXECUTION

2.1 WARRANTY AND WARRANTY SERVICE

A. Warranty

1. The Division 28 series security systems shall be fully guaranteed for a period of two (2) years beginning on the date of Owner acceptance.
2. The guarantee shall include the entire Division 28 series scope of work including all equipment, devices, materials, cable/wire, software and installation as it applies to security electronics.
3. Work shall be guaranteed to be free from defects. Any defective materials or workmanship, as well as damage to the Work of all other Security Electronics resulting from same, shall be replaced or repaired as directed by the Owner for a period of two (2) years from the date of Owner final acceptance. The Security Electronics Contractor shall provide written warranties for all systems and all buildings to the Owner.
4. The guarantee shall exclude acts of God, vandalism, physical abuse or operator misuse.

5. Acceptance by a manufacturer of an order for equipment for this contract signifies acceptance of this warranty. During the warranty period there shall be no charge to the Owner for equipment, material, software, etc. for guarantee work.
6. During the warranty period, there shall be no charges to the Owner for service calls (mileage, labor, travel, expenses, etc.) for warranty work.

B. Warranty Service

1. The Security Electronics Contractor shall provide warranty service as part of this Contract during the warranty period.
2. Warranty service agreement must be submitted separately and must contain the name, voice phone number, facsimile phone number and pager number of the service provider capable of meeting the response times as defined by the Architect Engineer.

3. This service shall consist of the following:

    a. 24-hour staffed phone number.
    b. Technician's factory trained by the manufacturers of the system's components.
    c. Authorized representation of the manufacturer via an agreement of factory support.
    d. Five years experience (minimum) servicing systems of the type included in this project.
    e. Capability of making additions or changes to the software systems used in this project.
    f. Capability of servicing the individual system components and the <u>total</u> security electronics system.
    g. Equipment and knowledge to test all specified equipment and devices.
    h. Current system documentation including but not limited to the following:

        1) Wiring diagrams.
        2) Operation and maintenance manuals.
        3) Software programs.
        4) Other documentation as required to provide assistance to the Owner in the operation and maintenance of the systems.
        5) All documents shall be made available to Owner upon request.
        6) Upon termination of maintenance agreement all system documents shall be furnished to Owner for maintenance continuity.

4. The Owner and/or Architect Engineer shall notify the Security Electronics Contractor in writing, outlining operational malfunctions or defects in the Division 28 series Security Electronics system. This report shall be emailed or faxed to the service provider, which will establish the date and time or problem notification.
5. Upon successful completion of warranty service, the responsible technician shall return a copy of the original service request to the facility with a detailed description of the problem found, and corrective action taken including a list of equipment/parts/software repaired or replaced. The technician shall also sign the on-site service log at the facility.
6. The Security Electronics Contractor shall maintain a repair parts inventory sufficient to maintain the response times specified. All parts used from the Owner's spare parts inventory for warranty service shall be replaced at no cost to the Owner.

2.2 OWNER INSPECTIONS

A. Inspections by the Owner shall consist of "go, no-go" type inspections to determine the operational state of a system. It is not intended that the Owner perform adjustments or modifications for system restoration.

B. The Owner as a result of daily inspections and/or operational use of the systems will initiate non-scheduled maintenance. Categories of maintenance support and the response time for system restoration are defined in NON-SCHEDULED MAINTENANCE below.

2.3 SCHEDULED MAINTENANCE

A. The Security Electronics Contractor shall provide scheduled maintenance as described below.

B. Quarterly Scheduled Maintenance

1. Security Control System

   a. Touch Screens and CPUs (inspect and clean).
   b. Programmable logic controllers.
   c. Test all duress/panic pushbuttons.
   d. Relay cabinets.
   e. Electro-mechanical detention hardware (Note: The Division 11 Detention Equipment Contractor shall perform all maintenance and adjustment of these devices. The Security Electronics Contractor shall verify proper security control system operations only).
   f. Inspect and clean all system filters.
   g. Auxiliary devices such as indication lights, push buttons, door position switches.

2. Video Surveillance System

   a. Verify proper video image at each VMS work station.
   b. Check image quality of each camera.

3. Intercom, Paging and Communication Systems

   a. Verify proper operation of master stations.
   b. Verify proper adjustment of all remote intercom amps.
   c. Verify proper adjustment and operation of all paging amplifiers.

4. Access Control System

   a. Verify proper operation of card readers
   b. Verify proper operation of request-to-exit devices

5. Uninterruptible Power Systems (UPS)

   a. Verify proper voltage and current levels
   b. Exercise UPS function by system power blackout and emergency generator test.

6. Grounding and Surge Protection

   a. Check status of all devices.

b. Perform ground measurements.

2.4 NON-SCHEDULED MAINTENANCE

A. The Security Electronics Contractor shall provide non-scheduled or "on-call" maintenance services in accordance with the following Service Response Categories.

1. Critical: Items which compromise the security of the facility or have an adverse effect on the operations of the facility. Items in this category shall be returned to service within 4 actual hours after receipt of a service call by the Security Electronics Contractor. Service shall be available on a 7-day, 24-hour basis.
2. Sensitive: Items which adversely impact the operations of the facility but are not considered "critical" as defined above. Items in this category shall be returned to service within 24 actual hours after receipt of a service call by the Security Electronics Contractor.
3. Normal: Items which require maintenance support but are not "critical" or "sensitive" as defined above. These are typically items which staff personnel identify and accept that maintenance shall be performed by Security Electronics Contractor during the standard quarterly inspection.
4. The Security Electronics Contractor shall coordinate Remote Access of the Security System for Maintenance, trouble shooting, and any other questions or issues with the owner. Remote access to the Security Network will be partitioned to control the access to the individual systems, I.E. PLC/GUI, Video Surveillance, Access Control, Intercom Paging. Contractor to coordinate access requirements with the owners IT Department.

B. System/Response Category Table

PRODUCT DATA SHEET 1 - SYSTEM		CATEGORY
1. Touch Screen/PLC/Security Control		
a.	All components	Critical
b.	Duress/Panic Pushbutton	Sensitive
2. Video Surveillance System		
a.	VMS Server	Critical
b.	Storage array or component	Critical
c.	Surveillance Camera	Sensitive
d.	VMS Work Station Display	Sensitive
e.	VMS Work Station CPU	Sensitive
3. Intercom System		
a.	Master Station	Critical
b.	Single remote station	Sensitive
c.	Paging	Critical
4. Uninterruptible Power Systems (UPS)		
a.	All components	Critical
5. Surge Suppression		

a. All components Sensitive

2.5 DOCUMENTATION OF MAINTENANCE

A. It shall be the responsibility of the Security Electronics Contractor to maintain all documents and modify drawings, schedules, and other documents as required to effect documentation which reflects the current system or wiring configuration.

B. Create and maintain a maintenance log that details maintenance services provided, system modifications, and software upgrades. One copy of log is to remain at the facility.

C. Upon termination of the service contract, the Security Electronics Contractor shall return all system documents to the Owner.

2.6 SPARE PARTS INVENTORY

A. An inventory of spare parts consisting of at least the quantity of items herein must be provided and maintained by the Security Electronics Contractor to support the maintenance response requirements defined in this document.

B. The spare parts inventory may be comprised of Security Electronics Contractor furnished and/or maintained parts.

C. The Security Electronics Contractor shall maintain a spare parts inventory in excess of the amount indicated in Contract Documents, as he deems necessary to support the maintenance and service requirements of this section.

D. During the maintenance and service period, the Contractor shall maintain a log of all component failures and parts replaced.

E. Six months prior to the expiration of the maintenance and service period, the Security Electronics Contractor shall submit the replaced parts log to the Owner. The Owner shall use the replace parts log to evaluate the on-site spare parts inventory required for future maintenance by the Owner/User.

2.7 FUTURE STAFF TRAINING

A. It shall be the responsibility of the Security Electronics Contractor to train the Owner on new system features or software which may be provided to enhance the system's capability.

2.8 THIRD PARTY SERVICE CONTRACTS

A. The Security Electronics Contractor shall provide a third-party service contract for all equipment supplied that is more efficiently serviced by the third-party company.

B. The service contract shall provide service response times as described above.

C. All third-party service requests shall be acknowledged through the Security Electronics Contractor to verify appropriate service procedures have been followed as outlined in the service manual.

END OF SECTION 28 05 10

SECTION 280511 - BACKBONE SYSTEM CABLING FOR ELECTRONIC SECURITY

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary conditions and Division 1 Specifications Sections, apply to this Section.

1.2 SYSTEM DESCRIPTION

A. General

1. Provide a complete Fiber Optic Backbone Cabling system that supports video voice and data as indicated in Project Documents relative to the implementation of the security electronics system(s).
2. Backbone shall consist of multi-mode fiber.
3. Provide Fiber Optic Backbone system cabling, rack mounted fiber optic termination enclosures, patch cables, terminations and testing for the Fiber Optic Backbone Cabling system as indicated in Project Documents.

B. Exclusions

1. The cabling systems described herein are those to be provided in support of the electronic security system(s) only and are not related to the facilities information transport system specified in Division 27.

PART 2 PRODUCTS

2.1 GENERAL

A. Equipment specified is intended as a reference standard for level of quality.

B. Lists of products and manufacturers are Non-restrictive. Submission of an unnamed product or manufacturer does not require a substitution or change to the Contract Documents, but must comply with requirements for “Comparable Products” as outlined in Section 010 60 00 PRODUCT REQUIREMENTS.

C. Provide materials listed by UL or ETL.

2.2 FIBER OPTIC BACKBONE CABLE

A. Specifications

1. Multi Mode

a.	Core Diameter:	50 +/- 2.5 um
b.	Core Non-circularity:	5% max
c.	Cladding Diameter:	125 +/- 1 um
d.	Core/Clad Concentricity Error:	< 1.5 um
e.	Coating fiber diameter:	245 +/- 10 um
f.	Cladding Non-circularity:	<1%
g.	Coating/Cladding Concentricity Error:	<6 um
h.	Colored Fiber Diameter:	254 um
i.	Numerical Aperture:	.275 +/- .015
j.	Effective Group Index of Ref. @850nm:	1.496
k.	Effective Group Index of Ref. @1300nm:	1.491
l.	Point Discontinuities @ 850 and 1300 nm:	<.08dB
m.	Max. Fiber Loss @850:	3 dB/km
n.	Max. Fiber Loss @1300:	1 dB/km
o.	Minimum Bandwidth @ 850:	200 MHz-km
p.	Minimum Bandwidth @1300:	500 MHz-km
q.	NEC CMP rated	

2. Single mode

a.	Core Diameter:	8.3 um nominal
b.	Cladding Diameter:	125 +/- 1 um
c.	Core/Clad Concentricity Error:	< .5 um
d.	Coating fiber diameter:	245 +/- 10 um
e.	Cladding Non-circularity:	<1%
f.	Coating/Cladding Concentricity Error:	<12 um
g.	Colored Fiber Diameter:	254 um
h.	Effective Group Index of Ref. @1310 nm:	1.466
i.	Effective Group Index of Ref. @1550 nm:	1.467
j.	Point Discontinuities:	.1 dB
k.	Max. Fiber Loss @1310:	.7 dB/km
l.	Max. Fiber Loss @1550:	.7 dB/km
m.	NEC CMP rated	

B. Acceptable Manufacturer

1. Intra Building

a. AMP/Netconnect
b. Commscope/Uniprise/Systimax
c. Panduit/General Cable
d. Hubbell/Mohawk
e. Belden/CDT
f. Multi mode indoor plenum rated cable. Refer to drawings for strand count.

2.3 FIBER OPTIC PATCH PANEL

A. Specifications

1. 14 ga. CRS construction
2. 19 rack mount, 4 RMS (7” high)
3. Modular construction
4. Provide fiber management bend limiting clips
5. Provide strain relief brackets
6. Provide adapter panels to support the fiber optic strand count shown on the plans.

B. Acceptable Manufacturers

1. AMP/Netconnect
2. Commscope/Uniprise/Systimax
3. Panduit/General Cable
4. Hubbell/Mohawk
5. Belden/CDT
6. Leviton

2.4 FIBER OPTIC PATCH PANEL ADAPTOR PLATE

A. Specifications

1. SC duplex multi mode adaptors
2. Provide adaptor panels to support the fiber optic strand count shown on the plans.
3. Ferrell color based on cross-connect field identification color code, TDMM latest addition, chapter 7.

B. Acceptable Manufacturers

1. AMP/Netconnect
2. Commscope/Uniprise/Systimax
3. Panduit/General Cable
4. Hubbell/Mohawk
5. Belden/CDT
6. Leviton

2.5 FIBER OPTIC CONNECTORS

A. Specifications

1. Duplex SC type connector
2. High impact plastic body
3. Zerconia/Ceramic ferrule
4. .3dB typical insertion loss
5. –30dB/-40dB reflectance, Multimode respectively
6. 32° – 131° F operating temperature
7. 12 pound tensile strength
8. Ferrell color based on cross-connect field identification color code, TDMM latest edition, chapter 7.

B. Acceptable Manufacturers

1. AMP/Netconnect
2. Commscope/Uniprise/Systimax
3. Panduit/General Cable
4. Hubbell/Mohawk
5. Belden/CDT
6. Leviton

2.6 FIBER OPTIC PATCH CABLES

A. Specifications

1. Duplex SC connectors
2. Ferrell color based on cross-connect field identification color code, TDMM latest edition, chapter 7.
3. 2 meters in length.
4. Patch cables are to be turned over to the Owner for use in installation of active equipment outside the scope of the project.
5. Furnish mode patch cables to match strand count and configuration as shown on the plans.

B. Acceptable Manufacturers

1. AMP/Netconnect
2. Commscope/Uniprise/Systimax
3. Panduit/General Cable
4. Hubbell/Mohawk
5. Belden/CDT
6. Leviton

PART 3 EXECUTION

3.1 INSTALLATION

A. General

1. Install all fiber cabling in accordance with applicable standards and codes.
2. Maintain fire rating of all penetrations through rated walls during construction.
3. Coordinate fire stopping of all cable runs through floor sleeves with the General Contractor. Refer to Section 078400 - Firestopping.
4. Install all fiber cabling and secure utilizing wire management brackets and hook and loop type (Velcro™) straps. No plastic cable ties shall be used to secure any cabling.

B. Backbone Cabling

1. Install cabling as per manufacturer's instructions.
2. Do not exceed specified pulling tensions.
3. Do not exceed specified bend radius.
4. Provide a 3 meter maintenance loop of fiber cable in the cable tray prior to dropping into the cabinets.

5. All fiber optic cable shall be installed in plenum inner duct.

C. Fiber Optic Termination Enclosures

1. Install all cabling and secure utilizing wire management system.
2. Secure fiber jacket in a minimum of two locations.
3. Install minimum one meter of unjacketed fiber strands coiled on the enclosure routing guides.
4. Terminate and connect all fibers in fiber termination enclosure:

   a. Populate the single-mode fibers on the ports beginning with 1.
   b. Populate the multi-mode fibers on the next available port after the single-mode fibers.

5. Use only hook and loop (Velcro™) type straps to secure and dress fiber cables.

3.2 LABELING

A. General

1. Provide labeling based on ANSI/TIA/EIA-606A administration concepts for all conduits, fiber, patch panels, jacks, bus bars, racks, etc.
2. Provide machine generated typewritten labels, hand labeling is not acceptable

B. Equipment Room Terminating Hardware

1. Provide an identifier for each Patch Panel that incorporates the Cabinet identifier. (e.g. TR2A-RR3-PP1 is the first patch panel in the third relay rack in the first intermediate telecommunications room on the second floor)
2. Provide an identifier for each Patch Panel port that incorporates the Patch Panel identifier. (e.g. TR2A-RR3-PP1-09 is the ninth port on the first patch panel in the third relay rack in the first intermediate telecommunications room on the second floor)

C. Backbone Cable

1. Provide both of the cable's Patch Panel Port identifiers on both ends of all backbone cables.
2. Insure that label is intact after termination of cable.

3.3 TESTING

A. General

1. Certify system is complete and functional.
2. Test all cabling and connections. Perform final functional tests in presence of the Architect Engineer.
3. Complete certified testing report.

B. Fiber Cable Testing

1. All fiber testing shall be performed on all fibers in the completed end to end system.
2. Every fiber shall be tested in both directions with a light source tester.

3. There shall be no splices unless clearly defined in construction documents.
4. Maximum allowable attenuation for 50 micron fiber shall be 3.0 dB per km at 850nm and 1.0 dB per km at 1300 nm.
5. Maximum allowable attenuation for single mode fiber shall be .5 dB per km at 1310 nm and 0.4 dB per km at 1550 nm.
6. All testing shall follow TIA/EIA-TSB-140 (or later revisions of this document) standards.

END OF SECTION 28 05 11

SECTION 280512 - HORIZONTAL CABLING SYSTEM FOR ELECTRONIC SECURITY

PART 1 GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SYSTEM DESCRIPTION

A. General

1. Provide a complete Horizontal Cabling system that supports voice, and data as indicated in Project Documents relative to the electronic security system(s).
2. Provide, equipment room rack mounted termination equipment, equipment room patch cables, work area outlets, work area equipment cables, terminations, labeling and testing for the Horizontal Cabling system as indicated in Project Documents.
3. Provide Fire stopping Materials for Horizontal Cabling as indicated in Project Documents, provide all labor and materials to maintain Fire stopping at all penetrations at all times during construction and to insure adequate Fire stopping at all penetrations at completion.
4. Provide all necessary materials and labor for the horizontal cabling system in all equipment rooms and closets as indicated in project documents.

B. Horizontal Cabling Subsystems

1. Provide a complete UTP horizontal cabling system as indicated in project documents relative to the electronic security system(s).
2. Provide UTP horizontal system cables, equipment room rack mounted UTP termination equipment, equipment room UTP patch cables, work area UTP jacks and faceplates, work area equipment cables, UTP terminations, labeling and testing for the UTP Horizontal Cabling system as indicated in Project Documents.

PART 2 PRODUCTS

2.1 GENERAL

A. Provide materials listed by UL or ETL. All cables shall be marked according to current standards.
B. All cable must be NEC type CMP unless installed in conduit from end to end.

2.2 UTP HORIZONTAL CABLE

A. Specifications

1. ANSI/EIA/TIA Category 6 compliant
2. Quantities and locations as indicated in Project Documents

3. 4 pair, 23 AWG, solid bare annealed copper
4. Flame retardant semi-rigid PVC insulation
5. Longitudinal rip-cord
6. Color based on cross-connect field identification color code, TDMM Latest edition, chapter 7.
7. All cables terminated per T568B.

B. Acceptable manufacturers

1. Panduit
2. Belden
3. Berk-Tek
4. Commscope
5. Superior Essex

2.3 PATCH PANELS

A. Specifications

1. Modular rack mounted
2. Release snap feature on faceplate allowing front access to installed modules.
3. Label version for easy port identification
4. Replacement label/label covers
5. Mount standard EIA 19” rack
6. Jack color to correspond with color of jack at work area outlet location.

B. Acceptable Manufacturers

1. Panduit
2. Belden
3. Berk-Tek
4. Commscope
5. Leviton

2.4 CATEGORY 6 RJ-45 JACKS

A. Specifications

1. Exceeds TIA/EIA-568-B.2 Category 6 and ISO 11801 2nd Edition Class D standards
2. Each jack is 100% tested to ensure NEXT and RL performance and is individually serialized for traceability
3. No punchdown tool required; termination tool ensures conductors are fully terminated by utilizing a smooth forward motion without impact on critical internal components for maximum reliability
4. Can be re-terminated a minimum of twenty times
5. Red termination cap designates Category 6 performance and provides a positive strain relief; helps control cable bend radius and securely retains wires
6. Terminates 4-pair, 22 – 26 AWG, 100 ohm, solid or stranded twisted pair cable
7. Termination cap is color coded for T568A and T568B wiring schemes
8. Accepts 6 and 8-position modular plugs without damage
9. Can be clearly identified with optional labels and icons
10. Colors include blue, white, green, yellow, red, or violet.

B. Acceptable Manufacturers

1. Panduit
2. Belden
3. Berk-Tek
4. Commscope
5. Leviton

2.5 CROSS CONNECT AND PATCH CABLE ASSEMBLIES

A. Specifications

1. ANSI/EIA/TIA Category 6
2. 4 pair RJ45
3. Bootless
4. All patch cables shall be an appropriate length. (this may require custom cable lengths in the telecommunications room)
5. Patch cables shall be constructed with cable of the same manufacturer as installed horizontal cable.

B. Acceptable Manufacturers

1. Panduit
2. Belden
3. Berk-Tek
4. Commscope
5. Leviton

PART 3 EXECUTION

3.1 INSTALLATION

A. General

1. Follow all ANSI/EIA/TIA installation guidelines
2. Follow all cabling solution provider installation guidelines
3. Install all cabling and secure utilizing wire management and hook and loop (Velcro™) Straps. No plastic cable ties shall be used to secure any cabling.

B. Equipment Rooms

1. Install all Horizontal Cable System equipment as indicated in Project Documents
2. Install cable management to support and train cables with spacing as required to meet bend radius and support requirements.

C. Work Area

1. Install all Horizontal Cabling System Work Area equipment and cabling as indicated in Project Documents
2. Do not exceed recommended pulling tensions
3. Route cabling from outlets to patch panel in equipment rooms or closets as indicated on the drawings.

4. Do not exceed 90 meter horizontal length for horizontal cables. Notify the Architect Engineer prior to install if any horizontal runs that have the potential of exceeding 90 meters.
5. Terminate data cabling per T568B wiring method.

    a. Maintain wire twists to within 0.5 inches of termination.
    b. Remove no more than 1.0 inches of cable jacket.

3.2 LABELING

A. Equipment Room Cabinet Labeling

1. Provide each cabinet a laminated black phenolic resin label with a white core and engraved lettering, a minimum of 1/4-inch high.

B. Equipment Room Patch Panel Labeling

1. Provide each Patch Panel with a laminated black phenolic resin label with a white core and engraved lettering, a minimum of 1/4-inch high.
2. Provide permanent, computer-generated labels at each Patch Panel port.

C. Horizontal Cable Labeling

1. Provide permanent, computer generated labels on both ends of every Horizontal Cable, Patch Cord and Work Area Equipment Cable.
2. Example of horizontal wiring label: 1A-A001 1A=Equipment Room number, A=the patch panel, and 001= patch panel port.

D. Work Area Outlet Labeling

1. Provide permanent, computer generated labels at the station faceplate

E. General

1. Provide labeling based on ANSI/TIA/EIA-606 administration concepts
2. Provide typewritten labels, hand labeling is not acceptable

F. Telecommunication Spaces and Pathways

1. Use the identifier ER for the Equipment Rooms
2. Provide a unique identifier for each Equipment Room that indicates the floor and an ordinal designation (e.g. ER2A is the first equipment room on the second floor)
3. Provide an identifier for each cabinet in each equipment room that incorporates the ER identifier (e.g. ER2A-RR3 is the third cabinet in the first equipment room on the second floor).
4. Provide an identifier for each cabling pathway

G. Equipment Room Terminating Hardware

1. Provide an identifier for each Patch Panel that incorporates the cabinet identifier (e.g. ER2A-EC3-PP1 is the first patch panel in the third equipment cabinet in the first equipment room on the second floor)
2. Provide an identifier for each Patch Panel port that incorporates the Patch Panel identifier (e.g. ER2A-EC3-PP1-09 is the ninth port on the first patch panel in the third

equipment cabinet in the first equipment room on the second floor)

H. Work Area

1. Provide an identifier for each Work Area Activation Point that indicates the room number and an ordinal designation (e.g. 142A is the first activation point in room 142).
2. Provide an identifier for each Work Area Activation Point jack that Work Area Activation Point designation (e.g. 142A-2 is the second jack in the first TO in room 142).

I. Horizontal Cable

1. Provide the cable's Patch Panel Port identifier and Work Area Activation Point Jack identifier on both ends of all Horizontal cables.
2. Insure that label is intact after termination of cable.

3.3 TESTING

A. Copper cable testing

1. Test all Category 6 horizontal cabling using a digital cable analyzer and certify that the system is complete and functional.
2. A level IIe or better test unit is required and must be updated to include the requirements of ANSI/TIA/EIA-568-B.
3. The basic tests required are:

   a. Wire Map
   b. Length
   c. Attenuation
   d. NEXT (Near and crosstalk)
   e. Return Loss
   f. Propagation Delay
   g. Delay Skew
   h. PSNEXT (Power sum near-end crosstalk loss)
   i. PSELFET (Power sum equal level far-end crosstalk loss)

END OF SECTION 28 05 12

SECTION 280513 - CONDUCTORS AND CABLES FOR ELECTRONIC SECURITY

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary conditions and Division 1 Specifications Sections, apply to this Section.

1.2 SYSTEM DESCRIPTION

A. General:

1. Provide a complete cabling system that supports, PLC/GUI, Surveillance, Intercommunications and other systems as indicated in Project Documents.
2. Provide all necessary materials for the cabling system in all equipment rooms and at all field devices as indicated in the project documents.

B. PLC/GUI Cabling Subsystems:

1. Provide a complete cabling system to support all door control field devices, power supplies, controllers, network devices and graphical user interface devices.
2. Include all termination and cable management as described in section 280500.

C. Video Surveillance Cabling Subsystem:

1. Provide a complete cabling system to support all video surveillance field devices, control and monitoring equipment and headend equipment.
2. Include all termination and cable management as described in section 280500.

D. Intercom Cabling Subsystem:

1. Provide a complete cabling system to support all intercom field devices, master stations, and controllers, expanders, amplifiers and ancillary devices.
2. Include all termination and cable management as described in section 280500

E. Access Control

1. Provide a complete cabling system that supports, Access Control, Request to Exit, Intercommunications and other systems as indicated in Project Documents.

F. Include all termination and cable management as described in section 280500.

PART 2 PRODUCTS

2.1 GENERAL

A. Provide materials listed by UL or ETL.

B. All cable must be NEC type CMP and installed in conduit from end to end.

2.2 MULTICONDUCTOR SHIELDED PAIRED CABLING

A. Specifications

1. #18 AWG 19 x 30 stranded tinned copper conductor
2. Overall aluminum polyester tape foil shield 100% coverage
3. 18 AWG drain wire
4. Pair count as appropriate to the application
5. Type CM jacket

B. Acceptable manufacturers

1. Belden
2. West Penn Wire
3. Commscope
4. Mohawk

2.3 MULTICONDUCTOR UNSHIELDED PAIRED CABLING

A. Specifications

1. #18 AWG 19 x 30 stranded tinned copper conductor
2. Pair count as appropriate to the application
3. Type CM jacket

B. Acceptable manufacturers

1. Belden
2. West Penn Wire
3. Alpha

2.4 LOW VOLTAGE BUILDING WIRE

A. Specifications:

1. Conform to system manufacturer's requirements regarding size and type.
2. Conforms to UL Article 444 for low smoke and low flame and rated for use in air plenums.
3. Conforms to NEC 300-21, 300-22, and 725-2.
4. Low voltage wire shall be type THHN, THWN, or TFFN as appropriate to the application.
5. All low voltage building wiring shall be installed in conduit.

B. Acceptable manufacturers

1. Atlas Wire
2. Cerrowire
3. Arthur J. Hurley Company

PART 3 EXECUTION

3.1 INSTALLATION

A. General:

1. Follow all ANSI/EIA/TIA installation guidelines
2. Follow all manufacturer installation guidelines
3. Follow all applicable NFPA and NEC codes

B. Cabling

1. Do not exceed recommended pulling tensions
2. Use only hook and loop type (Velcro™) Straps to secure and dress cabling.

3.2 LABELING

A. Equipment Room Cabinet Labeling:

1. Provide each cabinet with a laminated black phenolic resin label with a white core and engraved lettering, a minimum of 1/4-inch high.

B. Horizontal Cable Labeling:

1. Provide permanent, computer generated labels on both ends of every Horizontal Cable, Patch Cord and Equipment Cable

C. General:

1. Provide labeling based on ANSI/TIA/EIA-606 administration concepts
2. Provide typewritten labels, hand written labeling is not acceptable

END OF SECTION 28 05 13

SECTION 280526 - GROUNDING AND BONDING FOR ELECTRONIC SECURITY

PART 1 GENERAL

1.1 SYSTEM DESCRIPTION

A. Furnish all materials and labor necessary to complete the installation of specific systems described herein and integration of all systems as indicated, specified herein or both. The work includes the following, as well as work not listed below but described elsewhere:

1. Surge Protectors.

    a. Protection of exterior power circuits
    b. Protection of exterior data circuits
    c. Protection of exterior signal circuits
    d. Protection of power circuits entering equipment racks

2. Ground Circuits

    a. Ground circuitry for proper dissipation of lightning, voltage spikes, surges, transients and as required for life safety.

3. Back Up Power

    a. All microprocessor-based equipment shall be powered by an un-interruptible power supply (UPS). UPS is provided under division 26.

B. Security systems shall utilize the telecommunications grounding network outlined in 270526 and shown on the drawings.

PART 2 PRODUCTS

2.1 GENERAL

A. Equipment specified is intended as a reference standard for level of quality.

B. Lists of products and manufacturers are Non-restrictive. Submission of an unnamed product or manufacturer does not require a substitution or change to the Contract Documents, but must comply with requirements for “Comparable Products” as outlined in Section 010 60 00 PRODUCT REQUIREMENTS.

C. Provide materials listed by UL or ETL.

2.2 POWER LINE SURGE PROTECTION

A. Specifications

1.	Load Rating:	20 amps at 120 volts
2.	Limiters:	Series surge reactor current limiter. Cascaded auto-tracking dual polarity voltage limiter. Dual pulse inverters.
3.	Clamping Voltage Onset:	172 volts nominal (2 volts above peak line voltage, auto tracking)
4.	Filter:	With 50 ohm load: 3 dB @ 3 kHz; 38 dB @ 100 kHz; 50 dB @ 300 kHz; 50 dB @ 5 MHz; 50 dB @ 30 MHz.
5.	Let-Through Slew Rate:	5000 volt/us disturbance reduced to 28 volts/us within power wave envelope; less than 10 volts/us outside power wave envelope.
6.	Snubber:	Instant reacting snubber for fast-rising surges generated within the building.
7.	Max Applied Surge Pulse Voltage:	6000 volts (1.2 x 50 us pulse)
8.	Max Applied Surge Pulse Joule Rating: (8x20 us)	Unlimited, due to current limiting.
9.	Max Applied Surge Pulse Current:	100,000 amperes (8x20 us)
10.	UL 1449-2 Adjunct Classification Test Results:	1000 surges, 6000 volts, 3000 amps, C1 pulse, measured suppressed voltage 290 volts no failures.

B. Acceptable Manufacturer

1. SurgeX SX20-NE/RT, wall-mount applications. SurgeX SX2120, rack mount applications. Provide one power conditioner for each 20-amp circuit feeding security electronics equipment including access control, intercom, and CCTV.
2. Approved Equal.

2.3 DATA LINE SURGE PROTECTION

A. Specifications

1.	Primary Tech:	Bipolar Silicon Avalanche Diode
2.	Operating Frequency:	DC to 30 MHz
3.	Response Time:	<5 nanoseconds
4.	Protected Lines:	Two pairs
5.	Peak Pulse Energy Disp:	10 joules each mode
6.	Interface:	Wire clamp terminals
7.	Current Rating:	7 amps max
8.	Series Impedance:	<.01 ohms
9.	UL497B listed	

B. Acceptable Manufacturer

1. Northern Technologies PLP-S series surge protectors.
2. Ditek

3. Edco

2.4 RS-232 SURGE PROTECTION

A. Specifications

1.	Max Operating Voltage:	/- 20 V
2.	Typ. Leakage current:	5 u amps
3.	Max Data Rate:	22 kbps
4.	Max Surge Current (10x1000usec):	43 amps
5.	Max Clamp Voltage :	35 volts
6.	Max Transient Voltage :	6 kV
7.	Clamp Response Time:	< 1 nanosecond
8.	UL 497B listed	

B. Acceptable Manufacturers:

1. Edco SRS-232 series surge protector
2. Ditek
3. Northern Technologies

2.5 GROUNDING BUSS BAR

A. Specifications

1.	Predrilled solid copper	
2.	NEMA standard bolt hole spacing	
3.	0.25” thick minimum	
4.	Minimum dimensions: required	4” high x 12” wide size to accommodate connections.
5.	Mounting:	Minimum 2” insulated standoffs.
6.	Cover:	Lettered plexiglass as detailed in drawings.

B. Acceptable Manufactures

1. Panduit
2. Harger
3. Andrew

2.6 GROUNDING CONDUCTORS

A. Specifications

1.	Gauge:	As indicated on drawings
2.	Insulation:	Green PVC 600 volt rated

B. Acceptable Manufacturers

1. Harger
2. Tessco
3. Kris-Tech

2.7 TWO HOLE CODE CONDUCTOR

A. Specifications
   1. UL listed for use up to 35 KV
   2. Temperature rated 90 degrees Celsius
   3. CSA certified to 600V
   4. Meets J-STD-607-A
   5. Painting piercing washers required

B. Acceptable Manufacturer
   1. Panduit
   2. Harger
   3. Andrew

PART 3 EXECUTION

3.1 INSTALLATION

A. The System shall be installed by qualified personnel in strict compliance with manufacturer's instructions.

B. Wiring shall be color coded, uniform and in accordance with national electric codes and manufacturer's instructions.

C. Equipment shall be firmly secured, plumb and level.

D. All cable shall be tagged and identified.

E. Coordinate all work with other trades.

F. Ground all equipment as per manufacturer's recommendations, IEEE 1100, NEC, and EIA/TIA guidelines.

G. Provide equipment grounding conductor from equipment grounding lugs to ground bar. Size conductor based on length; see drawings for sizing requirements.

H. Provide a green insulated grounding conductor from rack to ground bar.

I. Provide secondary surge protection for all copper cable entering the building.

J. Grounding of security cables and peripheral equipment shall be installed per manufacturer's direction to eliminate noise induction and achieve optimum system performance.

K. The Trade Contractor shall provide power line surge and noise suppressor/filters for all equipment proposed. These devices shall buffer all video, control, and paging systems.

3.2 SYSTEM INITIALIZING AND PROGRAMMING

A. The power system shall be turned on and adjustment made to meet requirements of the specification and on-site conditions prior to powering any security systems.

B. Verify the output voltage of each power source outlet is within NEC guidelines for variation in voltage.

C. All UPS units shall be fully charged prior to powering any security systems.

3.3 GROUNDING

A. All equipment shall be grounded in accordance with the NEC, these specifications, and the equipment supplier's recommendations. Discrepancies shall be brought to the attention of the Architect Engineer for resolution prior to execution of the work.

B. Each equipment cabinet shall be bonded and grouped cabinets shall be bonded together and connected at a single point on ground buss bar.

3.4 LABELING

A. Provide an identifier for each Grounding Bus bar that incorporates the identifier of the space the bus bar serves.

B. Label both ends of all grounding conductors with both bus bars connected.

3.5 SPARE PARTS

1. Refer to section 28 05 10

3.6 SURGE PROTECTION

A. All security metallic data and video lines entering or leaving a building shall be protected with surge protection devices. This specification also applies to field devices mounted on the exterior of the building.

B. Grounding of protective devices shall be in accordance with the manufacturer's recommendations and/or as described in these specifications and drawings.

C. All signal line protective devices shall be located at the terminal point nearest the cable interface with the exterior cable plant. Devices shall be mounted to the back panel of the cabinet. Provide separate enclosure for all surge protection devices mounted in equipment cabinets.

3.7 SYSTEM TEST PROCEDURES

A. The System shall be completely tested to assure that all components are hooked up and in working order. Inspect system for defects. Correct all causes of such defects. If the cause is outside of the scope of the 28 series scope of work, promptly notify the Architect Engineer in writing, indicating the cause of the defect and suggested corrective procedures.

B. Provide written documentation showing all test results.

C. The System shall be final tested in the presence of the Architect Engineer.

3.8 OWNER INSTRUCTION

A. Instruct Owner on replacement of all user serviceable components including surge protectors, UPS units, breakers, and fuses.

END OF SECTION 28 05 26

SECTION 281116 - CABINETS AND ENCLOSURES FOR ELECTRONIC SECURITY

PART 1 - GENERAL

1.1 SYSTEM DESCRIPTION

A. Furnish and install all equipment, materials and labor necessary to complete the installation of specific systems described herein and integration of all systems as indicated, specified herein or both. The work includes the following, as well as work not listed below but described elsewhere:

1. Cabinets
2. Non-standard manufacturer furnished enclosures and back boxes

PART 2 - PRODUCT

2.1 GENERAL

A. Equipment specified is intended as a reference standard for level of quality.

B. Lists of products and manufacturers are Non-restrictive. Submission of an unnamed product or manufacturer does not require a substitution or change to the Contract Documents, but must comply with requirements for “Comparable Products” as outlined in Section 010 60 00 PRODUCT REQUIREMENTS.

C. Provide materials listed by UL or ETL.

2.2 FREE STANDING ELECTRONIC EQUIPMENT CABINETS

A. Specifications

1. Provide freestanding equipment cabinets to house 19” rack mountable equipment in the equipment rooms. Each cabinet shall have a rectangular frame with removable top panel, side panels and doors. Installed cabinets shall include thermal, power, and cable management accessories that control airflow through the cabinet and keep signal and power cables separate and organized
2. The cabinet frame shall be rectangular with four corner posts, manufactured from steel with welded frame construction. The sides of the frame shall be punched at the top and bottom with a hole pattern to allow attachment of equipment mounting rails and thermal, cable and power management accessories. The cabinet frame shall support 2000 lbs of equipment.
3. The cabinet shall be 27.6” wide by 36.3”deep by 88.8” high when doors, top panel and side panels are installed. Leveler feet will add approximately 1” to the height of the frame/cabinet.

4. Each cabinet shall include two pairs of equipment mounting rails. Mounting rails shall bolt to the side of the cabinet frame at the top and bottom of the frame and shall be adjustable in depth to provide front and rear support for equipment. Equipment Mounting Rails shall be spaced horizontally to support 19" wide EIA-310-D compliant rack-mount equipment and shall provide up to 30.3" of rail-to-rail depth for equipment. Mounting rails shall be square-punched according to the EIA-310-D Universal hole pattern with equipment mounting holes on alternating 5/8" – 5/8" – 1/2" vertical hole centers. Square-punched holes shall accept cage nut hardware with various threads. Rack mount spaces or units (RMU) shall be 1-3/4" high and shall be marked and numbered on the mounting rails. Numbering shall start at the bottom of the rail. Mounting rails shall provide 48 RMU for equipment
5. The cabinet shall include a solid top panel with one 3" x 11.5" cable access port located near the center of the frame. The cable access port shall be plastic with a brush seal to allow easy addition and removal of cables while limiting bypass airflow.
6. The cabinet shall include two locking solid side panels with spring loaded latches for easy installation and removal. The cabinet shall be designed to allow baying with or without side panels installed.
7. The cabinet shall include a single front door with a perforated metal panel, hidden tamper-resistant hinges with quick-release hinge pins and a swing handle. The door shall be removable and reversible to open from the right or left. The door shall open to 150° when the cabinet is bayed with other cabinets. The front door shall have a single-point slam latch with a keyed lock.
8. The cabinet shall include a Single rear door with a perforated metal panel, hidden tamper-resistant hinges with quick-release hinge pins and a swing handle. The door shall be removable and reversible to open from the right or left. The door shall open to 150° when the cabinet is bayed with other cabinets. The front door shall have a single-point slam latch with a keyed lock.
9. The cabinet frame, top panel and side panel shall be manufactured from steel. The door frames shall be manufactured from steel and aluminum. Door panels shall be steel. The door handle, side panel latches, rear door hinges and top panel cable access ports shall be plastic. The cabinet frame and front and rear door shall be welded and bolted. Cabinet components shall assemble with hardware.
10. The mounting rails, top panel, side panels and doors shall be electrically bonded to the cabinet frame.
11. The cabinet shall be UL Listed as an Information Technology and Communications Equipment Cabinet, Enclosure and Rack System to standard UL 60950 under category NWIN. UL Listing will be stated in the manufacturer's product literature.
12. The metal components of the cabinet frame, top panel, side panels, and doors shall be painted black with epoxy-polyester hybrid powder coat paint. The mounting rails shall be zinc-plated and silver-colored. Plastic components shall be black.
13. The cabinet shall include (4) leveling feet, (4) clamps for securing the leveling feet to the floor, cage nuts of size and type required to mount all equipment and a means for bonding the cabinet to the Telecommunications Grounding Busbar.

B. Acceptable Manufacturers

1. Atlas Soundolier
2. Middle Atlantic
3. Lowell
4. Approved Other

2.3 MISCELLANEOUS EQUIPMENT RACK PANELS AND VENTS

A. Blank Panels

1. Specifications

a. 16 gauge steel.
b. Flanged top and bottom.
c. Durable textured black powder coat finish.
d. Available in 1-6 space sizes.

2. Acceptable Manufacturers
3. Middle Atlantic SB Series
4. Atlas Soundolier
5. Lowell

B. Vent Panels

1. Specifications

a. 1/16” diameter hole with 1/8” staggered centers. 23% open area.
b. 16 gauge perforated steel.
c. Flanged top and bottom.
d. Durable black powder coat finish.
e. Available in 1-4 space sizes.

2. Acceptable Manufacturers

a. Middle Atlantic VTF Series
b. Atlas Soundolier
c. Lowell

2.4 FREE STANDING EQUIPMENT CABINET COOLING FAN

A. Specifications

1. 115V 10” fan
2. Ball bearing design
3. Fan guard
4. Proportional speed control
5. Free air CFM, 500
6. Thermostatic fan control

B. Acceptable Manufacturer

1. Middle Atlantic MW-10FT-FC fan and control. Furnish one for each free standing equipment cabinet. Provide vent blockers in accordance with manufacturers recommendations.
2. Lowell
3. Atlas Sound

2.5 POWER DISTRIBUTION UNITS

A. Specifications

1. 120 VAC output nominal
2. Max total current draw 16 Amps
3. NEMA L5-20P single phase locking plug
4. NEMA 5-20R receptacles (quantity of ??)
5. One, 3 meter line cord
6. Vertical rack design

B. Acceptable manufacturers

1. APC AP7530
2. Middle Atlantic
3. Lowell
   CPI

2.6 NEMA RATED SECURITY EQUIPMENT ENCLOSURES

A. Specifications

1. All equipment enclosures installed indoors shall be NEMA 12 enclosures.
2. All equipment enclosures installed outside or exposed to weather shall be NEMA 4X enclosures.
3. Provide double door, continuous hinge enclosures
4. Enclosures shall be constructed of 14 gauge rolled steel, minimum.
5. Enclosure doors shall be furnished with key lock-able doors with all Enclosures under Division 28 keyed alike.
6. All enclosures shall be furnished with removable steel back panels for mounting equipment.
7. 60” x 48” and larger enclosures will be equipped with floor standing “feet”
8. Enclosures shall be grounded as specified in Section 28 05 26.
9. All enclosures shall be furnished with black-on-white laminated plastic nameplates identifying each cabinet.
10. Enclosures finish shall be ANSI 61 gray inside and out.
11. Enclosures shall be sized in strict accordance with the NEC. Minimum size is as indicated on the drawings.
12. Enclosure back panels shall be furnished with a grounding lug to be used to connect the cabinet to the signal grounding system specified in section 28 05 26.
13. Enclosures shall be furnished with cross-ventilated, forced-air cooling to maintain the optimum temperature performance range of the equipment.

B. Acceptable Manufacturers

1. Hoffman.
2. Wiegmann
3. Hammond Manufacturing
4. Saginaw Control and Engineering

PART 3 - EXECUTION

3.1 INSTALLATION

A. The System shall be installed by qualified personnel in strict compliance with manufacturer's instructions.

B. All equipment cabinets are to be assembled and tested in the Security Electronics Contractor's facility prior to on-site installation. With the exception of field wiring, all interconnecting cables should be terminated and installed. All power distribution shall be completed.

C. Wiring shall be color coded, uniform and in accordance with national electric codes and manufacturer's instructions.

D. Equipment shall be firmly secured, plumb and level.

E. Cabinets shall be installed with the minimum NEC clearance of three feet in the front and three feet in the rear of the cabinet.

F. All cable shall be tagged and identified.

G. Provide Panduit IN-Cabinet cable management system. segregate cabling into groups based on signal type and voltage.

H. All power cables lengths are to be kept to a minimum and plugged into the nearest power outlet. Additional cable length shall be bundled and tied together using nylon cable ties.

I. Maintain separation between 120VAC power cables and all signal level cables. When necessary, cross 120VAC power cables perpendicular to all other cable types.

J. Coordinate all work with General Contractor and other trades contractors.

K. Grounding of audio cables and peripheral equipment shall be installed per manufacturer's direction to eliminate noise induction and achieve optimum system performance.

L. All entrance and exit conduit shall utilize grounding bushings to terminate the conduit to the equipment enclosure. Route a green insulated ground conductor to the TMGB/TGB. See drawings for conductor sizing based on length.

M. Blank panels and vent panels shall be used to fill all unused rack space.

N. Every equipment rack shall be equipped with a ventilation fan and adequate venting. The fan shall be installed to bring air in from the bottom of the rack, drawing the cool air up and exiting out the top.

O. Provide security covers for all rack mounted electronic components that do not require user interface.

P. The Trade Contractor is responsible for 120VAC power distribution within the equipment racks.

Q. Upon completion of the work, remove excess debris, materials, equipment, apparatus, tools etc. and leave the premises clean, neat and orderly.

3.2 SYSTEM TEST PROCEDURES

A. Verify that all doors open and close without obstruction.

B. Verify that cabinet fans are capable of circulating cool air throughout the equipment rack.

C. Verify that all door locks function properly.

D. Provide written documentation showing all test results.

E. The system shall be final tested in the presence of the Architect Engineer.

END OF SECTION 28 11 16

SECTION 28 13 00 - ACCESS CONTROL SYSTEM FOR ELECTRONIC SECURITY

PART 1 - GENERAL

1.1 SYSTEM DESCRIPTION

A. Furnish all materials and labor necessary to complete the installation of specific systems described herein and integration of all systems as indicated, specified herein or both. The work includes the following, as well as work not listed below but described elsewhere:

1. Furnish and install a complete and functional access control system. Provide coordination to ensure that the system furnished includes integration of or interfacing to all devices and systems.
2. Provide programming that integrates control and monitoring of devices indicated in the project documents.
3. Access control system shall interface with the PLC Security Controls Systems allowing full control and monitoring of the access control system thru the PLC graphical user interface.
4. Proximity card readers shall interface with the access control system. Card data base, door schedules, event schedules, etc. will be maintained on the access control software.
5. Access control panel relay outputs shall interface with the security controls systems. Valid card reads shall initiate relay closures that in turn initiate the door open sequence.
6. Access control panel relay feeds PLC input as valid read request to exit.
7. Electro mechanical locking devices and door position switches shall terminate to the PLC I/O.

B. Furnish all software and programming labor necessary to complete the installation of specific systems described herein and integration of all systems as indicated, specified herein or both. The work includes the following, as well as work not listed below but described elsewhere:

1. Programming of Access Control Computer and Controllers. Include programming that implements system management, control, and information storage data bases.

C. System Configuration

1. The access control system shall be a modular and network capable system. The system shall have the ability of handling multiple remote sites and be compatible with various reader technologies supported simultaneously. The system shall allow for easy expansion or modification of readers, inputs, and outputs. The system control at the central computer location shall be under a single software program control, shall provide full integration of all components, and shall be alterable at any time, depending upon the facility requirements. Reconfiguration shall be accomplished on-line through system programming, without hardware changes.
2. Access control functions shall include, validation based on time of day, day of week, holiday scheduling, automatic or manual retrieval of cardholder photographs, and access validation based on positive verification of card, card/PIN, and PIN.
3. Utilizing assigned passwords, it shall be possible to define the levels of system operation for each individual Operator. Operator Actions range from basic monitoring

to full control of the system databases.

4. The method of communication from remote locations to the central components shall be transparent to the user.
5. After installation, the OWNER shall be able to perform hardware configuration changes as desired without the services of the Trade Contractor.
6. Equipment repair shall be able to be accomplished on site, by module replacement, utilizing spare components.
7. The system programming shall be user-friendly Windows environment (use conventional “Title Bar”, “Menu Bar”, “Tool Bar” and “Status Bar”) and allow mouse control of key functions. The programming shall be MENU driven and include on-line “Documentation”, “Help” or “Tutorial” information, as well as on-line data entry examples. The software shall utilize combo boxes for all previously entered system-required data. The system shall provide supervised alarm point monitoring. Upon recognition of an alarm, the system shall be capable of displaying alarm information in text format, on a graphic floor plan, and switching video surveillance cameras that are associated with the alarm point. The system shall be capable of arming or disarming alarm points both manually and automatically, by time of day, and day of week.

PART 2 PRODUCTS

2.1 GENERAL

A. Equipment specified is intended as a reference standard for level of quality.
B. Lists of products and manufacturers are Non-restrictive. Submission of an unnamed product or manufacturer does not require a substitution or change to the Contract Documents, but must comply with requirements for “Comparable Products” as outlined in Section 010 60 00 PRODUCT REQUIREMENTS.
C. Provide materials listed by UL or ETL.

2.2 CONTROLLER

A. Specifications

1. The controller board shall be microprocessor based, incorporating Flash ROM (firmware) downloadable from the Host Computer, RAM (User Information, System Setups, Event Transaction Buffer) and a Clock/Calendar. The ROM shall be modularly upgradeable in the field for enhancements to system features. Fuses shall protect all powered connections to the controller board. All wiring connections to the controller board shall be to "Phoenix" type screw terminals. Each door connection shall consist of terminals for two readers, one 10 Amp rated Form C dry output relay for lock control, and one input for monitoring a status switch, a request-to-exit device, and a tamper switch. There shall be status indicator lights for active relays, as well as diagnostic indicator lights to aid in system troubleshooting. There shall be dedicated alarm output relay/s for external reporting of the following conditions: Alarm; Duress; Tamper; and Trouble.
2. All controllers shall be mounted in the Security electronics equipment rack. Controllers shall be securely fastened to the enclosure.
3. The controller shall have an internal power supply that shall accept 50 Hz/ 200 - 240 VAC, or 60 Hz/100 - 120 VAC. The primary side of the power supply shall be protected with a fuse. The power supply shall provide 28 VDC power to the controller board, internal battery charger, selected card readers, and reader interface boards.

4. The controller shall have an internal standby battery that is capable of running the system during AC power interruptions. A charging circuit incorporated into the controller board shall recharge it.
5. A maximum of 5 expansion boards can be installed in each controller, with the exception of 4 in the 1-64 relay expansion board
6. The controller shall be capable of accepting up to 32 additional supervised alarm inputs, in increments of 8. The sensitivity of the line supervision shall be 2%. The alarm expansion boards shall be mounted in the controller cabinet and connect to the controller board via an expansion bus cable. This option shall be limited to 16 additional supervised alarm inputs for the 16-zone alarm input controller.
7. The two access control and 1 alarm monitoring controllers shall be capable of accepting up to 32 additional Form C, 2 Amp rated relay outputs in increments of 8. The 1 - 32 relay controller shall accept up to a maximum of 24 additional Form C, 2 Amp rated relay outputs in increments of 8. The 1 - 64 relay controller shall not accept any additional relay outputs. These outputs shall be used for control applications other than standard door access, such as elevator floor control, local door annunciators, HVAC interface, etc. The relay expansion boards shall be mounted in the controller cabinet and connect to the controller board via an expansion bus cable.
8. The controller shall be capable of expanding the CODE database up to a maximum of 132,000 Users with the addition of a memory expansion board. The board shall be mounted in the controller cabinet and connect to the controller board via an expansion bus cable.
9. The controller shall be capable of expanding the event transaction buffer up to a maximum of 20,000 events and 2,000 alarms with the addition of a memory expansion board. The board shall be mounted in the controller cabinet and connect to the controller board via an expansion bus cable.
10. The control panels shall utilize an intelligent reader interface to communicate with card readers of various types. The interface shall be microprocessor based and allow data formats including ABA magnetic stripe, Wiegand (26 to 55 bit), Proximity, Bar Code, Touch Memory, Barium Ferrite, RF and Biometric. The interface shall utilize a digitizing algorithm, which shall convert the card data to a unique number, thus, eliminating the need for facility codes. A single interface shall support both entrance and exit readers with keypads associated with each door. The interface shall be U.L. Listed to U.L.294. The reader interface shall be included as standard in all Scramble Pads.

B. Acceptable Manufacturers

1. Hirsch Electronics Digi*trac Series Control Panels. Provide quantity and configuration as required to support quantity of doors shown on plans. Associated controller is to remain on the same floor as the door controlled.

    a. Hirsch Identiv Velocity M8N eight door controller.
    b. Lenel
    c. Approved Equal

2.3 ACCESS CONTROL SERVER

A. Specifications

1. 1RU Rack Mount
2. Windows Server 2012 standard, 64 bit OS
3. Intel Xeon E5-2603 Processor 1.8 GHz 4C 10M 6.4GT Hyper T 80 Watt

4. 16 GB 1RX4 RDIMM DDR3 1600
5. (4) 1TB 3.5" SATA enterprise hard drive 7.2K, 6 GB/s Hot Swap
6. Slim SATA DVD Optical
7. Mouse
8. Keyboard
9. Single monitor video card
10. Intel Pro/1000 PT Dual Port 1GB Ethernet Adapter
11. Dual 800 Watt Redundant PS
12. 3 Year onsite service

B. Acceptable Manufactures

1. Lenovo Thinkserver RD530
2. HP
3. Hirsch Identiv
4. Approved Equal

2.4 RACK MOUNT KEYBOARD/MOUSE/MONITOR

A. Specifications

1. Slide out rack mount keyboard monitor
2. Full 105 key style keyboard and touchpad
3. Installed keylock for security
4. 1280 x 1024 screen resolution
5. LCD can be in open position for system monitoring while keyboard is closed
6. PS/2 and USB adapter

B. Acceptable Manufacturer

1. Middle Atlantic RM-KB-LCD17
2. Approved Equal

2.5 POWER SUPPLIES

A. No access control power supplies are required. Switching of power to the door locks shall be accomplished via the PLC and its associated interposing relays. Access control system outputs shall only be configured as request to exit inputs to the PLC.

2.6 ALARM LINE MODULES

A. Specifications

1. High Security Alarm Inputs
2. 2% Line Supervision
3. Monitor up to 3 Discrete Inputs

    a. Alarm or Door Status
    b. Alarm Masking or Request to Exit
    c. Tamper Alarm, Tamper Secure

B. Acceptable Manufacturer

1. Hirsch Identiv Electronics - DTLM3
2. Lenel
3. Approved Equal

2.7 ALARM EXPANSION BOARD

A. Specifications

1. 8 Supervised inputs
2. 2% line supervision
3. Mounted in controller cabinet

B. Acceptable Manufacturer

1. Hirsch Identiv- AEB8
2. Lenel
3. Approved Equal

2.8 NETWORK INTERFACE BOARD

A. Specifications

1. Optically isolated
2. RS-485 and RS-232 ports
3. 115 KBps Baud Rate
4. Supports AES encryption
5. Mounts inside model 8
6. Screw terminal connections

B. Acceptable Manufacturer

1. Hirsch Identiv– SNIB2
2. Lenel
3. Approved Equal

2.9 RELAY EXPANSION BOARD

A. Specifications

1. Provide 8 expansion relay outputs
2. 2 amp form C SPDT contacts
3. Up to 5 boards/40 relays per controller

B. Acceptable Manufacturer

1. Hirsch Identiv- REB-8
2. Lenel
3. Approved Equal

2.10 MATCH READER INTERFACE BOARD

A. Specifications

1. Dual technology entry and exit control
2. Provides 5VDC @ 250mA reader power
3. UL Listed

B. Acceptable Manufacturer

1. Hirsch Identiv– MRIB
2. Lenel
3. Approved Equal

2.11 WALL MOUNT PROXIMITY READERS

A. Specifications

1. 13.56 MHz.
2. 3.25” iClass Card maximum read range
3. 2” iClass Key/Tag maximum read range
4. Compatible with iClass 2kbits, 16kbits, 32kbits
5. Encrypted algorithm data transmission between card and reader
6. 64-bit authentication key

B. Approved Manufacturer

1. HID iClass readers. Provide model 6120B R40 reader for standard wall mount applications. Provide 6100B R10 for mullion mount applications.
2. Approved Equal

2.12 PROXIMITY CARDS

A. Specifications

1. Graphics quality.
2. Printable PVC card
3. Sequentially numbered
4. Encoded
5. 2K EEPROM with 16 application sectors

B. Acceptable Manufacturer

1. HID 202X iClass Proximity Card. Furnish 500 cards.
2. Approved Equal

2.13 NETWORK SWITCH

A. Specifications

1. (24) Ethernet 10/100/1000 ports, (4) shared SFB/GBIC 1000ports

2. Switching fabric: 68 Gbps
3. Forwarding rate: 50 mpps
4. Memory: 64 MB DRAM & 32 MB flash
5. MAC addresses: Up to 10,000
6. IGMP groups/Multicast routes: Up to 255
7. Configurable MTU: 10000 Bytes with jumbo frames
8. 1000BaseT ports: RJ-45 connectors
9. Stacking: Minimum 16 switches
10. Stacking Backplane: 10gbps
11. Input power: 100 – 240 VAC auto-ranging
12. Indicators:
    a. Port link integrity
    b. Port disabled
    c. Port speed
    d. Port full duplex
    e. System status
    f. System RPS
    g. System link status
    h. System link duplex
    i. System link speed
13. Operating Temp: 0 to 50 degrees C
14. Operating relative humidity: 10 – 85% non-condensing
15. Power consumption: 40 Watts max (120VAC)
16. Certifications: UL listed, FCC part 15 Class A
17. POE: IEEE 802.3af on all ports simultaneously

B. Acceptable Manufacturers

1. IFS NS3601-24P/4S
2. Cisco
3. HP
4. Approved Equal

2.14 REQUEST TO EXIT PIR

A. Specifications

1. Passive infrared device
2. DSP filter technology
3. Curtain Fresnel lens
4. 12 VDC @ 50 mA
5. SPDT relay 1 Amp @ 30 VDC
6. ½ to 60 second main relay timer
7. UL 294 listed

B. Acceptable manufacturer

1. Detection Systems DS160
2. Bosch DS 150i
3. Approved Equal

2.15 ACCESS MANAGER SOFTWARE - SERVER

A. Specifications

1. General layout of the software “Windows” shall include but not be limited to:

a. **Main Menu Bar** shall be used to access all Functions from a standard pull down menu method.
b. **Tool Tips** describing the feature(s) that the selected item represent, shall be displayed in small “bubbles” underneath the selected item, field caption or other component. These tool tips shall be user definable.
c. **The Administration Console** shall use the familiar Explorer metaphor with a tree of folders in the left pane and details of selected folders in the right pane. The left pane shall include the following main components: Main Administration Console, Software System Configuration, Hardware Configuration, and Interface Configuration.
d. The Main Administration Console shall include:

1) Browser
2) Customization Manager
3) Enrollment Manager
4) Event Viewer
5) Graphics
6) Report Manager
7) Status Viewer
8) SQL Manager
9) Task Scheduler

e. The Software System Configuration Module shall include:

1) Credential Templates
2) Time Zones
3) Holidays
4) Door Groups
5) Function Groups
6) Operators
7) Operator Groups
8) Command Sets

f. The Hardware Configuration Module shall contain:

1) Add either an S*NET or X*NET communications port, either serial or TCP/IP
2) Add hardware Controller
3) Doors, Readers, Inputs, Outputs, Expansion Inputs, Expansion Outputs

g. The Interface Configuration Module shall define the parameters for communicating to a CCTV switcher.

2. **Dialog Boxes** shall provide a means for entering information into fields and displaying information from the System Software database.

3. Workstation Customization

a. The Operator may customize the general functionality of several features of the System Software per individual Operator. The features that may be customized will include but not be limited to: Alarm Viewer, Event Viewer, and customizable Graphical User Interface.

4. The system shall allow the Operator to initiate a search for information in the database to be entered into another database field and shall allow the Operator to specify at least two search criteria such as Field and Data.
5. Time Zones define periods during which readers, cards, codes, alarm inputs, doors or other system features are active or inactive. Basic configuration parameters shall "ask" the Operator to define "when" the user is enabling (or disabling) a specific feature. In addition to Monday-Sunday, there shall be one day of the week called Holiday. When selected, there shall be 4 Holiday Schedules that determine if the Holiday is to be followed for this Time Zone. There shall be 64 Standard Time Zones, 64 Master Time Zones, and 20 Grand Master Time Zones.

    a. Holidays- Holidays are used within the system for the purpose of defining if a Time Zone is to be followed on a defined Holiday. Each Time Zone has up to 4 Holiday schedules. There are 366 user definable Holidays this year and 366 days next year. It shall be possible for the Operator to "Make the rest of Today a Holiday".
    b. Door Groups- Door Groups shall allow the user to establish groups of readers, each with its own unique Time Zone, at a facility for the purpose of granting or denying access to Credentials. Door Groups are assigned to Credential Templates, and people being added to the system take on the Door Group of the Credential Template selected during the enrollment process. A new Door Group may be defined when adding a Credential or Credential Template without having to exit and re-enter the Credential function for that Person.
    c. The Door Group application shall allow the user to view any existing Door Group listed in the dialog box. A user, with proper authority, shall be able to modify, add, or delete a Door Group from the System Software.

6. Function Groups- Credentials can be assigned to perform a single User Function, like Momentary Access. When a Person requires multiple User Functions, a Function Group may be defined and associated with one or more credentials. The Function Group requires a Scramble Pad keypad to be used, where the Person's base Credential PIN number is entered, followed by an * (Asterisk), followed by a one or two digit Extension digit, which defines which User Function shall be issued for which Control Zone. This allows for a single person to perform multiple User Functions like: Unlock Door, Relock Door, Change Threat Level, Mask Alarm Inputs, and Lock Down Doors.
7. A Credential Template shall be used when adding Credentials to people. The Credential shall take on the properties of the Credential Template selected. This shall minimize the number of keystrokes and time required to add a Credential to a person. The Credential Template properties include: Credential Name; Badge Template; Activation and Expiration Date and Time; ID Format; Card Type; Code Length; Duress Digit; Credential Function and Category; Door Group or Function Group; Threat Authority; 2 Person Rule options; Use Count, Day Limit, and Absentee Limits; Apply Credential Management Globally; Tag, Alert, Disable Credential; Issue Number; Status; Executive Override for Passback; Special Needs Access Extension.
8. A Command Set defines an action or actions to be sent to a controller or controllers. Command Sets can include: Unlock and Relock a Door; LockDown and Release a LockDown on one or more doors; make the rest of today a Holiday; Mask all Interior Alarm Points; change the facility Threat Level; Forgive All Passback. Once defined, a Command Set can be executed from the Command Set Window, or from a Graphic

Floor plan ICON, if defined. There shall be an unlimited number of Command Sets available to be defined.

9. Each Operator entered into the System Software system shall be assigned to an "Operator Group". This feature shall allow the Operator to take on the Rights to Components, Reports and Graphic Floor plans. The Rights for Components can grant or deny the ability to Add, Delete, Save, or Open a component, as well as restrict to the Properties or Dialog boxes to the Tabbed level.
10. Operators entered into the system shall take on the Rights of the Operator Group to which they are assigned. In addition, a unique set of Permissions can be defined per Operator which grant or deny the Operator's ability to perform system functions, like: Acknowledge and Clear 1 or more alarms; Assign/Un-assign Credentials; Change Alarm and Event Viewer Properties; Display Scramble*Pad Codes; Download Credentials; Preview and Print Badges; Use any or all of the Component Windows.
11. There shall be a Task Scheduler that allows functions to be performed on an as needed basis, like activating and deactivating credentials. It can also schedule Tasks like Synchronize Controller Clocks and Run Historical Log Archiver on a Daily, Weekly, Monthly basis.
12. The SQL Database Manager shall be used to Backup and Restore data from the SQL database. Manual or automatic backups may be defined. SQL Scripts may also be run from the SQL Database Manager.
13. There shall be a Diagnostic Window available to aid in system diagnostics / troubleshooting. Once a Controller is selected, the Standard Setup and Status diagnostic commands may be selected from a drop down list and sent to the selected controller. The response from the controller is displayed in the Diagnostic Window, and may be viewed, copied to the clipboard, a Report created and printed or saved to a file.
14. In addition, any supported command can be sent to the selected controller.
15. There shall be a Status Viewer which displays in a spreadsheets type format, the real-time status of all or selected Doors, Readers, Inputs, Relays, Expansion Inputs, Expansion Relays. Devices may be grouped in to "Status Groups", which are selectable from a drop down list. Devices may have selected information displayed. The available list includes the following:

    a. Name and Address
    b. Status
    c. Alarm and Acknowledged Status
    d. Masking Status
    e. Line Module Input Status and Type
    f. Relay Status
    g. Revision Number
    h. Enabled Status
    i. Controller Alarm Relay, Tamper, and Battery Status.

16. Foreground, Background, and Secure colors may be changed. In addition, the Columns of data viewed in the Alarm and Acknowledged windows may be selected and the sequence in which they shall appear. The available columns include:

    a. ICON
    b. Controller Time
    c. Host Time
    d. Description
    e. Address
    f. Level
    g. Acknowledge Time and Acknowledged By (available for the Acknowledged Pane)

17. Tool bar ICONS shall include:

    a. Acknowledge Selected
    b. Clear Selected
    c. Acknowledge All
    d. Clear All
    e. Silence Beeper
    f. Add Note

18. The Event Viewer can display all or Filtered Transactions. Custom files may be defined and selected, or standard selections can be made for main categories of Event types. Column width, order, selection, and scrolling direction are user definable, as well as text and background color.
19. The number of cached events to load when launched, up to 10,000, may be defined. The Operator shall be able to scroll back in time to view events no longer seen on the screen, without the need for running a report.
20. The browser shall be an Internet Explorer like “Browser” for accessing on-line help, tutorials (AVI files), manuals, Known Issues, and Product Registration information.
21. There shall be a Customization Manager that allows the Operator to define an alternate language or change the English name or label for each element of the software.
22. Priority Levels may be defined (1-99) for each Alarm Type.
23. The Report Manager shall allow the Operator to select from a number of pre-defined Reports. Custom Reports can be created outside the software, and added to a Custom folder, making the Custom Reports available from within the Report Manager application.
24. Once a Report is selected, the default Criteria and sorting options may be used, or custom Criteria and sorting options may be selected.
25. Once the report is run, it may be viewed, printed, or saved in various standard file formats.
26. Standard Reports included as standard shall include:

    a. Customization Reports

        1) Component Resources
        2) Customizations Report

    b. Control Configuration

        1) Controllers
        2) Doors
        3) Expansion Inputs
        4) Expansion Relays
        5) Inputs
        6) Network Layout
        7) Printers
        8) Readers
        9) Relays

    c. History Logs

        1) All Events Log
        2) External Events Log
        3) Internal Events Log
        4) Operator Log

5) User Activity Log

d. Person Information

1) Credential Status
2) Door Access by Person
3) Dossier Style by Person
4) Expired and To-Be-Expired Person Access
5) Expired Credentials
6) Last Access by Person
7) Person Access and Function Group Summary
8) Person Access and Function Group Summary with Codes and Cards
9) Person Access by Door
10) Person Access Summary
11) Person Access Summary with Codes and Cards
12) Person FG Summary with Codes and Cards
13) Person Function Group Summary

e. Software Configuration

1) Command Sets
2) Door Groups
3) Function Group Extensions
4) Functions Groups with Users
5) Functions with Users
6) Holiday Schedules
7) Holidays
8) Operator Groups
9) Operators
10) Time Zones – Grand Master Time Zone
11) Time Zones – Master Time Zone
12) Time Zones – Standard Time Zone
13) Time Zones – Standard Time Zones in Use

27. The Console Preferences shall define specific settings or devices for use with Velocity. These shall include: File Paths; Show Splash Screen on Startup; Access and Enable Customized Values for Components in Customization Manager; Use 24-Hour Time Format; SQL Server and Network Connections settings; Enrollment Station properties; and Report.
28. This function shall contain the required definition of the hardware components of the system. The database files shall be based on the hierarchy of the system hardware as it is physically installed in the field.
29. Controller Properties shall define all General settings for the Controller. These setting shall include: Name, Type, Address, Local Time Zone, Enabled Status, Firmware Revision Number and Date, Expansion Option Boards Installed and available Hardware. All additional Controller Setup Options can be defined here and are detailed in the Firmware Features section below.
30. The Controller Device Properties shall define all connected field devices, including: Doors, Readers, Inputs, Relays, Expansion Inputs, and Expansion Relays. Device names and all operating parameters shall be definable if operation other than the included defaults is required.
31. The Graphics application shall allow the Operator to add, delete or modify graphic floor plans and add indicator icons to graphic floor plans that represent Controllers, input/output points, readers, or cameras located in the facility. Formats for Graphics supported include two Modes, Live and Design. The Live mode shall be used for real

time monitoring. In addition, right clicking an ICON presents the Operator with a list of available Access or Control Functions that can be issued to the device. The Design mode allows the Operator to define which graphics are to be used, place ICONS on the Graphics, and define properties for each ICON.

32. There shall be a Bird's Eye Viewer that provides a key plan that can be panned and scrolled by moving the red box, which indicates the current viewing area.
33. There shall be a Directory of available Graphics to easily select the desired Graphic to display.
34. An Object Toolbar shall be available for selecting Objects to appear on the Badge Template, including: Bit Map Logos, Photos, Fixed Text, and Database Fields. Each Object shall have a Properties box where the specific Properties of that Object are defined, including: File, database field, Font color, Font Style, Font Size.
35. The Enrollment Manager application shall maintain information related to a Person, and Credentials assigned to that person. Multiple Credentials per person shall be supported. The list of People shall be able to have Custom filters applied, allowing for quick and easy grouping of desired people. There shall be a quick find option for finding a specific person or credential.
36. The Personal Information pane shall include the General and Additional User Defined fields. The system shall be capable of defining up to 36 user definable fields of information per Person. These field names can be either a "Text Box", "Dropdown" where the Operator can enter text, or select from a Dropdown List, or a "Dropdown List" where selecting from the List is required. A Photo field shall be available for acquiring a live video image, acquire an image from a TWAIN device, or acquiring a photo from an existing file. A Record Last Updated field shall be available, as well as Preview and Print a Badge. A signature field shall also be available.
37. Once a person is added, one or more Credentials may be added to that Person. Credentials may be added using a Credential Template, or directly without a Credential Template. The Credential shall take on the properties of the Credential Template if used. There shall be a Card Enrollment Station used for entering card data into the system. PIN Numbers can either be randomly selected, or Operator/User selected.
38. Once a Person is selected from the List, the Credential Status and information is displayed for the assigned Credentials. The information includes: IDF, ID, Function, Description, Status, Expires On, Last Access, Last Door, Tag, and Alert. An Operator may right click on a Credential, and shall be presented with the following options: Tag, Alert, Disable, Forgive Passback, Override Code Tamper, Reset Limit Count, Force Download, Un-assign, Delete, and Properties.
39. The bottom of the Enrollment Manager window shall display counters for: People, Assigned Credentials, Unassigned Credentials, and Guest Credentials.

B. Acceptable Manufacturers

1. Hirsch Identiv Velocity System Software Package
2. Lenel
3. Approved Equal

2.16 CONTROLLER FIRMWARE

A. Specifications

1. The software for the controller shall reside in Flash ROM (firmware) and be located on a plug removable module on the controller board to facilitate easy field up-gradability of the features. All of the necessary software for a fully functional System is located in the controller. The controller firmware shall include the following general

features at a minimum and be fully supported by the head-end.

a. 3 - 15 digit keypad Code's
b. Duress digit for keypad Code's
c. 150 Time Zones for access restriction and automatic event control
d. 128 Access Zones for access management
e. 256 Control Zones for alarm and relay management
f. 366 programmable holidays this year, 366 days next year. Each Holiday may be assigned to 1 – 4 Holiday Schedules.
g. Automatic daylight savings time clock adjustment
h. 27 different functions for Code's and cards, e.g. access, unlock, re-lock, alarm mask, relay control
i. Add user records
j. Tag users for annunciation at host computer
k. 4,000 Users
l. 750 event, 750 alarm transaction buffer

2. The controller shall include the following access control features at a minimum.

a. Restrict access by: time of day; day of week; door; holiday
b. Momentary Access of door up to 8100 seconds
c. Extended Access for User Definable Momentary Access duration (requires Scramble Pad). Scramble Pad shall display time remaining on the minute, and annunciate at the defined "Warning Time"
d. Special Needs Time Extension to provide additional time for Momentary Access and Door Open Too Long for selected people.
e. Unlock/Re-lock of door by CODE, card or Time Zone
f. Door status monitoring shall allow for: door forced monitoring; door-open-too-long monitoring; door-open-too-long while door is unlocked; auto-re-lock of door when opened or closed
g. Request-to-exit masks alarm and/or unlocks door
h. 2-person requirement by door. A user can be defined as Normal, A/B Rule A, A/B Rule B, Executive Override. Can be disabled by Time Zone.
i. 63 Passback Zones. Can be disabled by Time Zone. A User can designate with Passback Executive Override.
j. Use Count limits on users
k. Absentee Rule limits on users
l. Temporary Day limits on users
m. Occupancy Counting / Minimum & Maximum limits per Passback Zone
n. Deadman CODE / Timer
o. Threat Levels – 99 Levels may be defined. Based on the Level in effect for the facility, selected readers may be disabled, dual readers in Card/Code Only during Time Zone can require dual, and selected User's Credentials can be disabled.

3. The controller shall include the following alarm management features at a minimum.

a. Momentarily mask alarm by CODE and/or card
b. Mask/unmask alarm by CODE and/or card or by Time Zone
c. Alarm device supervised while masked
d. Tamper switch on alarm device monitored while masked
e. Tamper Input may be configured to operate as a "Latch Monitor" with the appropriate door lock hardware.
f. Entry/Exit delay per alarm input
g. Alarm input triggers relay/s

4. The controller shall include the following relay control features at a minimum.

    a. CODE and/or card, input, or other relay triggers relay/s
    b. Trigger relay/s by time zone
    c. Relay may be normally de-energized or energized
    d. Disable relay/s during time zone
    e. Clear relay at end of time zone

B. Acceptable Manufacturers

1. Hirsch Identiv Velocity Firmware.
2. Approved Equal

PART 3 EXECUTION

3.1 INSTALLATION

A. All system programming shall be done at the Trade Contractor's facility prior to installation on site.
B. Qualified personnel shall install the System in strict compliance with manufacturer's instructions.
C. Wiring shall be color coded, uniform and in accordance with national electric codes and manufacturer's instructions.
D. Equipment shall be firmly secured, plumb and level.
E. All cable runs to the main equipment rack shall be tagged and identified.
F. Coordinate all work with Construction Manager – Advisor and other Trades Contractors.
G. Grounding of devices and peripheral equipment shall be installed per manufacturer's direction to eliminate noise induction and achieve optimum system performance.
H. Install and configure Security local area network as required for control and communication between system devices. When required, provide necessary coordination, termination, and programming associated with integrating Security local area network with facility network.
I. Equipment cabinets shall be assembled in the Trade Contractor's shop prior to delivery to the job site.

3.2 SOFTWARE SUPPORT

A. Refer to Section 284620 for software support and programming requirements.

3.3 SYSTEM INITIALIZING AND PROGRAMMING

A. All programming shall occur in the Trade Contractor's shop prior to installation on site.
B. The System shall be turned on and adjustment made to meet requirements of the specification and on-site conditions.
C. The System shall be programmed to function as specified.
D. Any special programming shall be documented and a written copy given to the Owner.
E. Coordinate integration of other electronic systems as called for in the contract documents.

3.4 SYSTEM TEST PROCEDURES

A. The System shall be pre-tested by the Security Equipment Trade Contractor and certified, in writing, to function in accordance with the plans and specification.
B. The Trade Contractor is to verify the system is communicating with all controlled devices.
C. Testing to be performed in the Trade Contractors shop prior to delivery-

1. Test 120VAC power equipment and hardware internal to all equipment racks. Test all conductors for shorts, opens, and polarity.
2. Fully charge all UPS systems. Test unit by removing power thereby causing the unit to switch to battery reserve.
3. Utilizing a test jig, simulate the operation of every circuit required.

D. Testing to be performed at the job site prior to powering the system

1. Test all 120VAC power sources for correct polarity and voltage. Test grounding system for continuity. Notify Electrical Trade Contractor of any problems.
2. The System shall be completely tested to assure that all components are hooked up and in working order. Motion detectors are to be aligned allowing for optimal pickup area. Locking devices are to be adjusted so that doors lock and unlock without interference. Correct all causes of such defects. If the cause is outside of the scope of the 281300 series scope of work, promptly notify the Architect Engineer in writing, indicating the cause of the defect and suggested corrective procedures.

E. Additional job site testing

1. After installation of head end electronics, verify proper operation of all field devices including locks, door position switches, card readers, push buttons, and intercom stations.
2. Verify proper integration between access control system and

a. PLC/GUI system
b. Video Surveillance system
c. Intercom/Paging system
d. Overhead door controls
e. Handicap assist door operators

F. The System shall be completely tested to assure that all components are hooked up and in working order. Inspect system for defects. Correct all causes of such defects. If the cause is outside of the scope of the Division 28 series scope of work, promptly notify the Architect Enginerr and Construction Manager - Advisor in writing, indicating the cause of the defect and suggested corrective procedures.
G. The system shall be capable of operating under normal operating conditions.
H. Provide written documentation showing all test results.
I. The System shall be final tested in the presence of the Architect Engineer. Trade Contractor is to provide all required testing equipment.

3.5 FIELD QUALITY CONTROL

A. Provide services of a duly factory authorized service representative for this project location to supervise the field assembly and connection of components and the pre-testing, testing, and adjustment of the system.
B. Make observations to verify that units and controls are properly labeled, and interconnecting wires and terminals are identified. Provide a list of final tap settings of paging speaker line matching transformers.

C. Rectify deficiencies indicated by tests and completely re-test work affected by such deficiencies at Trade Contractor's expense. Verify by the system test that the total system meets the Specifications and complies with applicable standards.

3.6 TRAINING

A. Provide the facility personnel with training in the use and maintenance of the entire access control system. Coordinate the training session with the Owner. Completed classroom sessions shall be documented by the Trade Contractor, certified by the attending Owner representative, and approved by the Acrhitect Engineer. Instruction shall take place during normal working hours (Monday through Friday, 8:00 a.m. to 5:00 p.m.). Instruction shall not begin until all systems are operational as designed.

B. The training sessions shall cover the operation and the maintenance manuals and the control console operators manuals and service manuals in detail, stressing all important operational and service diagnostic information necessary for the maintenance and operations personnel to efficiently use and maintain the control system.

C. Trade Contractor is responsible for providing operational and maintenance training applicable to the entire control system. Training is to include, but not be limited to the following-

1. Review all O+M manuals with Owner representatives present for training.
2. Perform a tour of the entire facility. During the tour the trainer shall point out all control equipment and provide a brief description of its purpose and use. This is to include but not be limited to control panels (graphic and pushbutton), all control system hardware, and devices controlled.

END OF SECTION

SECTION 282313 - VIDEO SURVEILLANCE FOR ELECTRONIC SECURITY

PART 1 - GENERAL

1.1 SYSTEM DESCRIPTION

A. Visual surveillance of the facility via cameras as indicated on the plans.

B. Video monitoring of all cameras on VMS workstations and displays at locations identified on the plans.

C. Review capabilities for the recorded images via the Video Management System.

D. Stored image transfer capabilities to allow archival functions and stored image transfer via removable media such as CD/DVD.

E. Cameras shall utilize Category 6 cable to transport video signal to the system.

F. Video surveillance system shall integrate with PLC/GUI Control system allowing for automatic camera call up upon manual input via touch screen icons, alarm or event activation. Alarms such as panic device activation or events such as intercom call acknowledge. When an alarm is activated, the nearest camera shall be displayed on the control station VMS displays automatically.

G. All IP cameras, recording devices, viewing stations, and controllers shall reside on a private dedicated Video Surveillance Ethernet Network included by the security electronics contactor as part of the system.

H. Provide all software and licensing as required.

I. Camera system to provide masking capability. Typical masking to include toilet/shower areas in detention areas, as well as other areas requested by Owner during final system testing.

J. Recording parameters and storage capacity

1. Servers and Mass storage devices are specified below. Provide a quantity of servers and storage devices necessary to accommodate the number of cameras indicated on the floor plans based on the camera specifications, and the following recording parameters:

    a. 7 IPS per camera
    b. Record based on motion
    c. Calculate motion based on 50% motion factor
    d. Minimum stored image retention of 45 days
    e. 30 IPS per camera when in alarm condition

2. If the installed system fails to provide the minimum 45 days of storage image retention for each camera; the integrator shall increase the storage array capacity until the 45 day requirement is met at no additional cost to the owner.

PART 2 - PRODUCTS

2.1 GENERAL

A. Equipment specified is intended as a reference standard for level of quality.

B. Substitutions of equal quality will be accepted for ONLY those products which state "Approved Equal" under the Acceptable Manufacturers list. Those "Approved Equal" items must comply with the requirements for "Comparable Products" as outlined in Section 01 60 00 PRODUCT REQUIREMENTS.

C. Provide materials listed by UL or ETL.

2.2 CORNER MOUNT CAMERA

A. Specifications

1.	Imaging Device	1 / 2.8" Exmor CMOS
2.	Max Resolution	1920 x 1080
3.	Shutter Speed	1/10000 – 1/60 (slow shutter 1/15, 1/8, ¼)
4.	Angle of View	120 degrees(H) – 70 degrees(V)
5.	Lens	Fixed 2.6mm, F2.0
6.	Input Voltage	24 VAC, 12 VDC POE IEEE 802.3af Class 0
7.	Power Consumption	24 VAC / 12VDC 500mA 6.0W PoE 48 VDC 125mA 6W
8.	Ethernet	RJ-45 10BASE-T/100BASE-TX
9.	Radio Frequency	FCC, CE
10.	Operating Temp	0 degrees celcius – 50 degrees celcius
11.	Humidity	0 – 80% (non-condensing)
12.	External Dimension	15" x 12.6"
13.	Weight	1600g

B. Acceptable Manufacturers

1. Vicon XX247-10-01 V-CELL HD Corner Mount Camera
2. Vicon

2.3 FIXED VIDEO SURVEILLANCE CAMERA 0.3 MP

A. Specifications

1.	Imaging Device:	1/2.8-inch CMOS sensor
2.	Max. Resolution:	SD (D1)
3.	Shutter Speed:	¼ - 1/20,000
4.	Automatic Gain Control:	On/Off selectable
5.	Signal-to-Noise Ratio:	>50 dB
6.	Sensitivity:	VGA: Color: 0.12 fc (1.25 lux); B&W: 0.014 fc (0.15 lux),slow shutter On, @f/1.6, 30 IRE

720P/1080P: Color: 0.07 fc (0.7 lux);

B&W: 0.007 fc (0.08 lux),slow shutter On, @f/1.4, 50 IRE

7. Zoom and Focus: Motorized focus and Zoom
8. Slow Shutter: 2X
9. Electronic Zoom: 1 ~ 10X (client software)
10. Lens Adjustment: Focus and zoom adjustment; fixed lens, DC iris/P-iris motorized lens, iris automatically adjusts to zoom condition
11. Focal Length: 3-9 mm (3X zoom)
12. Horizontal Field of View: 3-9 mm: 93°- 31.7°
13. Input Voltage: 24 VAC, 12 VDC, PoE
14. Current (MFZ On/Off): 24 VAC: 590 mA
    12 VDC: 550 mA

    PoE: Class 2
15. Power Consumption (MFZ Off/On): 12 VDC: 6.5 W, 24VAC: 7.5W, POE: 6.4W
16. Connectors: Power: 24 VAC/12 VDC screw terminal
    PoE/Network: RJ-45

    Video/Data: RJ-45
    Alarm In/Out: terminal block
    Audio In /Out: jack (audio out requires external amplifier)
    Slot for SD card
    Composite output provided for installation (NTSC/PAL selectable)
17. Radio Frequency

    Emission Rating: FCC Class A; CE
18. Operating Temperature: -40° to 122°F (-40° to 50°C)
19. Humidity: <90% relative, non-condensing
20. Construction: Plastic Dome: clear polycarbonate tamperproof screws, die-cast aluminum base
21. Dimensions: Height: 4.3 in. (110 mm), Diameter: 6.06 in. (154 mm)
    Dome Diameter: 4.3 in. (110 mm)
22. Weight: Approximately 2.5 lb (1.1 kg)

B. Acceptable Manufacturers

1. Vicon V920D-39MD-IP, typical of interior and exterior cameras. Provide required mounting supports and hardware. Provide quantity shown on plans. Provide software license as required.
2. Vicon

2.4 FIXED VIDEO SURVEILLANCE CAMERA 1.3 MP

A. Specifications

1.	Imaging Device:	1/2.8-inch CMOS sensor
2.	Max. Resolution:	720p
3.	Shutter Speed:	¼ - 1/20,000
4.	Signal-to-Noise Ratio:	>50 dB
5.	Tilt and Horizontal Adjustment:	3-axis adjustment: pan (360°), tilt (90°) and roll (lens may be rotated on its axis 360°)
6.	Electronic Zoom:	1 ~ 10X (client software)
7.	Lens Adjustment:	Focus and zoom adjustment; fixed lens, DC iris/P-iris motorized lens, iris automatically adjusts to zoom condition
8.	Focal Length:	3-9 mm
9.	Horizontal Field of View:	3-9 mm: 93°- 31.7°
10.	Input Voltage:	24 VAC, 12 VDC or PoE
11.	Current (MFZ On/Off):	24 VAC: 590 mA 12 VDC: 550 mA PoE: Class 2
12.	Power Consumption (MFZ Off/On):	12 VDC: 6.5 W, 24VAC: 7.5W, POE: 6.4W
13.	Connectors:	Power: 24 VAC/12 VDC screw terminal PoE/Network: RJ-45 Video/Data: RJ-45 Alarm In/Out: terminal block Audio In /Out: jack (audio out requires external amplifier) Slot for SD card Composite output provided for installation (NTSC/PAL selectable)
14.	Radio Frequency	
	Emission Rating:	FCC Class A; CE
15.	Operating Temperature:	-40° to 122°F (-40° to 50°C)
16.	Humidity:	<90% relative, non-condensing
17.	Construction:	Plastic Dome: clear polycarbonate tamperproof screws, die-cast aluminum base
18.	Dimensions:	Height: 4.3 in. (110 mm), Diameter: 6.06 in. (154 mm) Dome Diameter: 4.3 in. (110 mm)
19.	Weight:	Approximately 2.5 lb (1.1 kg)

B. Acceptable Manufacturers

1. Vicon V921D-39MD-IP, typical of interior cameras. Provide required mounting supports and hardware. Provide quantity shown on plans. Provide software license as required.
2. Vicon

2.5 MONITOR

A. Specifications

1.	LCD Panel:	LED
2.	Screen Size:	24”
3.	Pixel Pitch:	.248” x .248”
4.	Resolution:	1920x1080 pixels
5.	Aspect Ratio:	16:9
6.	Display Colors:	16.7 million colors
7.	Response Times:	5 ms
8.	Backlight:	LED
9.	Luminance:	250 cd/m²
10.	Contrast:	1000:1
11.	Viewing angle:	170 deg/160 deg
12.	Digital Input:	DVI-D, HDMI, VGA

B. Acceptable Manufacturer

1. Vicon VM-6215 LED-1
2. Approved Equal

2.5 MONITOR MOUTING ARM

A. Specifications

1. Accommodates CCTV Monitor size.
2. Accommodates CCTV Monitor weight.
3. Extends 16” (minimum)
4. Equipped with +/- 15 degree (minimum) tilt capabilities.

B. Acceptable Manufacturers

1. CorLiving A-202-MLM
2. Approved Equal

2.6 VIDEO MANAGEMENT SYSTEM

A. Specifications

1. Enterprise-Class Client/Server based video management system.
2. System-wide user management, alarm handling, health monitoring, and configuration.
3. Full virtual matrix capabilities, including analog monitor support and CCTV keyboard control

4. Superior alarm handling with alarm priorities and selectable user group distribution.
5. Provide load balanced storage across multiple arrays with recording failover in the event of an array malfunction.
6. Workstations must be capable of displaying live video independent of management server in the event the management server is unavailable.
7. Advances user interface concepts for effective and efficient operation
8. Supports all ONVIF Profile S devices,H.264, MPEG-4 encoders, decoders, IP cameras, IP auto domes.
9. Enterprise support for multiple management servers.
10. Video decoder support.
11. Support for camera call up. No scripting shall be required for interfacing between the VMS and PLC system.
12. VMS must have capability to monitor all network devices using SNMP.
13. Software Maintenance Agreements shall not be *required* by the manufacturer but rather offered.
14. Minimum Client Workstation PC Requirements
    a. HP Z420 Series
15. Minimum Central Server PC Requirements
    a. HP R8 Series

B. Acceptable Manufacturer

1. Vicon Viconnet Version 7. Provide expansion modules as required for support of viewing stations identified on plans, as well as modules required for video recording, system configuration and management, and system monitoring. Provide software license as required. Provide Software Maintenance as required.
2. Vicon

2.7 VIDEO MANAGEMENT SERVER

A. Specifications

1. 1RU Rack Mount
2. Windows Server 2012 standard, 64 bit OS
3. Intel Xeon E5-2603 Processor 1.8 GHz 4C 10M 6.4GT Hyper T 80 Watt
4. 16 GB 1RX4 RDIMM DDR3 1600
5. (4) 1TB 3.5” SATA enterprise hard drive 7.2K, 6 GB/s Hot Swap
6. Slim SATA DVD Optical
7. Mouse
8. Keyboard
9. Single monitor video card
10. Intel Pro/1000 PT Dual Port 1GB Ethernet Adapter
11. Dual 800 Watt Redundant PS
12. 3 Year onsite service

B. Acceptable Manufactures

1. Lenovo Thinkserver RD530
2. HP
3. Dell
4. Vicon

2.8 VIDEO STORAGE ARRAY

A. Specifications

1. The IP Video Storage System shall be an embedded, all-in-one IP Video Storage subsystem that provides “plug-and-play” iSCSI-based recording and management.
2. The IP Video Storage Array shall be a 2 U rack-mount chassis with eight (9) hot swappable, 3 Gbps SATA-II hard disk drives with RAID-5 protection..
3. The IP Video Storage Array shall be equipped with two (2) redundant 1 GbE network interfaces.
4. The IP Video Storage System shall contain a Disk-on-Module (DoM) solid-state memory module that contains a non-volatile backup image of all system software which can be used to initiate a full system recovery in the event the system partition is lost or corrupted.
5. The IP Video Storage Array shall be installed with the Microsoft Windows Storage Server 2012 operating system.
6. The IP Video Storage Array shall support the following:
   a. SNMP
   b. Remote Desktop
   c. HTTP monitoring
7. The IP Video Storage Array processor shall include ECC Unbuffered memory protection.
8. The storage array is designed so that all data is protected even if one hard disk drive completely fails.
9. Each 2TB disk drive in the storage array is hot swappable, so that a failed drive can be easily replaced without cycling power or interrupting recording or data retrieval.

B. Acceptable Manufacturer

1. Vicon NVR-Shadow digital video storage array. Provide a quantity of digital storage arrays to support the number of cameras shown on the plans.
2. Vicon

2.9 SECURITY NETWORK SWITCH

A. Specifications

1. (24) Ethernet 10/100/1000 ports, (4) shared SFB/GBIC 1000ports
2. Switching fabric: 68 Gbps
3. Forwarding rate: 50 mpps
4. Memory: 64 MB DRAM & 32 MB flash
5. MAC addresses: Up to 10,000
6. IGMP groups/Multicast routes: Up to 255
7. Configurable MTU: 10000 Bytes with jumbo frames
8. 1000BaseT ports: RJ-45 connectors
9. Stacking: Minimum 16 switches
10. Stacking Backplane: 10gbps
11. Input power: 100 – 240 VAC auto-ranging
12. Indicators:
    a. Port link integrity
    b. Port disabled
    c. Port speed
    d. Port full duplex

e. System status
f. System RPS
g. System link status
h. System link duplex
i. System link speed

13.	Operating Temp:	0 to 50 degrees C
14.	Operating relative humidity:	10 – 85% non-condensing
15.	Power consumption:	40 Watts max (120VAC)
16.	Certifications:	UL listed, FCC part 15 Class A
17.	POE: simultaneously	IEEE 802.3af on all ports

B. Acceptable Manufacturers

1. IFS NS3601-24P/4S
2. Cisco
3. HP

PART 3 COMPLETION

3.6 INSTALLATION

A. All system programming shall be done at the Trade Contractor's facility prior to installation on site.

B. Qualified personnel shall install the System in strict compliance with manufacturer's instructions.

C. Wiring shall be color coded, uniform and in accordance with national electric codes and manufacturer's instructions.

D. Equipment shall be firmly secured, plumb and level.

E. All cable runs to the main equipment rack shall be tagged and identified.

F. Coordinate all work with General Contractor other Trades Contractors.

G. Grounding of cables and peripheral equipment shall be installed per manufacturer's direction to eliminate noise induction and achieve optimum system performance.

H. Install and configure Security local area network as required for control and communication between system devices. When required, provide necessary coordination, termination, and programming associated with integrating Security local area network with facility administrative network.

I. Equipment cabinets shall be assembled in the Security Electronics Contractor's shop prior to delivery to the job site.

J. Cameras shall be aimed and focused in the presence and at the direction of the Owner.

3.7 SOFTWARE SUPPORT

A. Refer to Section 284620 for software support and programming requirements.

3.8 SYSTEM INITIALIZING AND PROGRAMMING

A. All programming shall occur in the Security Electronics Contractor's shop prior to installation on site.

B. The System shall be turned on and adjustment made to meet requirements of the specification and on-site conditions.

C. The System shall be programmed to function as specified.

D. Any special programming shall be documented and a written copy given to the Owner/User.

E. Coordinate integration of other electronic systems as called for in the contract documents.

3.9 FINAL ADJUSMENTS

A. Before obtaining permission from the Owner to schedule the acceptance test, provide written certification to the Architect Engineer that the complete system has been calibrated, tested and is ready to begin the 14 day burn-in period and acceptance testing.

B. Acceptance tests

1. Conduct final acceptance test after a period of not less than 14 consecutive normal working days of trouble free operation, on the complete and operational video surveillance system to demonstrate that it is functioning in accordance with all requirements of this specification. During this burn-in period, the video surveillance system shall operate continuously for 24 hours per day. Demonstrate the correct operation of all monitored and controlled points as well as the operation and capabilities of all sequences during the acceptance test.
2. Should retesting be deemed necessary by the Architect Engineer due to malfunction or inappropriate construction methods, the Trade Contractor shall be fully responsible for additional cost incurred for retesting, including the Architect Engineer and Trade Contractor's time.
3. Final system acceptance shall be based upon the completion of the following items:

    a. Completion of the installation of all hardware items. Complete operation of the system, with no failures during the entire acceptance test period.
    b. Satisfactory completion of the as-builts, operating, and maintenance manuals.
    c. Satisfactory completion of all training programs.
    d. Upon final acceptance, the warranty period shall begin.

3.10 SYSTEM TEST PROCEDURES

A. The System shall be completely tested to assure that all components are hooked up and in working order. Inspect system for defects. Correct all causes of such defects. If the cause is outside of the scope of the Division 28 series scope of work, promptly notify the Architect Engineer in writing, indicating the cause of the defect and suggested corrective procedures.

B. The Security Electronics Contractor is to verify the system is communicating with all controlled devices.

C. Test 120VAC power equipment and hardware internal to all equipment racks. Test all conductors for shorts, opens, and polarity.

D. Verify operation of UPS power conditioning and backup. Test by removing utility power from system.

E. Verify all field wiring is free of defects prior to termination of head end electronics.

F. After termination of head end electronics, fully test operation of system including activation of field devices, alarm initiation from field devices.

G. Provide written documentation showing all test results.

H. The System shall be final tested in the presence of the Architect Engineer. Trade Contractor is to provide all required testing equipment.

3.11 TRAINING

A. Contractor is responsible for providing operational and maintenance training applicable to the entire control system. Training is to include, but not be limited to the following-

1. Review all O+M manuals with Owner representatives present for training.
2. Perform a tour of the entire facility. During the tour the trainer shall point out all surveillance equipment and provide a brief description of its purpose and use. This is to include but not be limited to cameras, monitors, control stations, recording devices, and devices controlled.

END OF SECTION 282313

SECTION 28 31 11 – DIGITAL, ADDRESSABLE FIRE-ALARM SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. General: Drawings and conditions of the contract, including but not limited to General Conditions, and the Special Conditions listed below, apply to work of this section.

1. Supplementary Instructions to Bidders.
2. Supplementary Conditions.
3. Summary of the Work.
4. Project Coordination.
5. Cutting and Patching.
6. Definitions and Standards.
7. Submittals.
8. Schedules and Reports.
9. Temporary Facilities.
10. Security Regulations.
11. Safety and Health
12. Products.
13. Project Closeout.

B. Related Requirements:

1. Division 7 Section “Security Joint Sealants” for requirements for and locations to receive security joint sealants.
2. Division 11 Section “Tamper-Proof Metal Fasteners” for requirements for and locations to receive security fasteners.

C. Scope of Work: This performance specification provides the minimum requirements for the Life Safety System for both the YDC and OTSC. The system shall include, but not limited to all equipment, materials, labor, documentation and services necessary to furnish and install a complete, operational system to include but not limited to the following functions:

1. Smoke and fire detection.
2. Sprinkler suppression system monitoring and control.
3. Computer with fireworks software to annunciate all system activity.
4. Interface of the two buildings system.

D. Project Representatives

1. All contacts with the New Youth Detention Center Building & OTSC building shall be directed to the Owner's Representative, hereafter referred to as the Owner:

E. Interpretation

1. No interpretations of the meaning of the bid documents will be made to any bidder orally. Each request for such interpretation shall be made to the engineer in writing, addressed to Sidhu Associates.

F. Manufacturer

1. The manufacturer of the system equipment shall be regularly involved in the design, manufacture, and distribution of all products specified in this document. These processes shall be monitored under a quality assurance program that meets the ISO 9000 requirements.
2. All System components shall be the cataloged products of a single supplier. All products shall be listed by the manufacturer for their intended purpose.
3. Edwards Systems Technology, Inc. products constitute the minimum type and quality of equipment to be installed.
4. All control panel assemblies and connected field appliances shall be both designed and manufactured by the same company, and shall be tested and cross-listed as to ensure that a fully functioning is designed and installed. The system supplied under this specification shall be a microprocessor-based, system. The system shall utilize independently addressed, microprocessor-based smoke detectors, heat detectors, and modules as described in this specification.

G. Alternates

1. Strict conformance to this specification is required to ensure that the installed and programmed system will function as designed, and will accommodate the future requirements and operations of the building owner. All specified operational features must be met without exception.
2. The authorized representative of the manufacturer of the major equipment shall be responsible for the satisfactory installation of the complete system.
3. All equipment and components shall be the manufacturer's current model. The materials, appliances, equipment and devices shall be tested and listed by a nationally recognized approvals agency for use as part of a protected premises protective signaling system, access control, and smoke control. The authorized representative of the manufacturer of the major equipment, such as control panels, shall be responsible for the satisfactory installation of the complete system.
4. All control panel assemblies and connected field appliances shall be provided by the same system supplier, and shall be designed and tested to ensure that the system operates as specified. The system shall utilize independently addressed, microprocessor-based smoke detectors, heat detectors, as described in this specification.
5. All equipment and components shall be installed in strict compliance with the manufacturer's recommendations.
6. The equipment to be supplied will be considered only if it meets all sections of the performance specification. Any deviations of system performance outlined in this specification will only be considered when the following requirements have been met:
7. A complete description of proposed alternate system performance methods with three (3) copies of working drawings thereof for approval by the Owner, not less than ten (10) calendar days prior to the scheduled date for submission of bids.
8. The supplier shall furnish evidence that the proposed or alternate system performance is equal or superior to the system operation stated in the specification. Such evidence shall be submitted to and accepted by the Owner,

not less than ten (10) calendar days prior to the scheduled date for submission of bids.

9. The supplier shall submit a point-by-point statement of compliance for all sections in this specification. The statement of compliance shall consist of a list of all paragraphs within these sections. Where the proposed system complies fully with the paragraph as written, placing the word "comply" opposite the paragraph number shall indicate such. Where the proposed system does not comply with the paragraph as written, and the supplier feels the proposed system will accomplish the intent of the paragraph, a full description of the function as well as a full narrative description of how its proposal will meet its intent shall be provided. Any submission that does not include a point by point statement of compliance as described herein shall be disqualified. Where a full description is not provided, it shall be assumed that the proposed system does not comply.
10. The acceptability of any alternate proposed system shall be the sole decision of the Owner or his authorized representative.

1.2 REFERENCES

A. General

1. General (references): All work and materials shall conform to all applicable Federal, State and local codes and regulations governing the installation. If there is a conflict between the referenced standards, federal, state or local codes, and this specification, it is the bidder's responsibility to immediately bring the conflict to the attention of the Engineer for resolution. National standards shall prevail unless local codes are more stringent. The bidder shall not attempt to resolve conflicts directly with the local authorities unless specifically authorized by the Engineer.
2. System components proposed in this specification shall be ULI listed to operate together as a system. The supplier shall provide evidence, with his submittal, of listings of all proposed equipment and combinations of equipment. The supplier shall be responsible for filing of all documents, paying all fees (including, but not limited to plan checking and permit) and securing all permits, inspections and approvals. Upon receipt of approved drawings from the authority having jurisdiction, the supplier shall immediately forward two sets of drawings to the Owner. These drawings shall either be stamped approved or a copy of the letter stating approval shall be included.

B. Codes:

1. Fire The equipment and installation shall comply with the current provisions of the following codes and standards:

NFPA 70 - National Electric Code®
NFPA 72 - National Fire Alarm Code®
NFPA 90A - Air Conditioning Systems
NFPA 101- Life Safety Code®
IBC 2006
UL 864 - Control Units for Fire Protective Signaling Systems.
UL 268 - Smoke Detectors for Fire Protective Signaling Systems.
UL 268A - Smoke Detectors for Duct Applications.
UL 521 - Heat Detectors for Fire Protective Signaling Systems.
UL 228 - Door Closers-Holders, With or Without Integral Smoke Detectors.
UL 464 - Audible Signaling Appliances.
UL 38 - Manually Actuated Signaling Boxes for Use with Fire-Protective Signaling

Systems
UL 346 - Waterflow Indicators for Fire Protective Signaling Systems.
UL 1971 - Signaling Devices for the Hearing-Impaired.
UL 1481 - Power Supplies for Fire Protective Signaling Systems.
Factory Mutual (FM) approval
Baltimore City Fire Marshal.

Federal Codes and Regulations
Americans with Disabilities Act (ADA)
International Standards Organization (ISO)
ISO-9000
ISO-9001

1.3 SYSTEM DESCRIPTION

A. General

1. The Contractor shall furnish all labor, services and materials necessary to furnish and install a complete, functional fire alarm system (System) for both the YDC & OTSC buildings. The System shall comply in respects with all pertinent codes, rules, regulations and laws of the Authority, and local jurisdiction. The System shall comply in all respects with the requirements of the specifications, manufacturer's recommendations and Underwriters Laboratories Inc. (ULI) listings. It is further intended that upon completion of this work, the Owner be provided with:
Complete information and drawings describing and depicting the entire system(s) as installed, including all information necessary for maintaining, troubleshooting, and/or expanding the system(s) at a future date.
Complete documentation of system(s) testing.
Certification that the entire system(s) has/have been inspected and tested, is/are installed entirely in accordance with the applicable codes, standards, manufacturer's recommendations and ULI listings, and is/are in proper working order. Contractor shall use "Fire Alarm System Certification and Description" as required by Section 1-6.2 of NFPA 72 - 1999 edition. Provide and install a workstation computer with Fireworks FW-CGS software to annunciate all system activity from both buildings fire alarm systems. Connect the computer via CAT5e cable back to the EST3x fire alarm panel. Utilize an Edwards MN-COM1S network module for connection to the EST3x panel. The software shall support textual annunciation of all system activity, no common control over the FACP is necessary.

2. Description 24VDC NACs
   a. Provide and install a new fire detection and alarm system that shall consist of:
   b. Two Fire Alarm Control Panels located as shown on the drawings.
   c. Two LCD remote annunciator(s) located as shown on the drawings.
   d. A printer.
   e. Manual pull stations located as shown on the drawings.
   f. Area smoke detectors located as shown on drawings.
   g. Area heat detectors located as shown on drawings.
   h. Beam smoke detectors located as shown on the drawings.
   i. Duct smoke detectors located as shown on the drawings.
   j. Sprinkler system waterflow(s) and valve supervisory switch(s) located as shown on the drawings.

k. Interface with suppression system(s) as shown on the drawings.
l. Provide audible notification appliances (chimes) located as shown on the drawings.
m. Provide synchronized visual notification appliances located as shown on the drawings.
n. Provide magnetic door holders, located as shown on drawings.
o. Provide elevator recall functions for primary and alternate floors and elevator power shunt trip activation.
p. Provide connection to a central station. The owner shall arrange for two dedicated phone lines to be terminated as directed by the installing contractor.
q. Provide wire guards where shown on the drawings.

B. Sequence of Operations

1. General 24 VDC NACs

a. The alarm activation of any area smoke detector, heat detector, manual pull station, sprinkler water flow, the following functions shall automatically occur:
b. The internal audible device shall sound at the control panel and remote annunciator.
c. The LCD display shall indicate all applicable information associated with the alarm condition including; device type, device location and time/date.
d. All system activity/events shall be documented in system history and on the system printer.
e. Any remote or local annunciator LCD/LED's associated with the alarm shall be illuminated.
f. Activate notification audible appliances throughout the building.
g. Activate visual strobes notification appliances throughout the building. The visual strobe shall continue to flash until the system has been reset. The visual strobe shall not stop operating when the "Alarm Silence" is pressed.
h. Transmit an alarm signal to the central station.
i. All automatic events programmed to the alarm point shall be executed and the associated outputs activated.
j. All stairwell/exit doors shall unlock throughout the building.
k. All self-closing fire/smoke doors held open shall be released.

C. Duct Smoke Operation

1. The Alarm activation of any duct smoke detector, the following functions shall automatically occur:

a. The internal audible device shall sound at the control panel and remote annunciator.
b. The LCD display shall indicate all applicable information associated with the supervisory condition including; device type, device location and time/date.
c. All system activity/events shall be recorded on the system printer and system history file.
d. Any remote or local annunciator LED's associated with the supervisory shall be illuminated.
e. Transmit signals to remote annunciators .

f. Transmit an alarm signal to the central station.
g. Shutdown the local air handling unit.
h. All automatic events programmed to the alarm point shall be executed and the associated outputs activated.

D. Supervisory Operation

1. Upon supervisory activation of any sprinkler valve supervisory switch, the following functions shall automatically occur:

a. The internal audible device shall sound at the control panel and remote annunciator.
b. The LCD display shall indicate all applicable information associated with the supervisory condition including; device type, device location and time/date.
c. All system activity/events shall be documented on the system printer and system history file.
d. Any remote or local annunciator LCD/LED's associated with the supervisory activation shall be illuminated.
e. Transmit a supervisory signal to the central station.

E. Trouble Operation

1. Upon activation of a trouble condition or signal from any device on the system, the following functions shall automatically occur:

a. The internal audible device shall sound at the control panel and remote annunciator.
b. The LCD display shall indicate all applicable information associated with the trouble condition including; device type, device location and time/date.
c. All system activity/events shall be documented on the system printer and system history file.
d. Any remote or local annunciator LCD/LED's associated with the trouble zone shall be illuminated.
e. Transmit a trouble signal to the central station.

F. System Configuration

1. All Life Safety System equipment shall be arranged and programmed to provide a system for the early detection of fire, the notification of building occupants, the automatic summoning of the local fire department, the override of the HVAC system operation, and the activation of other auxiliary systems to inhibit the spread of smoke and fire, and to facilitate the safe evacuation of building occupants.
2. The System shall utilize independently addressed, smoke detectors, heat detectors and input/output modules as described elsewhere in this specification.

G. Power Supply

1. The power supply shall be a high efficiency switch mode type with line monitoring to automatically switch to batteries for power failure or brown out conditions. The automatic battery charger shall have low battery discharge protection. The

power supply shall provide internal power and 24 Vdc at 4.5A continuous for notification appliance circuits. <Auxiliary power shall be 24 Vdc at 1A.><Smoke power shall be 24vdc at 500mA> All outputs shall be power limited. The battery shall be sized to support the system for <60> <24> <4> hours of supervisory and trouble signal current plus general alarm for <5> <15> <30> minutes. The power supply shall be an EST model 2-PPS.

2. Auxiliary power supplies shall be a high efficiency switch mode type with line monitoring to automatically switch to batteries for power failure or brown out conditions. The automatic battery charger shall have low battery discharge protection. The power supply shall provide internal power and 24 Vdc at 6.4 continuous for notification appliance circuits. The power supply shall be capable of providing 8A to output circuits for a maximum period of 100 ms. All outputs shall be power limited. The battery shall be sized to support the system for <60> <24> <4> hours of supervisory and trouble signal current plus general alarm for <5> <15> <30> minutes. All supervision of the auxiliary supply shall be transmitted via addressable analog loop without additional equipment. The auxiliary power supply shall be an EST model SIGA-APS.

H. Display

1. The display module shall be of membrane style construction with a 4 line by 20 character Liquid Crystal Display. The LCD shall use super-twist technology and backlighting for high contrast visual clarity. In the normal mode display the time, the total number of active events and the total number of disable points. In the alarm mode display the total number of events and the type of event on display. Reserve 40 characters of display space for user custom messages. The module shall have visual indicators for the following common control functions; AC Power, alarm, supervisory, monitor, trouble, disable, ground fault, CPU fail, and test. There shall be common control keys and visual indicators for; reset, alarm silence, trouble silence, drill, and one custom programmable key/indicator. Provide four pairs of display control keys for selection of event display by type (alarm, supervisory, monitor and trouble) and forward / backward scrolling through event listings. The operation of these keys shall be integrated with the related common control indicator that lights when an event of its type is active. Allow the first event of the highest priority to capture the LCD for display so that arriving fire fighters can view the first alarm event "hands free". Provide system function keys; status, reports, enables, disable, activate, restore, program, and test. The module shall have a numeric keypad, zero through nine with delete and enter keys.
   The display module shall be an EST model 2-LCD.

I. Initiating Device Circuits

1. The Initiating device circuits (IDC) used to monitor manual fire alarm stations, smoke and heat detectors, water flow switches, valve supervisory switches, fire pump functions, and air pressure supervisory switches shall be Class B.
   The Initiating device circuits shall be EST Signature series modules.

J. 24 VDC Notification Appliance Circuits

1. 24 VDC Notification appliance circuits (NAC) shall be Class B (Style "Y"). All notification appliance circuits shall have a minimum circuit output rating of 2 amp

@ 24 vdc. The notification circuits shall be power limited. Non-power limited circuits are not acceptable.
The 24 VDC Notification appliance circuits shall be EST Signature series modules.

K. Signaling Line Circuits
1. The signaling line circuit shall communicate from a panel/node to analog/addressable detectors, input modules, output modules, isolation modules and notification appliance circuits.
2. Each signaling circuit connected to addressable/analog devices shall provide a minimum of 20 spare addresses.
3. When a signaling line circuit covers more than one fire/smoke compartments, a wire-to-wire short shall not affect the operation of the circuit from the other fire/smoke compartments.
4. The signaling line circuit (SLC) connecting panels and annunciators shall be Class B (style 4).
5. The signaling line circuit connecting to addressable/analog devices including, detectors, monitor modules, control modules, isolation modules, and notification circuit modules shall be Class B (style 4).

1.4 MRc2: Construction Waste Management

A. No less than the specified minimum proportion of all construction waste from the project shall be diverted from disposal in a landfill and/or incineration in accordance with the project requirements for Construction Waste Management. See Section 018113 Sustainable Design Requirements.

B. EQc4.1: LOW-EMITTING MATERIALS – SEALANTS AND ADHESIVES

All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the project requirements for Low-Emitting Materials – Sealants and Adhesives. See Section 018113 Sustainable Design Requirements.

Contractor shall provide LEED credit verification as per Section 013300 Submittal Procedures.

C. EQc4.2: LOW-EMITTING MATERIALS – PAINTS AND COATINGS

All paints and coatings used in the building interior comply with the project requirements for Low-Emitting Materials – Paints and Coatings. See Section 018113 Sustainable Design Requirements.

Contractor shall provide LEED credit verification as per Section 013300 Submittal Procedures.

1.5 Submittals (YDC and OSTC)

A. Project Submittal

1. The contractor shall purchase no equipment for the system specified herein until the owner has approved the project submittals in their entirety and has returned them to the contractor. It is the responsibility of the contractor to meet the entire intent and functional performance detailed in these specifications. Approved submittals shall only allow the contractor to proceed with the installation and shall not be construed to mean that the contractor has satisfied the requirements of these specifications. The contractor shall submit three (3) complete sets of documentation within 30 calendar days after award of purchase order.
2. Each submittal shall include a cover letter providing a list of each variation that the submittal may have from the requirements of the contract documents. In addition the contractor shall provide specific notation on each shop drawing, sample, catalog cut, data sheet, installation manual, etc. submitted for review and approval, of each such variation.
3. All drawings and diagrams shall include the Contractor's title block, complete with drawing title, contractor's name, address, date including revisions, and preparer's and reviewers initials.

B. Product Data

1. Data sheets with the printed logo or trademark of the manufacturer for all equipment. Indicated in the documentation will be the type, size, rating, style, and catalog number for all items proposed to meet the system performance detailed in this specification. The proposed equipment shall be subject to the approval of the Architect/Engineer.

C. Shop Drawings (YDC and OSTC)

1. A complete set of shop drawings shall be supplied for both the YDC and OTSC. The shop drawings shall be reproduced electronically in digital format. Shop drawing shall also be submitted to Permits Department and to the State Fire protection engineer for their approval and all the fees shall be paid by contractor. Resubmit as required to make clarifications or revisions to obtain approval. This package shall include but not be limited to:

    a. Control panel wiring and interconnection schematics.
    b. Complete point to point wiring diagrams.

D. Riser diagrams (YDC and OSTC)

1. Complete floor plan drawing locating all system devices and 1/4' = 1'-0 scale plan and elevation of all equipment in the Fire Command Station. Including showing the placement of each individual item of fire alarm equipment as well as raceway size and routing, junction boxes, and conductor size, quantity, and color in each raceway.
2. Detailed system operational description. Any Specification differences and deviations shall be clearly noted and marked.

E. Complete system bill of material (YDC and OSTC

1. All drawings shall be reviewed and signed off by an individual having a minimum of a NICET certification in fire protection engineering technology, subfield of fire alarm systems.

F. Samples

1. A sample of each smoke detector, intelligent modules, horn, wire guards and strobes shall be provided to the contractor for their familiarization. Wire guard shall be reviewed by the owner for review and approval.

G. Quality Assurance/Control Submittals

1. Installer's NICET Certification
2. The engineered systems distributor must be licensed in the state of project location and have been incorporated in the business in that state for a minimum of 5 years.
3. Submit a copy of the contractors training certification issued by the manufacturer of the Life Safety System. A copy of the installing technician's NICET certification.

H. System Calculations (YDC and OSTC)

1. Complete calculations shall be provided which show the electrical load on the following system components:

a. Each system power supply, including stand alone booster supplies.
b. Each standby power supply (batteries).
c. Each notification appliance circuit.
d. Each auxiliary control circuit that draws power from any system power supply.

1.6 Software Service Agreement

A. Comply with UL 864.

B. Technical Support: beginning with Substantial Completion, provide software support for two years.

C. Upgrade Service: Update software to latest version at project completion. Install and program software upgrades that become available with two years from date of Substantial Completion. Upgrading software shall include operating system. Upgrade software shall include new or revised license for use of software.

D. Provide 30 days' notice to owner to allow scheduling and access to system and to allow owner to upgrade computer system if necessary.

1.7 Software and Firmware Operational Documentation:

A. Software operating and upgrade manuals.

B. Program Software Backup: On magnetic media or compact disk, complete with data files.

C. Device address list.

D. Printout of software application and graphics screen.

1.8 Project Conditions

A. Conditions

1. It shall be the Contractor's responsibility to inspect the job site and become familiar with the conditions under which the work will be performed. Inspection of the building may be made by appointment with the Owner. Contractors are requested to inspect the building prior to the pre-bid meeting.
2. A pre-bid meeting will be held to familiarize the Contractors with the project. Failure to attend the pre-bid meeting may be considered cause for rejection of the Contractor's bid. The minutes of this meeting will be distributed to all attendees and shall constitute an addendum to these specifications.

1.9 Warranty and Maintenance

A. Warranty

1. The contractor shall warranty all materials, installation and workmanship for two (2) year from date of acceptance, unless otherwise specified. A copy of the manufacturer's warranty shall be provided with close-out documentation and included with the operation and installation manuals.
2. The System Supplier shall maintain a service organization with adequate spare parts stock within 50 miles of the installation. Any defects that render the system inoperative shall be repaired within 24 hours of the owner notifying the contractor.

B. Spare Parts

1. The Contractor shall supply the following spare parts:

a. Automatic detection devices - Two (2) percent of the installed quantity of each type.
b. Manual fire alarm stations - Two (2) percent of the installed quantity of each type.
c. Glass rods or panels for break glass manual fire alarm stations (if used) - <Ten> percent of the installed quantity, but no less than two devices.
d. Audible and visible devices - One (1) percent of the installed quantity of each type, but no less than two (2) devices.
e. Keys - A minimum of three (3) sets of keys shall be provided and appropriately identified.

1.10 Training

A. Training: The System Supplier shall schedule and present a minimum of 8 hours supporting 3 shifts of owner reps with documented formalized instruction for the building owner, detailing the proper operation of the installed System.

B. The instruction shall be presented in an organized and professional manner by a person factory trained in the operation and maintenance of the equipment and who is also thoroughly familiar with the installation.

C. The instruction shall cover the schedule of maintenance required by NFPA 72 and any additional maintenance recommended by the system manufacturer.

D. Instruction shall be made available to the Local Municipal Fire Department if requested by the Local Authority Having Jurisdiction.

1.11 COMMISSIONING

A. The materials, components and systems described in this section are subject to the Commissioning process. Contractor must comply with all Commissioning Requirements. Commissioning Requirements are described in Section 019113 General Commissioning Requirements and in Division 36 Commissioning. Division 36 provides an individual Commissioning specification section for each Division 2 through Division 33 specification section requiring Commissioning.

PART 2 - PRODUCTS

2.1 Manufacturer

A. Acceptable fire alarm system manufacturers include:

1. Edwards Systems Technology, Inc.

a. All equipment and components shall be the manufacturer's current model equal to EST3X. The materials, appliances, equipment and devices shall be tested and listed by a nationally recognized approval agency for use as part of a protected premises protective signaling (fire alarm) system. The authorized representative of the manufacturer of the major equipment, such as control panels, shall be responsible for the satisfactory installation of the complete system.

b. The contractor shall provide, from the acceptable manufacturer's current product lines, equipment and components, which comply, with the requirements of these specifications. Equipment or components, which do not provide the performance and features, required by these specifications are not acceptable, regardless of manufacturer.

2.2 Panel Components & Functions

A. General

1. The control panels shall be a multi-processor-based system and shall be able to network between two fire alarm panels and designed specifically for fire and releasing system applications. The control panel shall be listed and approved for the application standard(s) as listed under the General section.

2. The control panel shall include all required hardware, software and system programming to provide a complete and operational system. The control panel shall assure that life safety takes precedence among all panel activities.
3. The control panel shall include the following capacities:
   a. Support up to 380 analog/addressable points per panel (1,900 total with 5 networked panels)
   b. Support up to 5 fully supervised network remote annunciators.
   c. Support a DACT (dialer) for off premise notification
   d. Support up to 576 chronological events in history.
   e. Network with other panels and workstation.
4. The control panel shall include the following features:
   a. Provide auto programming and electronic addressing and mapping of analog/addressable devices.
   b. Provide an operator interface display that shall include functions required for annunciation, command and control system functions.
   c. Provide a discreet system control switch provided for reset, alarm silence, local silence, drill switch, up/down switches, status switch, program switch, enable and disable switches, activate and restore switches, reports switch and test switch.
   d. Provide system reports that provide sensitivity and history details.
   e. Provide an authorized operator with the ability to operate or modify system functions like system time, date, passwords; and auto program, enable mapping, restart the system and clear control panel event history file.
   f. Provide an authorized operator to perform test functions within the installed system.
5. Supervision of system components, wiring, initiating devices and software shall be provided by the control panel. Failure or fault of system component or wiring shall be indicated by type and location on the LCD display. Software and processor operation shall be independently monitored for failure.

B. Annunciation
1. The system shall be designed and equipped to receive, monitor, and annunciate signals from devices and circuits installed throughout both YDC and OSTC building. Manufacturer's standard control switches shall be acceptable if they provide the required operation, including performance, supervision and position indication. If the manufacturers' standard switches do not comply with these requirements, fabrication of custom manual controls acceptable to the owner is required.
2. Receipt of alarm, trouble, and supervisory signals shall activate integral audible devices at the control panel(s) and at each remote annunciation device.
3. The annunciator shall contain the following system status indicators:
   a. 80 character Backlit Liquid Crystal Display.
   b. System Power Indicator - green LED.
   c. System Common Alarm - red LED.
   d. System Common Trouble - yellow LED.
   e. System Common Supervisory - yellow LED.
   f. System Common Monitor - yellow LED.
   g. System Ground Fault - yellow LED.
   h. System CPU Fault - yellow LED.
   i. System Disabled - yellow LED.
   j. System Test Point(s) - yellow LED.
   k. System Reset Switch with Integral yellow LED.
   l. System Alarm Silence Switch with Integral yellow LED.
   m. System Local Silence Switch with Integral yellow LED.

n. System Drill Switch with Integral yellow LED
o. System Message Queue Scroll Switches.
p. Additional buttons as required to provide system control and operator functions.
q. The networked annunciator(s) shall be an EST EST2 series.

C. Power Supply

1. Each system power supply shall be a minimum of 6 amps @ 24 vdc.
2. Upon failure of normal (AC) power, the affected portion(s) of the system shall automatically switch over to secondary power without losing any alarm, trouble or operator acknowledgment signals.
3. Each system power supply shall be individually annunicated and shall identify the inoperable power supply in the event of a trouble condition.
4. All standby batteries shall be continuously monitored by the system. Low battery and disconnection of battery power supply conditions shall immediately annunciate as a trouble signal, identifying the deficient batteries.
5. All system power supplies shall be capable of recharging their associated batteries, from a fully discharged condition to a capacity sufficient to allow the system to perform consistent with the requirements of this section, in 48 hours maximum.
6. All AC power connections shall be to the building's designated emergency electrical power circuit and shall meet the requirements of Section 1-5.2 of NFPA 72 - 1999. The AC power circuit shall be installed in conduit raceway. The power circuit disconnect means shall be clearly labeled FIRE ALARM CIRCUIT CONTROL and shall have a red marking. The location of the circuit disconnect shall be labeled permanently inside the each control panel.
7. The power supply shall be an EST model 2-PPS/6A.

D. Display

1. System Message Processing and Display Operations:

a. The system shall allow message routing to be configured to any or all annunciators.
b. All system printer port shall be configurable to output any combination of alarm, supervisory, trouble, or monitor, event messages.
c. Each LCD display on each annunciator shall be configurable to display the status of any combination of alarm, supervisory, trouble, or monitor, event messages.
d. Clear distinction shall be provided between alarm, supervisory, trouble, and monitor status messages.
e. The system shall provide the ability to retrieve data from the analog/addressable detectors to a PC while the system is on-line and operational in the protected premises. The uploaded data may then be analyzed in a diagnostic program supplied by the system manufacturer.
f. A standby power supply shall automatically supply electrical energy to the system upon primary power supply failure.

E. Dialer – Fiber Modem

Provide fiber modem for fire alarmpanel located in existing OSTC building for the connection to MTC.

F. Reports

1. The system shall provide the operator with system reports that give detailed chronological description of the last 576 system events. The system shall provide a report that gives a listing of the sensitivity and environmental compensation usage of all of the detectors on the system, or specified analog/addressable circuit.
2. The system report shall also include facility name, compiled date, compiler revision, project revision and report date. The system shall output these reports via the main LCD, and reports shall be capable of being printed on the system printer.

2.3 Field-mounted system components

A. Initiating Devices

1. Smoke Detectors & Accessories

a. Analog Addressable Smoke General
   1) Each analog addressable smoke detectors sensitivity shall be capable of being programmed individually as: most sensitive, more sensitive, normal, less sensitive or least sensitive.
   2) An alternate alarm sensitivity level shall be provided for each detector, which can be set to any of the five (5) sensitivity settings manually or automatically using a time of day event.
   3) The detector's sensing element reference point shall automatically adjust, compensating for background environmental conditions such as dust, temperature, and pressure. Periodically, the sensing element real-time analog value shall be compared against its reference value. The detector shall provide a maintenance alert signal that 80% to 99% compensation has been used. The detector shall provide a dirty fault signal that 100% compensation has been used.
   4) The system shall allow for changing of detector types for service replacement purposes without the need to reprogram the system. The replacement detector type shall automatically continue to operate with the same programmed sensitivity levels and functions as the detector it replaced. System shall display an off-normal condition until the proper detector type has been installed or change in the application program profile has been made.

b. Smoke Detector – Photoelectric
   1) Provide analog/addressable photoelectric smoke detectors at the locations shown on the drawings. The system shall have the ability to set the sensitivity and alarm verification of each of the individual detectors on the circuit. It shall be possible to automatically change the sensitivity of individual analog/addressable detectors for the day and night periods. Each smoke detector shall be capable of transmitting alarm signals as well as normal, trouble and need cleaning information. It shall be possible to program control panel activity to each level. Each smoke detector may be individually programmed to operate at any one of five (5) sensitivity settings. Each detector microprocessor shall contain an environmental

compensation algorithm that identifies and sets ambient environmental thresholds approximately six times an hour. The microprocessor shall monitor the environmental compensation value and alert the system operator when the detector approaches 80% and 100% of the allowable environmental compensation value.

2) The analog/addressable photoelectric smoke detector shall be an EST model SIGA-PS.

c. Duct Detector Housing

1) Provide smoke detector duct housing assemblies to mount an analog/addressable detector along with a standard, relay or isolator detector mounting base. The housing shall also protect the measuring chamber from damage and insects. The housing shall utilize an air exhaust tube and an air sampling inlet tube that extends into the duct air stream up to ten feet. Drilling templates and gaskets to facilitate locating and mounting the housing shall also be provided. The housing shall be finished in baked red enamel. Remote alarm LED indicators and remote test stations shall be provided.

2) The smoke detector duct housing shall be an EST model SIGA-SD.

B. Heat Detectors

1. Fixed Temperature-ROR Heat Detector

a. Provide analog/addressable combination fixed temperature / rate-of-rise detectors at the locations shown on the drawings. The heat detector shall have a nominal fixed temperature alarm point rating of 135°F (57°C) and a rate of rise alarm point of 15°F(9°C) per minute. The heat detector shall be rated for ceiling installation at a minimum of 70 ft (21.3m) centers and be suitable for wall mount applications.

b. The analog/addressable combination fixed temperature / rate-of-rise detector shall be EST model SIGA-HRS.

C. Detector Bases

1. Detector Base – Standard

a. Provide standard detector mounting bases suitable for mounting on either North American 1-gang, 3½ or 4 inch octagon box and 4 inch square box, or European BESA or 1-gang box. The base shall, contain no electronics and support all series detector types.

b. The standard detector base shall be an EST model SIGA-SB4.

D. Manual Stations

1. Provide Double-action mechanism requiring two actions to initiate an alarm, pull-lever type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit. The manual station shall be suitable for mounting on North American 2 ½ (64mm) deep 1-gang boxes and 1 ½ (38mm) deep 4 square boxes with 1-gang covers. Manual station accessible to inmate shall be key Typed.

E. Notification Appliances

1. General (signals)

    a. All appliances which are supplied for the requirements of this specification shall be UL Listed for Fire Protective Service, and shall be capable of providing the "equivalent facilitation" which is allowed under the Americans with Disabilities Act Accessibilities Guidelines (ADA(AG)), and shall be UL 1971 Listed.
    b. All appliances shall be of the same manufacturer as the fire alarm control panel specified to insure absolute compatibility between the appliances and the control panels, and to insure that the application of the appliances are done in accordance with the single manufacturer's instructions.
    c. Any appliances that do not meet the above requirements, and are submitted for use must show written proof of their compatibility for the purpose intended. Such proof shall be in the form of documentation from all manufacturers that clearly states that their equipment (as submitted) is 100% compatible with each other for the purpose intended. All strobes shall be provided with lens markings oriented for wall mounting.
    d. All notification appliances shall be <red><white> unless noted otherwise on the drawings.

2. Chime

    a. Low Profile Chimes: Provide low profile wall mount chimes at the locations shown on the drawings. The chime shall provide a 79 dBA sound output at 10 ft. when measured in reverberation room per UL-464. The chime shall automatically pulse at 60 strokes per minute. In and out screw terminals shall be provided for wiring. The chime shall mount in a North American 1-gang box. The low profile wall mount chimes shall be EST Model G1-C Genesis series.

3. Chime-Strobes

    a. Low Profile Chime-Strobes: Provide low profile wall mount chime/strobes at the locations shown on the drawings. The chime/strobe shall provide an audible output of 79dBA at 10 ft. when measured in reverberation room per UL-464. Strobes shall provide synchronized flash outputs. The strobe output shall be determined as required by its specific location and application from a family of 15cd, 30cd, 60cd, 75cd & 110cd devices. In and out screw terminals shall be provided for wiring. Low profile chime/strobes shall mount in a North American 1-gang box.The low profile wall mount chime/strobes shall be EST G1-CVM Genesis series.

4. Low Profile Strobes

    a. Provide low profile wall mounted strobes at the locations shown on the drawings. In and out screw terminals shall be provided for wiring. Strobes shall provide synchronized flash outputs. Strobe output shall be determined as required by its specific location and application from a family of 15cd, 30cd, 60cd, 75cd, or 110cd devices. Low profile strobes shall mount in a North American 1-gang box.
    b. The low profile wall mounted strobes shall be EST Genesis series.

F. Initiation & Control Modules

1. Intelligent Modules – General

    a. It shall be possible to address each intelligent module without the use of DIP or rotary switches. Devices using DIP switches for addressing shall not be acceptable. The personality of multifunction modules shall be programmable at site to suit conditions and may be changed at any time using a personality code downloaded from the Analog Loop Controller. Modules requiring EPROM, PROM, ROM changes or DIP switch and/or jumper changes shall not be acceptable. The modules shall have a minimum of 2 diagnostic LEDs mounted behind a finished cover plate. A green LED shall flash to confirm communication with the loop controller. A red LED shall flash to display alarm status. The module shall be capable of storing up to 24 diagnostic codes which can be retrieved for troubleshooting assistance. Input and output circuit wiring shall be supervised for open and ground faults. The module shall be suitable for operation in the following environment:
        1) Temperature: 32°F to 120°F (0°C to 49°C)
        2) Humidity: 0-93% RH, non-condensing

2. Control Relay Module - SIGA-CR

    a. Provide intelligent control relay modules at the locations shown on the drawings. The Control Relay Module shall provide one form "C" dry relay contact rated at 2 amps @ 24 Vdc to control external appliances or equipment shutdown. The control relay shall be rated for pilot duty and releasing systems. The position of the relay contact shall be confirmed by the system firmware. The control relay module shall be suitable for mounting on North American 2 ½" (64mm) deep 1-gang boxes and 1 ½" (38mm) deep 4" square boxes with 1-gang covers.
    b. The addressable control relay circuit module shall be an EST model SIGA-CR.

3. Dual Input Module - SIGA-CT2

    a. Provide intelligent dual input modules at the locations shown on the drawings.. The Dual Input Module shall provide two (2) supervised Class B input circuits each capable of a minimum of 4 personalities, each with a distinct operation. The module shall be suitable for mounting on North American 2 ½" (64mm) deep 1-gang boxes and 1 ½" (38mm) deep 4" square boxes with 1-gang covers. The dual input module shall support the following circuit types:
        1) Normally-Open Alarm Latching (Manual Stations, Heat Detectors, etc.)
        2) Normally-Open Alarm Delayed Latching (Water flow Switches)
        3) Normally-Open Active Non-Latching (Monitor, Fans, Dampers, Doors, etc.)
        4) Normally-Open Active Latching (Supervisory, Tamper Switches
    b. The intelligent dual input module shall be an EST model SIGA-CT2.

4. Single Input Module - SIGA-CT1

    a. Provide intelligent single input modules at the locations shown on the drawings. The Single Input Module shall provide one (1) supervised Class

B input circuit capable of a minimum of 4 personalities, each with a distinct operation. The module shall be suitable for mounting on North American 2 ½" (64mm) deep 1-gang boxes and 1 ½" (38mm) deep 4" square boxes with 1-gang covers. The single input module shall support the following circuit types:

1) Normally-Open Alarm Latching (Manual Stations, Heat Detectors, etc.)
2) Normally-Open Alarm Delayed Latching (Water flow Switches)
3) Normally-Open Active Non-Latching (Monitor, Fans, Dampers, Doors, etc.)
4) Normally-Open Active Latching (Supervisory, Tamper Switches)

b. The intelligent single input module shall be an EST model SIGA-CT1.

2.4 Graphic Annunciators (YDC and OSTC)

A. Two graphics panel one for each bldg. are required, both located @ YDC lobby.

B. The annunciator graphical diagram shall be 18 x 18 inch per foot scale minimum and operating on nominal 24 Vdc. All annunciator switches shall be system input points and shall be capable of controlling any system output or function. The graphic annunciator shall be UL and ULC Listed. The graphic shall be back-lit using high intensity LEDs. The unit shall be surface mounted. The main graphic door shall be tamper resistant and equipped with a key lock. It shall be possible to update the graphic image in the field without replacing the entire graphic.

1. The graphic annunciator shall be an EST Envoy series.

2.5 Wire cage

A. Provide intuitional grade UL listed wire cage around horn, strobes and smoke detectors located in inmate areas. Wire cage shall be approved by the owner via a sample.

2.6 Workstation

A. Provide and install two workstation computers with Fireworks FW-CGS software to annunciate all system activity from both buildings fire alarm systems. Connect the computer via CAT5e cable back to the EST3x fire alarm panel. Utilize an Edwards MN-COM1S network module for connection to the EST3x panel. The software shall support textual annunciation of all system activity, no common control over the FACP is necessary.

PART 3 - EXECUTION

3.1 Installation

A. Installation Sequence

1. Installation of the systems shall be conducted in stages and phased such that circuits and equipment are installed in the following order:

    a. Riser conduits, AC power conduits and control cabinets.
    b. Fire command center, remote control panel(s), control component(s), annunciator(s), remote CRT terminal(s), and printer(s). Provide temporary mounting of fire command center in <location.>
    c. Conduits and wiring for complete notification circuits and appliance installation throughout facility.
    d. Pre-test the audible and visual notification appliance circuits.
    e. Install all new detection devices.
    f. Terminations between field devices and the associated control equipment.
    g. The detection system shall be switched over and end of each day the system shall be operational. At no time will the system be placed out of service over night.
    h. Complete the interface to the building automation system.
    i. Complete contractor pre-test of system.
    j. Complete system testing.

B. Conductors

1. The requirement of this section apply to all system conductors, including all signaling line, initiating device, notification appliance, auxiliary function, remote signaling, AC and DC power and grounding/shield drain circuits, and any other wiring installed by the Contractor pursuant to the requirements of these Specifications.
2. All circuits shall be rated power limited in accordance with NEC Article 760.
3. All new system conductors shall be of the type(s) specified herein.
4. All initiating circuit, signaling line circuit, AC power conductors, shield drain conductors and grounding conductors, shall be solid copper, stranded or bunch tinned (bonded) stranded copper.
5. All signaling line circuits, including all addressable initiating device circuits shall be 18 AWG minimum multi-conductor jacketed twisted cable or twisted shielded or as per manufacturer's requirements.
6. All non-addressable initiating device circuits, 24 VDC auxiliary function circuits shall be 18 AWG minimum or per manufacturer's requirements.
7. All notification appliance circuit conductors shall be solid copper or bunch tinned (bonded) stranded copper. Where stranded conductors are utilized, a maximum of 7 strands shall be permitted for No. 16 and No. 18 conductors, and a maximum of 19 strands shall be permitted for No. 14 and larger conductors.
8. All audible notification appliance circuits shall be 14 AWG minimum twisted pairs or twisted pairs shielded or per manufacturer's requirements.
9. All visual notification appliance circuits shall be 14 AWG minimum THHN or twisted pairs or twisted shielded pairs or per manufacturer's requirements.
10. Use existing wires and conduit in OSTC building, where existing devices are being replaced with new at the same location. The wiring should be tested ahead

of time ensure continuity with a test report. In case of the failing test replace the wiring. Include 20% of the existing wiring to be replaced in the bid.

11. Installed in EMT conduit in concealed space and RGS when exposed.

3.2 Field Quality Control

A. Test & Inspection

1. All intelligent analog addressable devices shall be tested for current address, sensitivity, and user defined message.
2. All wiring shall be tested for continuity, shorts, and grounds before the system is activated.
3. All test equipment, instruments, tools and labor required to conduct the tests shall be made available by the installing contractor.
4. The system including all its sequence of operations shall be demonstrated to the Owner, his representative, and the local fire inspector. In the event the system does not operate properly, the test shall be terminated. Corrections shall be made and the testing procedure shall be repeated until it is acceptable to the Owner, his representatives and the fire inspector.
5. At the final test and inspection, a factory trained representative of the system manufacturer shall demonstrate that the system functions properly in accordance with these specifications. The representative shall provide technical supervision, and participate during all of the testing for the system.
6. All fire alarm testing shall be in accordance with National Fire Alarm Code, NFPA 72 - 1999, Chapter 7.
7. A letter from the Contractor certifying that the system is installed entirely in accordance with the system manufacturer's recommendations and within the limitations of the required listings and approvals, that all system hardware and software has been visually inspected and functionally tested by a manufacturer's certified representative, and that the system is in proper working order.

END OF SECTION 283111

SECTION 284619 - PLC HARDWARE FOR ELECTRONIC SECURITY

PART 1 - GENERAL

1.1 SYSTEM DESCRIPTION

A. Furnish all materials and labor necessary to complete the installation of specific systems described herein and integration of all systems as indicated, specified herein or both. The work includes the following, as well as work not listed below but described elsewhere:

1. Graphical User Interface (GUI) shall integrate control and monitoring of major subsystems and devices indicated in Project Documents. The GUI shall act as an operator interface to the major security control and monitoring subsystems. Include programming that implements control and monitoring functions defined in project documents.
2. System shall include a complete IEEE 802.3 100/1000 BASE-T Local Area Network (LAN) that interfaces the GUI computers and the Programmable Logic Controllers (PLC), Intercom Control and Video Surveillance systems. This network is closed, only used by the Security Control Systems.
3. All electronic equipment furnished and installed by the Security Electronics Contractor shall be protected by transient voltage surge suppression. See Specification Section 280526.
4. Provide computer-based hardware and custom designed, application-specific, Microsoft Windows latest edition software that operates in conjunction with Programmable Logic Controllers (PLC) specified below to integrate or interface to all devices and systems.
5. Provide and install graphical control and annunciation icons on graphics mode video displays along with programming that provides the sequences of operation verified with the Owner and Architect Engineer during the software development process described in 284620-PLC Software for Electronic Security, Part - 3.1, Software Support.
6. The GUI computer shall contain graphics and wavetable programs only. All control logic programs shall reside in the PLC.
7. General Requirements of PLC System

    a. Provide a Programmable Logic Controller (PLC) system that is the product of a single company, which has regularly manufactured PLC equipment for a period of 15 years.
    b. Provide only components that are regularly used in industrial automation applications.
    c. Components must be in stock from a distributor within 100 miles of this facility or be able to be shipped next day to this facility.
    d. Provide only UL Listed components.
    e. Provide PLC System that seamlessly integrates the Control system to the Private Security Control System Local Area Network.
    f. Provide CPU(s) with a visual status indication of backup battery.
    g. Provide alarm in the event of CPU low battery voltage before battery failure and for communication failure.
    h. Provide 15% spare PLC system capacity at the completion of the project. This includes program memory, I/O memory allocation, register memory, user memory, etc.

i. Provide programming software memory usage summary with as-built documentation.
j. Provide 15% spare PLC I/O module capacity at the completion of the project. Calculate inputs and outputs separately when figuring capacities.
k. All Components must be mounted in a metal enclosure.
l. All PLC interposing relays must be fused to protect relay and field device wiring from over-current caused by shorts or device failure.
m. EMC filter must be installed on the power supply lines
n. PLC racks and modules shall be Din Rail mountable.
o. Din Rail must be mounted on a metallic surface that is grounded to earth using screws with star washers every 6 inches.
p. All Safety and Reference grounds for PLC equipment shall be in compliance with IEEE 1100.
q. Expansion and Remote Cables must be 100% shielded. A 100% shield means that the braided cable shield is connected to the metal shell of the connector.
r. Termination Labeling

    1) Each wire shall be labeled with an industry standard thermal transfer wire marker.
    2) I/O wire number should reference wiring diagram and Software I/O list.
    3) Felt tip pen labels are unacceptable.
    4) Power wiring should reference wiring diagram.
    5) Communication cables should reference wiring diagram and node ID.

s. The control architecture shall use distributed control over Ethernet. Each controller will share selected memory with all other controllers via broadcast messages over Ethernet.
t. All Ethernet communication shall be configured using producer/consumer exchanges without requiring PLC logic to drive the communications.
u. All Remote I/O shall be connected over Ethernet.
v. Remote I/O shall use the exact same module types and same I/O module part numbers as those that are used at the PLC's CPU unit.
w. PLC racks and Remote I/O drops shall be expandable up to 64 modules per Ethernet drop using local expansion cables.
x. All I/O modules shall utilize terminal block style wire connections and support hot removal and insertion
y. Output modules shall be available with Electronic Short Circuit Protection. The diagnostic status of the Electronics Short Circuit Protection (ESCP), for those discrete output modules containing ESCP, shall be indicated by a green LED during normal operation per point and amber during a fault. The fault should be auto-corrective without the need to cycle power.

8. Touch Screen Control Workstations

a. Provide single and dual touch screen control work stations as indicated on the plans
b. Primary control location of each door is noted within the door lock symbol on the plans.
c. The touch screens located in central control shall be the fail over/takeover control location. Hierarchy and sequence of fail over/takeover shall be as defined during the phase
d. I software development meeting.
e. Each Central Control touch screen station consists of two 24" LCD touch screens, computer CPU, wireless mouse, and keyboard.

9. Integration with Video Surveillance System

   a. Provide integration of the video surveillance system that allows VMS control to be accomplished through the GUI. Functions to include but not be limited to:

      1) Camera call up via touch screen icons
      2) Video follow audio functionality
      3) Video follow alarm functionality

   b. Administrative level configuration and set up functions are not required to be accessible from the GUI

10. Integration with intercom system

   a. Provide integration of the intercom system to allow automatic video follow audio functionality.

   b. Provide programming that allows all intercom master control functions to be accomplished through the GUI including but not limited to:

      1) Answer
      2) Answer and zoom
      3) Page zone activation
      4) Clear call without answering
      5) Connect without a call being placed
      6) View Queuing log
      7) GUI shall annunciate a call placed at the station and by screen on the key plan.

   c. Administrative level configuration and set up functions are not required to be accessible from the GUI.

11. Integration with Access Control

   a. Provide integration of the Access Control system that allows control of door access to be accomplished through the GUI. Functions include, but are not limited to:

      1) Door unlock
      2) Request to Exit
      3) Door Monitoring

PART 2 - PRODUCTS

2.1 GENERAL

A. Equipment specified is intended as a reference standard for level of quality.

B. Lists of products and manufacturers are Non-restrictive. Submission of an unnamed product or manufacturer does not require a substitution or change to the Contract Documents, but must comply with requirements for “Comparable Products” as outlined in Section 010 60 00 PRODUCT REQUIREMENTS.

C. Provide materials listed by UL or ETL.

2.2 GUI TOUCH SCREEN USER INTERFACE

A. GUI Touch Screen Monitor

1. Specifications

a. 24.0” diagonal
b. 16:10 active matrix TFT LCD
c. Usable screen

1) 21.4” Horizontal
2) 13.8” Vertical

d. 1920 x 1200 native resolution
e. 16.7 million colors
f. 5ms Response time
g. +/- 80 degree viewing angle horizontal or vertical
h. 1000:1 contrast ratio
i. 120 VAC 61 watts power consumption
j. Two 2 watt internal speakers
k. Audio input 3.5mm TRS jack
l. Weight, 27.8 lbs
m. 32 to 104 degree F operating temperature
n. Surface acoustic wave touch technology

2. Acceptable manufacturers

a. ELO Touch 2400 LM
b. Equal by HP
c. Equal by NEC

B. GUI Touch Screen Monitor Mounting Arm

1. Specifications

a. Accommodates GUI Touch Screen Monitor size.
b. Accommodates GUI Touch Screen Monitor weight.
c. Extends 16 inches (minimum).
d. Equipped with +/- 15 degree (minimum) tilt capabilities.

2. Acceptable Manufacturers

a. CorLiving A-202-MLM
b. Approved Equal

C. GUI Touch Screen Computer

1. Specifications

    a. Intel Xeon E5-1620, 10 Meg Cache, 3.6 GHz
    b. Windows 7 professional 64 bit
    c. 4GB ECC PC3 1333 MHz uDIMM
    d. NVIDIA NVS510 2GB DDR3 HP Win 7 Video Adaptor
    e. 3.5” internal SATA HDD 1 TB, 7200 RPM
    f. Integrated Ethernet Adaptor
    g. USB Keyboard and Mouse

2. Acceptable manufacturer

    a. Lenovo S30
    b. Equal by HP
    c. Equal by Dell

D. GUI Speakers

1. Integral to monitor

2.3 SECURITY SYSTEM MANAGEMENT COMPUTER (SSMC)

A. Computer

1. Specifications

    a. Intel Xeon E5-1620, 10 Meg Cache, 3.6 GHz
    b. Windows 7 professional 64 bit
    c. 4GB ECC PC3 1333 MHz uDIMM
    d. NVIDIA NVS510 2GB DDR3 HP Win 7 Video Adaptor
    e. 3.5” internal SATA HDD 1 TB, 7200 RPM
    f. Integrated Ethernet Adaptor
    g. USB Keyboard and Mouse
    h. ThinkVision LT1952P 16:9 19” LED Monitor

2. Acceptable Manufacturers

    a. Lenovo S30
    b. Equal by HP
    c. Equal by Dell

B. Printer

1. Specifications

    a. 21 ppm color or B/W
    b. 250 sheet input
    c. Network ready
    d. Standard 2.0 USB and Ethernet
    e. 128 MB RAM
    f. 417 MHz processor
    g. 500 to 1500 pages per month recommended usage
    h. 1200 x 1200 dpi printing

i. Weight – 54 lbs

2. Acceptable Manufacturers

a. Lexmark C540n
b. Equal by Canon
c. Equal by Epson

2.4 CONTROL SYSTEM LOCAL AREA NETWORK SWITCH

A. Specifications

1.	Configuration:	48 Ethernet 10/100/1000 ports 4 of which are dual purpose
2.	Catalyst 2960 software image	
3.	Switching fabric:	32 Gbps
4.	Forwarding rate:	39 mpps
5.	Memory:	64 MB DRAM & 32 MB flash
6.	MAC addresses:	Up to 8,000
7.	IGMP groups/Multicast routes:	Up to 255
8.	Configurable MTU:	9000 Bytes with jumbo frames
9.	1000BaseT ports:	RJ-45 connectors, 4 pair Cat 5 UTP
10.	Input power:	100 – 240 VAC auto-ranging
11.	Indicators:	
12.	Port link integrity	
13.	Port disabled	
14.	Port speed	
15.	Port full duplex	
16.	System status	
17.	System RPS	
18.	System link status	
19.	System link duplex	
20.	System link speed	
21.	Operating Temp:	32 – 113 deg F
22.	Operating relative humidity:	10 – 85% non-condensing
23.	MTBF:	167,606 hours
24.	Power consumption:	140 watts max
25.	Certifications:	UL listed, FCC part 15 Class A

B. Acceptable Manufacturers

1. Cisco 2960G-48 TC
2. HP

2.5 PROGRAMMABLE LOGIC CONTROLLER

A. General requirements

1. Provide a Programmable Logic Controller (PLC) system that is the product of a single company, which has regularly manufactured PLC equipment for a period of 15 years.
2. Provide only components that are regularly used in industrial automation applications.
3. Components must be in stock from a distributor within 100 miles of this facility or be

able to be shipped next day to this facility.

4. Provide only UL Listed components.
5. Provide PLC System that seamlessly integrates the Control system to the Local Area Network switches.
6. Provide CPU(s) with a visual status indication of backup battery.
7. Provide primary and secondary CPUs and provide redundant power supplies on all CPU and I/O racks.
8. Provide alarm in the event of CPU low battery voltage before battery failure.
9. Provide 15% spare PLC system capacity at the completion of the project. This includes program memory, I/O memory allocation, register memory, user memory, etc.
10. Provide programming software memory usage summary with as-built documentation.
11. Provide 15% spare PLC I/O module capacity at the completion of the project. Calculate inputs and outputs separately when figuring capacities.
12. All Components must be mounted in a metal enclosure.
13. All PLC interposing relays must be fused to protect relay and field device wiring from over-current caused by shorts or device failure.
14. PLC AC power supply must be supplied through an IEC-rated isolation transformer.
15. EMC filter must be installed on the power supply lines
16. PLC racks and modules shall be Din Rail mountable.
17. Din Rail must be mounted on a metallic surface that is grounded to earth using screws with star washers every 6 inches.
18. All Safety and Reference grounds for PLC equipment shall be in compliance with IEEE 1100.
19. Expansion and Remote Cables must be 100% shielded. A 100% shield means that the braided cable shield is connected to the metal shell of the connector.
20. Termination Labeling

    a. Each wire shall be labeled with an industry accepted wire marker
    b. I/O wire number should reference wiring diagram and Software I/O list.
    c. Felt tip pen labels are unacceptable
    d. Power wiring should reference wiring diagram.
    e. Communication cables should reference wiring diagram and node ID

21. The control architecture shall use distributed control over Ethernet. Each controller will share selected memory with all other controllers via broadcast messages over Ethernet.
22. All Ethernet communication shall be configured using producer/consumer exchanges without requiring PLC logic to drive the communications.
23. All Remote I/O shall be connected over Ethernet.
24. Remote I/O shall use the exact same module types and same I/O module part numbers as the PLC's.
25. PLC racks and Remote I/O drops shall be expandable up to 64 modules per Ethernet drop using local expansion cables.
26. All I/O modules shall support hot removal and insertion.
27. Output modules shall be available with Electronic Short Circuit Protection. The diagnostic status of the Electronics Short Circuit Protection (ESCP), for those discrete output modules containing ESCP, shall be indicated by a green LED during normal operation per point and amber during a fault. The fault should be auto-corrective without the need to cycle power.

B. Specifications

1. PLC Central Processor Units

a. Maximum 2048 inputs and 2048 outputs I/O capacity
b. Maximum 64K word instruction memory
c. RS-232 ASCII configurable auxiliary com port
d. Bit instruction execution time of 0.80µs max
e. Built in real time clock and calendar
f. Built in 10BaseT 10Mb/sec Ethernet port
g. Battery backed EEPROM memory
h. Connectivity via Ethernet, Devicenet, Sysnet, Systlink, Mod Bus RTU master/slave over RS-485 and RS-232-C.
i. Shock rating, operating – 30.0g (3 pulses, 11 ms)
j. Vibration rating – 1.0g @ 5-2000 Hz
k. Operating Temperature range – 32 to 140 Degrees F
l. Operating Humidity range 5 – 95% RH non-condensing

2. PLC Digital DC Input Modules

a. 10 – 30 VDC operating range
b. Sourcing or Sinking type modules
c. Maximum on/off signal 0.5mS max with selectable 1 or 7mS filter
d. Maximum off state current 0.5mA
e. 32 point modules minimum
f. Maximum backplane current load – 50mA

3. PLC Digital DC Output Modules

a. 10.2 - 30 VDC operating range
b. Sourcing or Sinking type modules
c. Maximum continuous current per output, .5 amp sourcing/1.0 amp sinking
d. Maximum continuous current per module, 8 amp sinking or sourcing @ 60 degrees C
e. 32 point modules minimum
f. Maximum backplane current load – 90mA @ 5 VDC
g. Removable terminal blocks
h. Gold plated contacts

4. PLC Power Supplies

a. 120/220 VAC nominal input voltage
b. Maximum input power, 27 VA
c. Backplane output current, 1.5 amps total
d. Operating Temperature range – 0 to 60°C
e. Operating Humidity range 5 – 95% RH non-condensing

C. Acceptable Manufacturers

1. Omron CS-1D Series
2. Allen Bradley
3. Modicon Momentum Series

2.6 LINEAR POWER SUPPLY

A. Specifications

1.	AC Input:	120 VAC, +10%, -13%
2.	DC Output:	24 VDC @ 12 amps
3.	Line Regulation:	+/-.05% for a 10% change
4.	Load Regulation:	+/- .05% for a 50% load change
5.	Output Ripple:	3 mV peak-to-peak maximum.
6.	Transient Response:	50 microseconds for 50% load change.
7.	Short Circuit Protection:	Automatic current limit/fold back
8.	Stability:	+/-.05% for 24 hours after warm up.
9.	Efficiency:	55%

10. Provide back plates, mounting hardware and all appurtenances required to install the power supplies in the system equipment racks.
11. An individual homerun cable is required between each field device powered by the power supply.
12. The output of the power supply is to feed a series of fuses rated for the intended load one each per homerun cable/device load.

B. Acceptable Manufacturer

1. SL Power F2412A+
2. Sola SMP B6
3. Power One F24-12A

2.7 GENERAL PURPOSE RELAYS (LOW CURRENT LOAD < 6 AMPS)

A. Specifications

1.	Switching Capacity:	6 Amp
2.	Termination:	Blade
3.	Operating Indicator Light:	Coil Rated Current:< 70 ma
4.	Operating Voltage	24 VDC
5.	Max. Cont. Applied Volt:	110%
6.	Drop-out Voltage:	10%
7.	DIN Rail Mountable Socket	
8.	Contacts Material	Gold Plated Silver

B. Acceptable Manufacturer

1. Idec
2. Potter and Brumfield
3. Finder

2.8 GENERAL PURPOSE HIGH POWER CONTROL RELAYS (HIGH CURRENT LOADS < 10 AMP)

A. Specifications

1. The control relays shall do the actual switching of the power to high current devices - locks, receptacles, etc.
2. Relays contacts shall be U.L. listed for a continuous current of 10 amps (inrush of 16 amps)
3. Each relay contact to the control device shall be individually fused externally with an indicating fuse holder.
4. Termination: Screw compression
5. Operating Indicator Light
6. Coil Rated Current: < 70 ma
7. Operating Voltage 24 VDC
8. Max. Cont. Applied Volt: 110%
9. Drop-out Voltage: 10%
10. DIN Rail Mountable Socket
11. Relays shall be pluggable with diode protection across coils and LED indication of activated coil circuit.
12. Low voltage wiring in relay cabinet shall be separated from high voltage wiring and all wiring shall be color-coded and marked with approved wire markers.
13. Control wiring shall be routed through plastic wire duct and landed on terminal strips.
14. Relays shall be controlled directly by the PLC.
15. Peripheral interface cards with active circuitry shall not be approved.
16. Relays shall have integral manual activation switch to override PLC for circuit testing and troubleshooting.
17. 24 VDC coil 1.2 watts or less
18. SPST of DPDT as required.

B. Acceptable Manufacturer

1. Idec
2. Potter and Brumfield
3. Finder

2.9 FUSED TERMINAL BLOCKS

A. Specifications

1. Din Rail mountable IEC style
2. dead front safety (ie. touch safe)
3. Screw clamp and Spring Clamp are acceptable
4. All Fuse terminal blocks shall be sized according to the wire gauge and currents load required for the application.
5. All Fuse Holders shall have a blown fuse indicator

    a. DC circuits shall have LED
    b. AC circuits shall have Neon or Trip lever

6. Provide lever disconnect type IEC fuse blocks.

B. Acceptable Manufacturer

1. Allen Bradley 1492-H5
2. Phoenix Contact UK-5 HESI
3. Square D AB1SF520

2.10 MODULAR TERMINAL BLOCKS

A. Specifications

1. Din Rail mountable IEC style
2. dead front safety (ie. touch safe)
3. Screw clamp and Spring Clamp are acceptable
4. All terminal blocks shall be sized according to the wire gauge and currents load required for the application.
5. Safety grounds should be identified with yellow/green color.
6. One wire per termination point unless Ferrules are used for Special Applications
7. All Ferrules are to be Crimped using the manufacturer's recommended Crimping tool.

B. Acceptable Manufacturer

1. Allen Bradley 1492-J4
2. Phoenix Contact UT-4
3. Square D AB1VV

PART 3 - EXECUTION

3.1 INSTALLATION

A. All initial system programming shall be done at the Security Electronics Contractor's facility prior to installation on site.

B. The System shall be installed by qualified personnel in strict compliance with manufacturer's instructions.

C. Upon completion of system programming enable the write protect function of the PLC CPU

D. Prevent unauthorized communications with the PLC CPUs by restricting the PLC to respond only to specific IP addresses. IE: "OMRON IP to FINS table set up."

E. Wiring shall be color coded, uniform and in accordance with national electric codes and manufacturer's instructions.

F. Equipment shall be firmly secured, plumb and level.

G. All cable runs to the main equipment rack shall be tagged and identified.

H. Coordinate all work with General Contractor - other Trades Contractors.

I. Grounding of electronics control cables, and peripheral equipment shall be installed per section 280526 and manufacturer's direction to eliminate noise induction and achieve optimum system performance.

J. Install and configure Security local area network as required for control and communication between system devices. When required, provide necessary coordination, termination, and programming associated with integrating Security local area network with facility network.

K. Equipment cabinets shall be assembled in the Security Electronics Contractors shop prior to delivery to the job site.

L. All cabling shall be continuous between field device and equipment cabinet. Terminations shall be to terminal boards with punch down blocks, or on screw terminals. Twisted and taped splices are unacceptable.

3.2 SOFTWARE SUPPORT

A. Refer to Section 284620 – Software for Electronic Security for software support and programming requirements.

3.3 SYSTEM INITIALIZING AND PROGRAMMING

A. All programming shall occur in the Security Electronics Contractor's shop prior to installation on site.

B. The System shall be turned on and adjustment made to meet requirements of the specification and on-site conditions.

C. The System shall be programmed to function as specified.

D. Any special programming shall be documented and a written copy given to the Owner.

E. Coordinate integration of other electronic systems as called for in the contract documents.

3.4 SYSTEM TEST PROCEDURES

A. The system shall be completely tested to assure that all components are hooked up and in working order.

B. The System shall be pre-tested by the Security Electronics Contractor and certified, in writing, to function in accordance with the plans and specification.

C. The Security Electronics Contractor is to verify the system is communicating with all controlled devices.

D. Testing to be performed in the Security Electronics Contractor's shop prior to delivery-

1. Test 120VAC power equipment and hardware internal to all equipment racks. Test all conductors for shorts, opens, and polarity.
2. Utilizing a test jig, simulate the operation of every circuit required.

E. Testing to be performed at the job site prior to delivery of the system

1. Verify all field wiring is free of shorts and opens prior to termination of head end

electronics.

2. Test all 120VAC power sources for correct polarity and voltage. Test grounding system for continuity. Notify General Contractor and Electrical Contractor of any problems.

F. Additional job site testing

1. After installation of head end electronics, verify proper operation of all field devices including locks, door position switches, card readers, push buttons, and intercom stations.
2. Verify proper integration between control system and

   a. Door control system
   b. Video surveillance system
   c. Intercom/Paging system
   d. Overhead door controls

   e. Handicap assist door operators

G. The System shall be completely tested to assure that all components are hooked up and in working order. Inspect system for defects. Correct all causes of such defects. If the cause is outside of the scope of the Division 28 series scope of work, promptly notify the General Contractor and the Architect Engineer in writing, indicating the cause of the defect and suggested corrective procedures.

H. Provide written documentation showing all test results.

I. The System shall be final tested in the presence of the Architect Engineer. Security Electronics Contractor is to provide all required testing equipment.

3.5 FIELD QUALITY CONTROL

A. Provide services of a duly factory authorized service representative for this project location to supervise the field assembly and connection of components and the pre-testing, testing, and adjustment of the system.

B. Make observations to verify that units and controls are properly labeled, and interconnecting wires and terminals are identified. Provide a list of final tap settings of paging speaker line matching transformers.

C. Rectify deficiencies indicated by tests and completely re-test work affected by such deficiencies at Trade Contractor's expense. Verify by the system test that the total system meets the Specifications and complies with applicable standards.

3.6 TRAINING

A. Provide the facility personnel with training in the use and maintenance of the entire control system. Coordinate the training sessions with the Owner. Completed classroom sessions shall be documented by the Security Electronics Contractor, certified by the attending Owner representatives, and approved by the Architect Engineer. Instruction shall take place during normal working hours (Monday through Friday, 8:00 a.m. to 5:00 p.m.). Instruction shall not begin until all systems are operational as designed.

B. The training sessions shall cover the operation and the maintenance manuals and the control console operators manuals and service manuals in detail, stressing all important operational and service diagnostic information necessary for the maintenance and operations personnel to efficiently use and maintain the control system.

C. Security Electronics Contractor is responsible for providing operational and maintenance training applicable to the entire control system. Training is to include, but not be limited to the following-

1. Review all O+M manuals with Owner representatives present for training.
2. Perform a tour of the entire facility. During the tour the trainer shall point out all control equipment and provide a brief description of its purpose and use. This is to include but not be limited to control panels (graphic and pushbutton), all control system hardware, and devices controlled.

END OF SECTION 284619

SECTION 284620 - PLC SOFTWARE FOR ELECTRONIC SECURITY

PART 1 - GENERAL

1.1 SYSTEM DESCRIPTION

A. Furnish all software and programming labor necessary to complete the installation of specific systems described herein and integration of all systems as indicated, specified herein or both. The work includes the following, as well as work not listed below but described elsewhere:

1. Programming of Security Systems Management Computer (SSMC). Include programming that implements system transaction logging, access control functions, and database retrieval functions.
2. Programming of Graphical User Interface Consoles (GUI). Include programming that implements Touch-screen control and monitoring functions defined in project documents.
3. Programming of Access Control Systems. Include programming the implements Access Control system interface functions and integration with the GUI.
4. Programming of Video Surveillance systems. Include programming that implements video surveillance system internal functions and integration with the GUI.
5. Programming of Intercom systems. Include programming that implements Intercom internal functions and integration with the GUI.
6. Computers shall be programmed such that any computer can be placed at any Touch Screen Location and reboot to that specific operator application without reprogramming.

PART 2 - PRODUCTS

2.1 GENERAL

A. Equipment specified is intended as a reference standard for level of quality.

B. Lists of products and manufacturers are Non-restrictive. Submission of an unnamed product or manufacturer does not require a substitution or change to the Contract Documents, but must comply with requirements for “Comparable Products” as outlined in Section 010 60 00 PRODUCT REQUIREMENTS.

C. Provide materials listed by UL or ETL.

2.2 GUI SOFTWARE/GRAPHICS

A. Basis of design

1. These specifications are written using the Omron IWS or Omron Indusoft product. Any product by another manufacturer must include the same features and functions to those listed below.

B. Specifications

1. Include the most recent PLC protocols from the PLC manufacturer and allows direct communication with ALL current, future and legacy OMRON networks (SYSNET, SYSLINK, ControllerLink, Ethernet and EthernetIP)
2. Provide software that is all-inclusive for communications, graphics, alarming, databasing, etc. No need for "add-on" software modules to provide these features.
3. Provide software that allows global changes to system icons
4. Provide software that allows changes to workstations/runtime licenses “on the fly”; software that requires a workstation to be shut down to make a change shall not be considered.
5. Software that includes third party I/O drivers shall not be considered.
6. Systems that utilize polling to determine the status of I/O points shall not be considered.
7. Provide displays utilizing accurately depicted, properly aligned floor plans. Floor plans must be displayed as seen from the GUI console operator’s perspective (i.e.; rooms and doors in front of the operator at the top of the display, rooms and doors behind the operator at the bottom of the display). GUI consoles facing different directions must display accordingly different floor plans.
8. Provide displays that optimize the use of screen resolution and color to enhance and simplify the information displayed. Provide a textured, dull, light gray background for all displays. Provide displays that minimize the unnecessary use of highly saturated colors. Provide displays that utilize contrasting colors. Utilize color to clarify annunciation, highlight choices and indicate correct operator input. Saturated colors shall be used to annunciate conditions of devices other than their normal or secure state. Use red for alarm conditions, yellow for cautionary conditions and information such as the depiction of interlock groups, use green for intercom and blue for video surveillance devices.
9. Provide properly sized control icons that are a minimum 1/2" square. Control icons must be large enough to facilitate proper and easy operation. Where screens are congested and placement of icons becomes difficult, divide the screens and increase the scale of the background so that the icons can be properly placed.
10. Provide control icons and annunciation icons that provide an intuitive depiction of their purpose. Control icons and annunciation icons shall utilize color to indicate abnormal or “on” conditions only. Control icons and annunciation icons associated with devices that are in a normal or off state shall utilize muted, de-saturated colors.
11. Provide programming that uses a cursor to depict the control icon that has the current focus. Provide programming that allows the user to place a cursor on the screen and “drag” the cursor over the desired control icon, activating the associated function when the cursor is released (“activation on liftoff”). As the cursor moves over a control icon, the icon should “highlight” to indicate that if the cursor is released the icon shall activate. Annunciation only icons should not function in this fashion. Using the touch capability of the system, the operator shall be able to “drag” the cursor across the screen to the desired icon with the same effect as moving the mouse to control the cursor.
12. Provide a mouse for each GUI. Moving the cursor with the mouse shall provide the same highlighting function as described above. Touching or left clicking the mouse shall activate the highlighted device.
13. Provide programming that ensures that any screen can be displayed in a maximum of two (2) touches. Provide “pan” function icons to display adjacent areas. Provide “zoom” function icons to display enlarged views of areas.

14. Screen display redraw/update/remote device response time thru-put shall be held to 0.5 seconds maximum. Activating a control icon shall cause the associated field device to operate within 0.5 seconds maximum. A field device that changes state must cause an annunciation icon to change state within 0.5 seconds maximum.
15. Provide the number of graphic "screens" that supports the sequences of operation verified with the Owner and Architect Engineer during the software development process described in Part - 3.1, Software Support. Any screen that the user or security consultant determines is to densely packed or too “busy” shall be subdivided at no expense to the Owner.
16. Locate global control function icons in a “tool bar” configuration. Users shall have the ability to locate the tool bar on the top, bottom, right or left of the screen.
17. Tool bar functions may be divided into global functions and miscellaneous functions at the integrators discretion. Display of global and miscellaneous tool bars may be configured independently.
18. Place icons for "high traffic" functions on multiple screens as verified with the Owner and Architect Engineer during the software development process described in Part - 3.1, Software Support. Any icon that the user or security consultant determines is necessary on more than one screen shall be provided on more than one screen at no cost to the Owner.
19. Provide software that annunciates alarms until they are acknowledged, independent of screen displayed. Provide prioritization of alarms as verified with the Owner and Architect Engineer during the software development process described in Part - 3.1, Software Support.
20. Provide a method for unanswered alarms to move to a designated GUI as verified with the Owner and Architect Engineer during the software development process described in Part - 3.1, Software Support.
21. Graphical User Interface operators consoles are intended to operate in concert with each other, i.e.; Silencing an alarm on one screen causes the alarm to be silenced on all other screens displaying the same alarm. Multiple operations on multiple screens to silence the same alarm are not acceptable.
22. Hierarchy of Control - During the software development process described in Part - 3.1, designated GUI takeover scenarios shall be confirmed and provided by the integrator under Base Bid.
23. During the software development process described in Part - 3.1, interlock groups shall be confirmed and provided by the Trade Contractor under Base Bid.
24. Provide a “Supervisors Utility Screen”, protected by a pin code to allow updating of modifiable system parameters as verified with the Owner and Architect Engineer during the software development process described in Part - 3.1, Software Support.
25. Provide for instant connection of the intercom system master station to the calling station selected from the GUI.
26. Provide instant display or manual selection of the screen showing the alarm location or the calling intercom location graphically as verified with the Owner and Architect Engineer during the software development process described in Part - 3.1, Software Support.
27. In addition to manual camera call up by touching a camera icon, provide for automatic video surveillance camera call-up to a designated monitor from the GUI. Provide automatic call-up of the nearest video surveillance camera upon intercom connection (“Video follow Audio”) or alarm “seek” display (Video follow Alarm”) as verified with the Owner and Architect Engineer.

28. Provide automatic GUI calibration during System "boot-up" without operator input and manual calibration accessible from the Supervisors Utility Screen.
29. Provide user selectable audible feedback on all icon commands. This audible feedback shall be selectable between male voice, female voice, or a tone. This shall be selected from the miscellaneous function icons as described above. Menu of tones shall be reviewed and tones shall be selected by the Owner during the phase I software development process described in Part 3.1, Software Support.
30. Provide unauthorized entry alarm for monitored or controlled door going unsecured with no corresponding unlock command from system; on GUI, provide visual and unique audible annunciation and location information on message text line.
31. Provide 2 step operations for activations of devices that reduce the security or safety of the facility. These operations include, but are not limited to unlocking doors, holding doors open, group release, isolating doors or intercoms, etc.
32. Provide 3 step operations for critical changes to secure status such as interlock overrides, emergency release, etc.
33. Provide single step operations for operations that increase or have no impact on secure status such as locking doors, camera call up, intercom select, etc.
34. Provide architectural labeling of rooms and spaces, Owner defined labeling of rooms and spaces, and the ability for the operator to switch between the two labeling schemes.
35. Provide the ability to do hard copy and archival logging of all system events and transactions.
36. Provide programming that disables all methods of switching from the security control application to the operating system except with appropriate supervisory level password.
37. The development tools used for the graphical interface shall be that of a nationally recognized industrial applications software development package with a national support network.
38. Implement programming that initiates “video follow” functions for intercom devices and alarms. All intercoms and alarms with in the field of view of a camera shall be automatically routed to the appropriate monitors when the alarm or intercom becomes active.

C. Acceptable Manufacturers

1. Omron Indusoft 512k
2. Wonderware Intouch Runtime 60K with I/O
3. GE Cimplicity no limit runtime

D. Software design and implementation

1. All monitoring and login logic shall be programmed within the Cimplicity, Omron Indusoft or Wonderware application. The security management system software and the Input/Output Data Access Servers shall be Cimplicity, Omron Indusoft or Wonderware brand; no other approach shall be considered.
2. The finished software product shall be examined by the manufacturer and the Architect Engineer for compliance with this specification. Should the examination reveal that proprietary code was created; the integrator shall remove such code and replace it at no additional cost to the owner. The process shall be repeated until the Owner and Architect Engineer are satisfied that the system as developed contains no proprietary content that would prevent the system being maintained by another service provider.

3. The system integrator shall turn over all programming passwords, source code and programming schedules at the end of the project. Prior to final payment all software shall be authenticated as being non-proprietary by the Owner or the Owner's designated representative as described above.
4. All PLC I/O addresses from the Cimplicity, Indusoft or Wonderware environment shall have continuous communication with the PLC. No Cimplicity, Indusoft or Wonderware programming tag PLC addresses shall be changed during runtime.

2.3 GUI CONTROL STATION ICON (SWITCH) FUNCTION AND DESCRIPTION

A. Specifications

1. GUI Switch Functions

   a. Door Control Icons
   b. Utility Control Icons (Lighting, Power, Water, Phone)
   c. Log In/Out, Satellite GUI Takeover and GUI Disable Icons
   d. Intercom Control and Call Disable Icons
   e. Key Plan Zoom Window
   f. Alarm Silence and Reset Icons
   g. Monitor Selection/Camera call-up Icons
   h. Other functions as defined during the software development process described in Part - 3.1, Software Support.
   i. Elevator Controls

2. Provide animation of actual control and annunciation icon as verified with the Owner and Architect Engineer during the software development process described in Part - 3.1, Software Support.
3. Throughout the software design process linking of "follow" functions shall be accommodated as part of the basic scope of services. Follow functions shall be defined as camera calls to specified monitors based on intercom, alarm or door control functions; or, intercom talk paths automatically being established based on alarm functions. Automated "follow" functions shall be limited to camera and intercom functions. No automated door release functions shall be allowed.
4. Door Control Icons

   a. Door Unlock

      1) Touch or left click the Unlock global function icon.
      2) Touch or left click the associated door icon.
      3) The security system momentarily applies power to the lock or electrically operated door to start the lock or door through its unlock or open cycle.
      4) The unlock function remains enabled for 3 seconds after each door icon is touched. If the timer lapses and no icon is selected, the unlock global must be selected again to reactivate the function.

b. Group Unlock

1) Touch or left click the Unlock global function icon.
2) Touch or left click the associated door group icon.
3) The security system momentarily applies power to the locks or electrically operated doors in the group one at a time to start them through their unlock or open cycles.
4) During a group unlock, an isolated door shall not be powered.
5) The unlock function remains enabled for 3 seconds after each door icon is touched. If the timer lapse and no icon is selected, the unlock global must be selected again to reactivate the function.

c. Door Hold Open

1) Touch or left click the Hold Open global function icon.
2) Touch or left click the associated door icon.
3) The security system applies power to the lock or electrically operated door to maintain the lock or electrically operated door in the unlock or open position.
4) The held open function remains enabled for 3 seconds after each door icon is touched. If the timer lapses and no icon is selected, the hold open global function must be selected again to reactivate the function.
5)

d. Door Lock

1) Touch or left click the associated door icon.
2) If necessary, the security system momentarily applies power to or removes power from the lock or electrically operated door to start the lock or door through its lock or close cycle.

e. Door Stop

1) Touch or left click the Stop global function icon.
2) The security system shall stop all powered moving doors being controlled by the initiating GUI.

f. Isolate

1) Touch or left click the Isolate global function icon.
2) Touch or left click the associated device icon. (doors or intercoms)
3) The security system isolates the device from normal operation.
4) The isolate function toggles each time a device is selected. The isolate global function remains active for 3 seconds after the last device selected.
5) Provide group “synchronization.” Selecting the isolate global function and a group button the first time shall un-isolate any door in the group that is currently isolated. Selecting the group button the second time, shall isolate all doors in the group.

g. Emergency Door Release

1) Touch or left click the EMERGENCY DOOR RELEASE miscellaneous function icon.
2) When the EMERGENCY DOOR RELEASE icon is selected, a red pop up message box shall be displayed with a written warning and the audible annunciation shall warn the operator of the danger associated with an Emergency Door Release. The audible warning must reiterate the displayed text and must play in its entirety before the first level confirmation icon is displayed.
3) A second, red EMERGENCY DOOR RELEASE warning box shall then appear on the current screen with a written warning.
4) The function can be canceled at any time by selecting the CANCEL button.
5) After the second confirmation is selected, the background around the EMERGENCY DOOR RELEASE icon shall flash and the audible annunciation shall continuously announce “EMERGENCY DOOR RELEASE”.
6) All emergency release doors shall be unlocked. Those doors that are unlocked under the emergency door release, shall display as if opened via the control system. These doors are equipped with half cycle locks. See detention hardware section for lock function description to be incorporated into the controls system.
7) Other control stations also monitoring or controlling the same doors as the panel initiating the release shall have an EMERGENCY DOOR RELEASE ACTIVE indication located on their screen and will alarm and flash as described previously.
8) Emergency Relock. Provide EMERGENCY DOOR RELEASE RELOCK miscellaneous function icon. This Icon releases the affected door to relock.

h. Interlock Override Icon

1) Touch or left click the Interlock Override miscellaneous function icon.
2) A yellow pop up message box shall be displayed with a written warning and the audible annunciation shall warn the operator of the danger associated with interlock override. The audible annunciation warning must reiterate the displayed text and must be capable of playing in its entirety before the second level confirmation icon is displayed. Delay must be adjustable and confirmed during phase I and II.
3) A second yellow interlock override warning box shall then appear with a written warning. The audible feedback warning must reiterate the displayed text and must be capable of playing in its entirety before the first level confirmation icon is displayed. Delay must be adjustable and confirmed during phase I and II.
4) Only after the second confirmation is made shall the interlock indications be removed from the screen.
5) Once any door icon is selected, the interlock override function shall cancel. If no door icons are selected within 10 seconds of the second confirmation, the interlock override function shall cancel. Also, the function can be canceled at any time by selecting the “CANCEL” icon.
6) Attempting to unlock a door that is interlocked shall cause the voice

annunciation system to state, "Function not allowed. Door is interlocked."

5. Utility Control: Lighting, Power Receptacles, Water, and Inmate Phone.

   a. Utility control icons are to be located on the utility control screen. The utility control screen shall segregate the utility icons from security icons such as door locks, intercom and video surveillance. Selection of the utility screen shall be via the global function tool bar.
   b. Touch or left click the global utility icon, the normal icons are hidden and the utility icons are displayed.
   c. Touch or left click the associated control icon.
   d. The security system removes power from the coil of the low voltage relay associated with the device to be controlled, and the utility comes on.
   e. Touch or left click the icon a second time.
   f. The security system applies power to the coil of the low voltage relay and maintains power until the icon is clicked again. When the relay is engaged the utility is off.
   g. Provide group control of cell lights.
   h. Provide group "synchronization." Selecting the group button the first time shall turn any utility in the group that is currently on to its off state. Selecting the group button the second time, shall turn all utilities in the group on.
   i. Utility control shall be configured such that failure of the PLC/GUI control systems renders the utility "on".
   j. An icon shall be provided in central control for manual activation of the smoke evacuation system. The manual activation shall be used to provide a means of evacuating tear gas in the event it is used on a unit. The icon shall function as described above and shall activate the sequence of operation just as if it were started by the fire alarm system.
   k. TV Receptacle.

6. Log In, Satellite GUI Takeover and GUI Disable

   a. Log In/Out

      1) Touch or left click the Log in/out icon.
      2) Login validation shall be integrated with the SSMC's database to allow the tracking of the operators name for all functions at each GUI until it is logged off.
      3) The GUI displays a "scrambled" numeric keypad for the operator to enter a PIN code.
      4) If the PIN code is valid the operator is logged in as the current operator of the station.
      5) An operator remains the current operator until a new operator is logged in or until the GUI is taken over or disabled (see below).

   b. Satellite GUI Takeover

      1) Touch or left click the Satellite GUI Takeover icon.
      2) The security system disables all control and monitoring functions at the Satellite GUI, blocks all attempts to log in at the Satellite GUI and transfers control and monitoring responsibility to the initiating GUI. Icon shows "Off Line".
      3) Touch or left click the icon a second time.

4) The security system allows attempts to log into the Satellite GUI, but retains control and monitoring until an operator logs into the Satellite GUI.
5) When an operator is logged in to the Satellite GUI the control system returns all previous control and annunciation to the Satellite GUI. Central Control shall still have the ability to view the locally controlled screens. Central Control's icons in these locally controlled areas shall appear to be "sunken" into the screen with a passive or muted video color. The status of the DPS and LSS shall be dynamically displayed. The intent is to allow Central Control to be aware of door movement throughout the building, while leaving control of devices with the Satellite GUIs.
6) Failure of the workstation or software at the satellite locations shall cause control to be transferred to the designated takeover station. A pop up window annunciating the failure and transfer shall be provided to alert the operator of the takeover station as to the transfer.

c. GUI Disable

1) Touch or left click the Disable icon.
2) The security system immediately logs out the current station operator and transfers responsibility for control and annunciation to central control. Satellite GUI shall still have the ability to view the locally controlled screens. The icons in these locally controlled areas shall appear to be "sunken" into the screen with a passive or reverse video color. The status of the DSS and LSS shall be dynamically displayed. The intent is to allow the Satellite GUI to be aware of door movement in their areas, while control is transferred to the designated control point.
3) Attempts to log into the station are not allowed until central control enables the satellite station.

7. Intercom Control

a. Intercom Control

1) Call-in from field device causes associated Intercom Station icon to flash and tone/VAS to sound.
2) Selecting the Intercom Station icon connects the Master Intercom to the associated intercom station in listening mode, turns the icon solid color and silences the call in tone/VAS.
3) Selecting the same icon a second time disconnects the call, and turns off the solid icon color.
4) Selecting a second intercom icon while connected to another station causes the connected station to disconnect and connects the selected station.
5) When a call is designated to route to more than one master, the establishing of a talk path by the first to answer the call, cancels the call at the other stations.
6) Implement video follow audio for adjacent cameras. When an intercom talk path is established, the associated camera (if any) shall be displayed on the Intercom Monitor, and the associated camera icon shall indicate it has been activated.
7) The intercom system incoming shall be routed through the GUI

Audio System.

b. Communications Window

1) A portion of each screens tool bar, without obstruction to the floor plan, shall be allocated for intercom que. This window shall contain a “Pending List” of the next (7) pending calls.
2) Call Control Icons and Indicators include:

a) ACTIVE STATION containing the text name of the active intercom call
b) Master to Master call (Caller ID)
c) Master call waiting/busy
d) CALL ANSWER button
e) CALL ANSWER AND ZOOM button,
f) ZOOM ACTIVE button
g) CALL DISCONNECT button

3) This window shall allow the operator to answer calls without having to go to a particular screen (answer) unless it is desired to do so. (answer and zoom)

c. Pending List

1) The list of incoming pending calls designated for the particular GUI shall show the Owner-assigned text names for the oldest seven pending calls that have not been answered and in the order that they were initiated.
2) As a call is answered it shall be removed from the list and the list shall be automatically updated with any new incoming calls.
3) If a call-in is isolated, it should not be displayed in the Pending List.
4) If a master to master call is placed, and the receiving master is busy, the calling master receives a busy prompt and is held in queue until call is accepted by the master being called.

d. Call Answer Button

1) Touch or left click the Call Answer Button
2) Each time this button is selected, the active station shall automatically cancel and the first station on the pending list shall automatically connect.
3) If there are no pending calls, this button shall be muted on the tool bar.

e. Call Answer and Zoom Button

1) Touch or left click the Call Answer and Zoom Button
2) Each time this button is selected, the active station shall automatically connect to the first station in the call queue.
3) The GUI shall automatically go to the screen where the answered intercom station is located.
4) If there are no pending calls, this button shall be muted on the tool bar.

f. Zoom Active Button

1) Touch or left click the Zoom Active Button.
2) When this button is selected, the GUI shall automatically go to the screen where the connected intercom station is located.
3) If there is no active call, this button shall be muted on the tool bar.

g. Call Disconnect Button

1) Touch or left click the Call Disconnect Button
2) When this button is selected, the active intercom call is disconnected.
3) If no station is connected, this button shall be muted on the tool bar.

h. Call Isolate

1) Selecting the isolate button from the global function tool bar and then selecting an intercom station icon shall place the intercom station in isolate mode.
2) In the isolate mode, calls placed from the station shall annunciate visually only and not via the tone/VAS.
3) When placed in the isolate mode, the icon shall change state to reflect the mode.
4) When placing an icon in the isolate mode, the operator shall be prompted to enter the reason the station was isolated using the occurrence log.
5) All isolated icons shall reset to normal mode at a time selected by the Owner; the duration of an isolation shall not exceed 24 hours.

i. Paging. Provide icons associated with the paging zones.

8. Key Plan and Zoom Window

a. Zoom Window

1) A portion of the tool bar on each screen, without obstruction to the floor plan, shall be allocated for the key plan. This window shall contain a whole site plan and be located on every screen.
2) All screens shall be accessible with no more than two touches of the site plan.
3) Any screen can be accessed from any other screen with no more than two touches. A screens outlined area on the site plan shall highlight when the curser is placed over the associated section of the key plan.
4) Each control screen shall be geographically outlined on the Zoom Window. The highlighted outline shall follow the shape and pattern of the zoom screen area.
5) The Zoom Window shall contain -

a) Zoom Area
b) Site Plan Location Indicator
c) Site Plan Pending Call Indicator
d) Site Plan Alarm Indicator

b. Zoom Area

1) Touch or left click outlined area of the site plan.
2) Activation shall cause the GUI to go directly to the screen that controls the selected area or a more detailed zoomed area.
3) A distinctive audible sound shall annunciate when this action is performed.

c. Site Plan Location Indicator

1) The area on the site plan that represents the current screen shall be highlighted in white to indicate exactly what screen is active in relation to the whole facility.
2) The other areas shall be gray unless pending calls or alarms are active as explained in the Site Plan Pending Call Indicator and the Site Plan Alarm Indicator.

d. Site Plan Pending Call Indicator

1) When calls are pending from areas other than the current screen, then the area of the call shall flash on the site plan.
2) If both an alarm and a pending call are active at the same time in an area, then the respective area shall flash alternating colors.

e. Site Plan Indicator

1) When alarms are active from areas other than the current screen, then the area of the alarm shall flash on the site plan.
2) If both an alarm and a pending call are active at the same time in an area, then the respective area shall flash alternating colors.

f. Plan Navigation Arrows.

1) Provide arrows on each map as an additional means to navigate through the facility.

9. Alarm Silence and Reset Icons

a. Alarm Silence

1) When an audible alarm annunciation is sounding; touch or left click the Alarm Silence icon.
2) The audio alarm stops.
3) The audio alarm starts again if alarm conditions exist on other screens, or if new alarms are received on the same screen.

b. Alarm Reset

1) Provide the Reset Icon to reset all alarmed icons to normal conditions if they are not of the self-resetting type.
2) Touch or left click the Reset icon when the alarm conditions no longer exist.
3) Reset function shall only operate on those alarms annunciated on the active screen. No global alarm reset icons shall be allowed.

10. Camera Selection

a. Camera Selection via icons

1) In addition to automatic call up, Cameras can be selected via the GUI.
2) Touch or left click the camera icon.
3) Selecting the camera icon causes the icon to change color, and displays the CCTV image on the active monitor.
4) Selecting the same icon a second time disconnects the camera and returns the active monitor to its default scene.
5) Selecting a second camera icon while another camera is active causes the active camera to deactivate and activates the selected camera.
6) Camera selection is to the default "call up" monitor at the touch screen work station. Provide a means of selecting cameras to the overhead monitors by changing from the default monitor to a selected monitor from the tool bar. Only monitors within direct view of a touch screen location shall be selectable from the tool bar.

11. Occurrence Log

a. Entry of New Occurrence Logs

1) User can enter text via the attached keyboard.
2) As characters are selected on the keyboard they should be displayed on the appropriate field.
3) Select the submit button to save the entered text into the SSM computer.
4) After submitted, status should indicate that the text has been sent and saved successfully, and the title and log fields should be cleared. If the text is not sent and saved successfully, the status should indicate "Log Entry Failed", and the title and log fields should not be cleared.
5) Select clear button to clear title and log fields.
6) Select view logbook button to view previous entries within the last 24 hours.
7) Occurrence log entry shall be as illustrated herein.
8) Title field shall be capable of 100 characters.

b. Viewing Previous Entries

1) Shall be capable of viewing 100 logged entries.
2) The retrieval time shall be less than 10 seconds.
3) Select the view log entry button to return to the new occurrence log entry screen.
4) All data is stored on the SSM computer.

12. Elevator Control

a. Car panel will not function under normal operation. All elevator movement will be via remote control from Master Control.
b. The intercom system is used to call the car to a given floor. The Touch Screen is required to emulate the control and indication functions of the car panel.
c. Elevator control icons will be located on the tool bar and will not require a dedicated screen.

d. Interface between the elevator controllers and the PLC system are designed as discrete dry contact relay interface for all control and indication functions.

2.4 GUI CONTROL STATION INDICATOR CONDITONS

A. Door Status - Provide red and gray (or white) animated graphic indicators on the screen at each door to be monitored, to indicate the status of the door. Monitor the Door Position Switch (DPS) and the Latch Bolt Monitor (LBM) switch independently. Secure indication should only be displayed when both switches are in the secure condition. Differentiate between doors that are open, and doors that are closed but unlocked. Alarm is generated for unauthorized opening of doors; doors opened via unlock commands and doors left open too long. Timer for door open too long must be adjustable via supervisor's utility screen.

1. Flashing Red - alarm
2. Red - unsecured
3. Gray or white – secured

B. Utility Status – Provide yellow and gray animated graphic indicators on the screen at each utility location to indicate the utility status.

1. Yellow – Utility On
2. Gray - Utility Off

C. Log In/Out, Satellite GUI Takeover, and GUI Disable – Provide a gray animated graphic indicator that contains the appropriate text.

D. Intercom Control and Inmate Call Disable – Provide green, yellow, and gray animated graphic indicators on the screen at each intercom location, to indicate the intercom status.

1. Flashing Green – Intercom call-in
2. Green – Intercom active
3. Yellow "X" - Intercom call-in isolated
4. Gray – Intercom inactive
5. "Sunken" – Intercom station calls to another master.

E. Alarm Silence and Reset – Provide a gray animated graphic indicator that contains the appropriate text.

F. Camera Selection - Provide a blue green red and gray animated graphic indicator on the screen at each camera location to indicate the camera status.

1. Blue – Camera manually activated and CCTV image displayed on active monitor.
2. Purple – Video follow audio activated and CCTV image displayed on intercom monitor.
3. Red – Video follow alarm activated and CCTV image displayed on alarm monitor.
4. Gray - Camera deactivated.

G. Interlock Status - Provide yellow color indicators at each door in an interlock group.

1. When a door in an interlocked group becomes un-secure, illuminate yellow

indicators on all other doors in the interlock group.
2. VAS shall annunciate that door cannot be unlocked if interlock condition exists (see below)

H. Uninterruptible Power System Alarm and System Trouble Icon

1. UPS Power System Alarm

a. Upon loss of primary AC power, the UPS icon shall appear and begin to flash red “Inverter On”, accompanied by a unique tone.
b. Activating the alarm silence Icon shall silence the tone and cause the Icon to glow steadily. Upon return of primary AC power, activating the alarm reset Icon shall extinguish the red indication and hide the icon.

2. Similar function for Trouble indication. Flashing yellow “UPS Trouble” indication.

I. Duress Alarm/Panic Alarm - Provide red animated graphic indicators on the screen at each duress/panic switch on alarm only. Inactive or “normal” condition of the duress alarms hides the icon in lieu of muting it. Implement video follow alarm for cameras adjacent to duress or panic buttons. Duress or panic alarms with video follow alarm function shall call the camera to the alarm monitor at the associated GUI Operators post.

1. Flashing Red - alarmed
2. Red – acknowledged

J. Provide access to a system status screen with text display of the following:

1. Name of operator logged on to each console
2. List of all pending, silenced, and acknowledged alarms currently indicated through the entire system.

2.5 VOICE ANNUNCIATION SYSTEM

A. Provide a Voice Annunciation System (VAS) as an additional interface between personnel and the computer system. The VAS shall use speech from a stored vocabulary to provide alert and annunciation messages, special direction or information to facility staff in staff areas (intercom speakers) and control rooms. Verify message requirements and locations during Phase-1 software meeting.

1. The VAS shall be entirely electronic, no tapes, and meet the following minimum requirements
2. The VAS shall speak individual words, phrases and sentences in addition to tones.
3. VAS shall provide output to audio amplifiers, speakers and intercom speakers that are also part of system.
4. The VAS shall be selectable between male voice, female voice, and a tone. This shall be selected from the miscellaneous function icons as described above.

2.6 SECURITY SYSTEM MANAGEMENT COMPUTER (SSMC) OPERATIONAL REQUIREMENTS:

A. Specifications

1. The Security System Management Computer (SSMC) shall perform functions including, but not limited to, the following:

    a. Programming of PLC.
    b. PLC system remote diagnostic capabilities.
    c. Recording all security control system transactions and events.
    d. Recording of incident reports.

2. The SSMC shall generate reports of the recorded transactions and events within the system. All data shall be recorded into a database and the SSMC shall have the capability to generate reports through selection of any data field or timeline. The SSMC shall have advanced search capabilities for any combination of data and can search the incident logs independently.

PART 3 - EXECUTION

3.1 SOFTWARE SUPPORT

A. Phase I

1. Provide screen shots. The Trade Contractor shall request, in writing, scheduling of the Phase I meeting within one (1) week of receiving the approved shop drawing submittal. A proposed agenda shall be included with the request. The Phase I meeting shall be held within thirty (30) working days of receiving the approved shop drawing submittal.
2. The purpose of the Phase I meeting is to define the project specific functions and operational procedures of the control system with the Owner & Architect Engineer. The Trade Contractor shall present proposed operational procedures for every function specified in the Contract Documents or recognized as industry standard or convention for a correctional facility Control System. The Trade Contractor will present proposed operational schemes to the Owner & Architect Engineer, and modify those schemes based on the Owner's policies and procedures.
3. The Trade Contractor shall address integration of the components and subsystems making up the control system when presenting the proposed operational procedures. The Trade Contractor shall provide an operating GUI at the Phase I meeting (of an operating facility or this facility) that demonstrates every control and annunciation function described in the specifications to help with Owner's design decisions. This demo shall not include any operational procedures that are not included in the Base Bid for this project. This operating GUI shall demonstrate all data capture and reporting features of the SSMC.
4. The Trade Contractor shall prepare and present 4 sets of color screen drawings at this meeting. As a minimum, these screen drawings shall depict the following:

    a. Overall building layout screen.
    b. Area control screens. (These area screens shall be drawn to represent actual orientation with control officer's view). Different orientation views shall be created per each control post and the control officer's orientation view.
    c. All special control and transition screens. (Utility, Administration, help, etc.)
    d. Each sheet shall be numbered for easy reference.
    e. Actual size to show detail and all text legible.

5. The Trade Contractor shall prepare a detailed report summarizing the operation of all icons. The report is to be submitted for approval by the Owner and Architect Engineer no later than two (2) weeks after the date of the Phase I meeting. The software systems that make up the control system shall be designed specifically from this document.

B. Phase II

1. At least thirty (30) working days prior to the scheduled date for job site delivery of the first control system head end components, the Trade Contractor shall request a Second meeting with the User (maximum of 4 representatives) and the Architect Engineer (2 representatives) at the Trade Contractor's manufacturing facility. The Trade Contractor shall provide a full demonstration of the completed control system with fully functional control software. The Trade Contractor shall provide means to simulate all real world conditions necessary to demonstrate each function and operating procedure agreed to in the Phase 1 meeting. The design and function of the software shall match the exact performance as specified in the revised Phase I report. The Trade Contractor shall be responsible for the cost of travel expenses incurred by the Owner and Architect Engineer representatives for this trip. Travel expenses shall include airfare (if applicable), hotel accommodations, ground transportation, and meals.
2. All performance deviations and necessary changes identified at this meeting shall be documented by the Architect Engineer on a "pre-punch list". The pre-punch list shall be 100% corrected by the Trade Contractor prior to delivering the equipment to the job site.
3. During this time period the Trade Contractor shall perform all shop testing as defined in the approved testing plan.

C. Phase III

1. Immediately following the installation and testing of the control system, the Trade Contractor shall provide a formal demonstration of all systems to the Owner and Architect Engineer that includes all operational elements covered in the Phase II meeting. The Trade Contractor shall work with the Owner, facility personnel and the Architect Engineer to correct any problems or operational deviations from the original Phase I and Phase II design documents. Deficiencies will be identified during the Architect Engineer's punch list inspection, and documented to the Trade Contractor. The Trade Contractor shall perform all hardware and software modifications necessary to correct any problems or operational deviations resulting from engineering, programming or installation services provided by the Trade Contractor.
2. Upon achieving a 100% functional control system as determined by the Architect Engineer, a documented release form provided by the Trade Contractor shall be signed by the Owner, and retained on file with the Architect Engineer. The Trade Contractor shall continue to work on the installed system at no cost to the Owner until the Architect Engineer has determined the Phase I and Phase II documents have been met and the system has been 100% field tested as defined in the approved testing plan, regardless of substantial completion. The system warranty shall begin after the Architect Engineer has verified 100% compliance has been met.

3.2 INSTRUCTION PERIOD

A. Provide the facility personnel with training in the use and maintenance of the entire

control system. The first sessions to be prior to system turnover, the Second at turnover and the third immediately after turnover. Coordinate the training sessions with the Owner. Completed classroom sessions will be documented by the Trade Contractor, certified by the attending Owner representatives, and approved by the Architect Engineer. Instruction shall take place during normal working hours (Monday through Friday, 8:00 a.m. to 5:00 p.m.). Instruction shall not begin until all systems are operational as designed. See section 28 05 00 – Common Work Results For Electronic Security for additional information regarding training.

B. The training sessions shall cover the operation and the maintenance manuals and the control console operators manuals and service manuals in detail, stressing all important operational and service diagnostic information necessary for the maintenance and operations personnel to efficiently use and maintain the control system.

C. Trade Contractor is responsible for providing operational and maintenance training applicable to the entire control system. Training is to include, but not be limited to the following-

1. Review all O+M manuals with Owner's representatives present for training.
2. Perform a tour of the entire facility. During the tour the trainer shall point out all control equipment and provide a brief description of its purpose and use. This is to include but not be limited to touch screen control stations, all control system hardware, and devices controlled.

END OF SECTION 284620

SECTION 285000 - MISCELLANEOUS SYSTEMS FOR ELECTRONIC SECURITY

PART 1 - GENERAL

1.1 SYSTEM DESCRIPTION

A. Furnish all materials and labor necessary to complete the installation of specific systems described herein and integration of all systems as indicated, specified herein or both. The work includes the following, as well as work not listed below but described elsewhere:

1. Door Release Push Button
2. Emergency Door Release Push Button
3. Duress Alarm Push Button, Under Counter
4. Duress Alarm Push Button, Wall Mount

PART 2 - PRODUCTS

2.1 GENERAL

A. Equipment specified is intended as a reference standard for level of quality.

B. Lists of products and manufacturers are Non-restrictive. Submission of an unnamed product or manufacturer does not require a substitution or change to the Contract Documents, but must comply with requirements for “Comparable Products” as outlined in Section 010 60 00 PRODUCT REQUIREMENTS.

C. Provide materials listed by UL or ETL.

2.2 DOOR RELEASE PUSH BUTTON

A. Specifications

1. Desktop Mini Console style similar to Secure Door Controls DT Series.
2. Dry contact
3. Screw terminal connections
4. Provide CAT 5/5e jack and faceplate in wall outlet and a workstation cord for connection to console.

B. Acceptable Manufacturers

1. Security Door Controls 450 series
2. Approved Equal

2.3 EMERGENCY DOOR RELEASE PUSH BUTTON

A. Specifications

1. Push button
2. Dry contact
3. 3 amp contact rating

4. Screw terminal connections
5. Vandal resistant stainless steel single gang plate

B. Acceptable Manufacturers

1. Security Door Controls 450 series.
2. Approved Equal

2.4 DURESS ALARM PUSHBUTTON, WALL MOUNT

A. Specifications

1. Momentary DPDT contacts
2. Switch Rating: 3 Amps at 28VDC

B. Acceptable Manufacturers

1. Ademco – 269.
2. Approved Other

2.5 PANIC ALARM PUSHBUTTON, UNDER COUNTER

A. Specifications

1. Silent, single-push switch, for sending an immediate signal to supervisory personnel.
2. The switching mechanism contains a double-pole, double-throw contact supplied with lock mounted switch and two keys.
3. The switch can be reset only with a key by an authorized person.
4. Mounted to single gang aluminum plate.

B. Acceptable Manufacturers

Bulletin 800 Series/ Allen Bradley with Mushroom Head.

2.6 ELECTRONIC HORN / STROBE

A. Specifications

1. Xenon Strobe Light source with horn
2. Flash rate 60 fpm
3. 100 dB at 1 meter/90dB at 10 ft.
4. Low current Draw
5. Terminals for easy wiring
6. Diode Polarized for use in electrically supervised circuits. (869DSTR)
7. Operating indoor temp range: -31 degree F to 150 degree F

B. Acceptable Manufacturers

1. Edwards Signaling 869STRB-N5

2. Approved Others

2.7 DRIVE UP PEDESTAL

A. Specifications
   1. sized as needed for mounting intercom, and camera, ETC.
   2. 2 x 4 steel tubing construction for base
   3. 8" x 8" base plate
   4. See detail. White powder coat finish

B. Acceptable Manufactures
   1. Engineered Parking Systems
   2. The Housing Company
   3. Approved equal

PART 3 - EXECUTION

3.1 INSTALLATION

A. All system programming shall be done at the contractor's facility prior to installation on site.

B. Qualified personnel shall install the System in strict compliance with manufacturer's instructions.

C. Wiring shall be color coded, uniform and in accordance with national electric codes and manufacturer's instructions.

D. Equipment shall be firmly secured, plumb and level.

E. All cable runs to the main equipment rack shall be tagged and identified.

F. Coordinate all work with other trades and Contractors.

G. Grounding of devices and peripheral equipment shall be installed per manufacturer's direction to eliminate noise induction and achieve optimum system performance.

H. Install and configure Security local area network as required for control and communication between system devices. When required, provide necessary coordination, termination, and programming associated with integrating Security local area network with facility network.

I. Equipment cabinets shall be assembled in the Contractor's shop prior to delivery to the job site.

3.2 SOFTWARE SUPPORT

A. Refer to Section 284620 for software support and programming requirements.

3.3 SYSTEM INITIALIZING AND PROGRAMMING

A. All programming shall occur in the Contractor's shop prior to installation on site.

B. The System shall be turned on and adjustment made to meet requirements of the specification and on-site conditions.

C. The System shall be programmed to function as specified.

D. Any special programming shall be documented and a written copy given to the Owner/User.

E. Coordinate integration of other electronic systems as called for in the contract documents.

3.4 SYSTEM TEST PROCEDURES

A. The System shall be completely tested to assure that all components are hooked up and in working order.

B. The System shall be pre-tested by the security equipment contractor and certified, in writing, to function in accordance with the plans and specification.

C. The contractor is to verify the system is communicating with all controlled devices.

3.5 FIELD QUALITY CONTROL

A. Provide services of a duly factory authorized service representative for this project location to supervise the field assembly and connection of components and the pre-testing, testing, and adjustment of the system.

B. Make observations to verify that units and controls are properly labeled, and interconnecting wires and terminals are identified. Provide a list of final tap settings of paging speaker line matching transformers.

C. Rectify deficiencies indicated by tests and completely re-test work affected by such deficiencies at Contractor's expense. Verify by the system test that the total system meets the Specifications and complies with applicable standards.

END OF SECTION 285000

SECTION 285123 - INTEGRATED INTERCOM/PAGING SYSTEM FOR ELECTRONIC SECURITY

PART 1 - GENERAL

1.1 SYSTEM DESCRIPTION

A. Furnish all materials and labor necessary to complete the installation of specific systems described herein and integration of all systems as indicated, specified herein or both. The work includes the following, as well as work not listed below but described elsewhere:

B. Provide Intercom System that meets the following functional requirements

1. The purpose of the intercom system shall be to provide clear, two-way, remote reply intercommunication between intercom master stations and remote intercom substations.
2. System shall also accommodate zoned overhead paging to the areas identified throughout the facility with talk back capabilities provided. Source input is limited to the intercom push to talk master stations at the various control consoles.
3. The extent, size, locations, and layout of the various systems shall be shown on the plans.
4. The system is configured to allow for visual and audible notification to the operator of intercom call in and active intercom channels on the graphical user interface associated with each control console.
5. Intercom substations shall be programmed to call a designated master based on the location of the station and the area of influence for each control console.
6. System shall be capable of audio monitoring and of initiating an alarm when the voice being monitored at a certain location exceeds preset audio parameters.
7. The intercom/paging system shall be a major sub-system of the overall integrated control system. Controlling the system, selecting stations, and integration with other sub-systems shall be accomplished through a communications interface (Ethernet) to the graphical user interface.
8. Paging system shall be capable of routing to individual or groups of defined speaker zones. All call paging is also required.
9. Manufacturer-approved personnel shall perform installation and maintenance.

C. System Configuration

1. Microprocessor based, network centric controllers and expanders are required. Controllers and expanders shall support 2 master stations each and be capable of fully independent talk paths for each.
2. Ethernet communications and a separate audio trunk shall provide the capability to network individual exchanges with each other creating an integrated system. Transfer of station call between exchanges shall be accommodated via the network.
3. Standard 25-volt output amplifiers shall provide audio power to IC stations.
4. Tamper resistant substations shall be flush mounted as shown on the drawings or specified.
5. Intercom master stations are required for control locations. Connection of the master stations shall be via Ethernet.
6. Controller software shall allow for individual level control, sensitivity, and equalization of each station.

7. Intercom system shall interface with video surveillance system via Ethernet and vendor specific API programming
8. When intercom station talk path is established, the video surveillance system shall display image of the nearest camera on call up monitor associated with the console establishing the talk path.
9. The ability to suspend a station's capability to call in shall be provided via integration with the graphical user interface shall be provided. This ability is necessary to prevent inmates from harassing console operators with continuous calls.
10. Console master stations shall be capable of listening to intercom stations or talk back page zones without privacy tones announcing that a console is listening.
11. Pages shall originate from the various consoles and shall include talkback capabilities.

PART 2 - PRODUCTS

2.1 GENERAL

A. Equipment specified is intended as a reference standard for level of quality.

B. Lists of products and manufacturers are Non-restrictive. Submission of an unnamed product or manufacturer does not require a substitution or change to the Contract Documents, but must comply with requirements for "Comparable Products" as outlined in Section 010 60 00 PRODUCT REQUIREMENTS.

C. Provide materials listed by UL or ETL.

D. Basis of Design

1. Drawings and specifications included in these contract documents are based on the Harding Instruments DXL product.
2. Equal by Stentofon is acceptable
3. All other manufacturer's products must be submitted for approval per 2.1.B above

2.2 DIGITAL COMMUNICATION CONTROLLERS (DCC's)

A. Specifications

1. Digital Communication Controllers to each from an intercom exchange capable of independent local operation. Exchange capacity to be increased by connecting up to four Digital Communication Expanders to each DCC.
2. Multiple DCC's to be networked together via digital audio trunks and Ethernet data networks to form the larger system. VoIP enabled systems shall utilize IEEE 802.1p/Q Quality of Service (QoS) compliant Ethernet networking equipment.
3. Each DCC to include:

    a. a Process Control Card (PCC)
    b. a Master Control Card (MCC)
    c. two Station Control Cards (SCCs)
    d. an internal PCI card (Lonworks or VoIP accelerator card)
    e. a front panel keypad/display for system setup and maintenance.
    f. a 110 VAC, 60 Hz power supply for internal functions.

4. Process Control Card:

    a. Process Control Card to contain system configuration and data, control exchange operations and switching, and provide exchange network ports.
    b. Process Control Card to include:

        1) USB network ports for exchange expansion.
        2) Ethernet network ports for system expansion and external control by touch screen computers and graphic control panels.
        3) Fiber optic or copper digital audio trunk ports. (not required for VoIP over Ethernet audio trunking)
        4) Two serial ports.
        5) An internal modem for transmitting and receiving data over a telephone line.

5. Master Control Cards:

    a. Include ports for any combination of two intercom or telephone set master stations.
    b. Include two line level audio inputs with status and control.
    c. Include two line level audio outputs with status and control.
    d. Convert incoming audio signals to digital format and outgoing signals to analog format.
    e. Intercom master station audio, press-to-talk and hook switch status transmitted over two single shielded pair cables with wiring supervision to detect open circuit and short circuit faults.
    f. Telephone set master station functions transmitted over a single wiring pair.

6. Station Control Cards:

    a. Each provides sixteen half-duplex intercom station ports which can be employed in adjacent pairs for full duplex devices.
    b. Provide an interface for intercom stations. Units to convert incoming audio signals to digital format and outgoing signals to analog format. Each channel to monitor the status of up to two (2) switches associated with each intercom station.
    c. Each card interfaces with 16 half-duplex channels. Each channel includes a separate audio power amplifier for non-blocking call operation and sixteen (16) independent software controlled volume settings.
    d. All station audio, switch, and power functions on 400-Series and 401-Series cards to be transmitted over a single shielded pair cable with supervision to detect open circuit and short circuit faults.
    e. Audio and switch functions on 300 Series (Generic Intercom) station control cards to be transmitted on separate wiring pairs.

B. Acceptable Manufacturers
    1. Harding

2.3 DIGITAL COMMUNICATION EXPANDERS (DCE's)

A. Digital Communication Expanders to provide master station and intercom features similar to the DCCs to facilitate exchange expansion.

B. Each DCE to include:

1. A Process Control Card (PCC) without exchange control or network functions.
2. A Master Control Card (MCC)
3. Two Station Control Cards (SCCs)
4. A 110 VAC, 60 Hz power supply for internal functions.

2.4 TALKBACK EXPANDERS (TBEs)

A. Talkback Expanders to provide 8 amplified paging outputs that can drive 25 Vrms loudspeaker circuits.

B. Each TBE is to;

1. Provide 5 watts output per channel
2. Allow adjacent channels to be bridged to obtain higher power.
3. Provide talkback capability on all channels.
4. Include Audio Level Alarm capability on all channels.

2.5 PAGE ZONE EXPANDERS (PZEs)

A. Page Zone Expanders to provide 3 page inputs (from an audio amplifier) with each input having 6 selectable relay controlled outputs

B. Each PZE input to include

1. 1 relay controlled output for each input that can be used to key an audio amplifier.

2.6 ADMINISTRATOR SOFTWARE

A. Administrator Software to function on a standard PC to support system configuration, diagnostics, maintenance, and logging but not be required for system operation.

B. Administrator Software to employ Windows features including views of system tree structure, tables of devices, screens for system settings and adjustments, and tables of operational data.

C. Configuration features to include:

1. Creation of overall system architecture.
2. Creation of multiple device templates.
3. Copy and paste functions with auto-numbering and auto-assignment to create device schedules.
4. Configuration error detection and alerts.
5. Device naming and call routing functions.
6. Device setting and performance functions.

D. Diagnostic and Maintenance features to include:

1. Verification of system configuration and installation.

2. Verification of system networks.
3. Verification of device connections.
4. Verification of system operation.
5. Diagnostics via modem or Ethernet ports.

E. Logging features to include:

1. Display of system activity with filtering options.
2. Search by time and date.
3. Search by device.
4. Search by parameter.

2.7 TOUCHSCREEN CONSOLE INTERCOM MASTER STATION PTT MICROPHONES

A. Desktop intercom master stations in cast aluminum housing

B. Dynamic, cardioid polar pattern

C. Lockable push to talk button

D. Dual input impedance settings; 19 to 300 ohms and high impedance

E. 60 Hz to 11kHz frequency response

F. 4 conductor shielded un-terminated line cord for connection to master audio interface

G. Control, station selection and other necessary functions on the integrated master station shall be accomplished via the touch screen.

H. Talk back audio and annunciation queues for the intercom system shall be routed through the touch screen console speaker. See section 284619 – PLC Hardware For Electronic Security.

I. Basis of design for the desk top push to talk microphone is the Shure 522

2.8 VoIP MASTER AUDIO INTERFACE MODULE

A. External master audio interface module to consist of:
1. Network and power supply interface, audio amplification and processing module, network and operating status LED's, ribbon cable header for connection to display module.
2. External microphone interface with phantom power capability.
3. External loudspeaker interface.
4. Telephone handset with press-to-talk switch interface.
5. Headset jack interface.
6. External buzzer contact closure interface.
7. Surface wall mount enclosure nominally 9" H x 6.5" W x 1.8" D.

2.9 ANALOG INTERCOM STATIONS

A. Intercom stations are to be designed for mounting on standard 2-gang back boxes. Faceplates to be constructed of 11-gauge brushed stainless. Internal steel offset grille to restrict inserting objects through speaker grille. Stations to be ruggedly constructed and resistant to damage from soil and sprays.

B. Each intercom station is to incorporate an internal loudspeaker, microphone preamplifier and function multiplexing circuitry. One pushbutton is to be provided on each station. Pushbutton to be software assignable for placement of call request.

C. Pushbuttons to be vandal resistant and of stainless steel. Switch to have positive tactile action with 1 million-operation lifetime. (*Pushbuttons to be solid metal piezo-electric type with no moving parts and a 50 million operation lifetime*).

D. Loudspeakers to be waterproof mylar cone type.

E. All intercom station functions to be transmitted over a single shielded pair cable. Stations to be provided with MTA type insulation displacement connector that requires no wire stripping for installation.

F. Outdoor intercom stations are to be identical in all respects to standard intercom stations except that all metal plates and hardware to be stainless steel, and internal circuitry and components to be conformally coated.

2.10 PAGING AMPLIFIERS

A. Provide paging amplifiers and zone switching as required to perform the functions described herein and indicated on the drawings.

B. Paging amplifiers to be the constant voltage output type with power output capacities to drive the loudspeakers connected at sufficient levels with no more than 90% amplifier loading.

2.11 WIRE AND CABLE

A. Factory manufactured field interface cables to be provided, as required, for all:

1. CBL-MST-A male DB-15 connector with 6 individually shielded twisted pairs for connecting to master station ports.
2. CBL-STN-A male DB-37 connector at one end with 16 individually shielded twisted pairs for connecting from station control card audio port to terminal blocks.
3. CBL-STQ-A with male DB-37 connectors at both ends and with 16 individually shielded twisted pairs. For connecting from station control card audio ports to QCB-120-1 Quick Connect Board.
4. CBL-SWT-A male DB-25 connector at one end with 16 individually unshielded twisted pairs for connecting from SCC- 300 station control card switch port to a terminal block.
5. CBL-SWQ-A with male DB-37 connectors at both ends and with 16 unshielded twisted pairs. For connecting from SCC- 300 station control card switch port to QCB-120-2 Quick Connect Board.

B. Field wiring to conform to manufacturer's recommendations.

2.12 QUICK CONNECT BOARDS

A. Quick Connect Boards are designed with a female DB connector to connect a cable from the station control card ports to screw clamp terminals that terminate the field wiring.

1. QCB-120-1 connects the audio port of either the SCC-300 or SCC-400/401 station control card to the field wiring.
2. QCB-120-2 connects the switch ports of an SCC-300 station control card to the field wiring.

2.13 STATION PORT ADAPTER

A. Station Port Adapter provides a line-level output for use with external paging amplifiers.

1. Provides a single line-level output.
2. Provides a single control output (when connected to a 400 or 401 series station card audio port).
3. Screw terminal connections.

2.14 RECESSED CEILING PAGING SPEAKERS, NON-DETENTION AREAS

A. Specifications

1. Speaker
   a. Continuous Power Rating: 25 watts
   b. Frequency: 110 - 20KHz
   c. Impedance: 8 ohms
   d. Sensitivity: 88 dB, Avg./ 92 dB, Peak
   e. Coaxial: ½' post mounted domed tweeter, 4 inch paper cone speaker with poly ether foam surround and a 10 oz magnet.
2. Transformer
   a. Primary Voltage: 70.7 volts
   b. Frequency Response: +/- 1 dB, 50-15 kHz
   c. Primary Taps: 1, 2, 4, and 8 watts
   d. Secondary Impedance: 4 and 8 ohms
   e. Insertion Loss: .6 dB
3. Back Box
   a. Enclosure Diameter: 5-3/8"
   b. Enclosure Depth: 7-5/8"
   c. Flange Diameter: 7-9/16"
   d. Internal Volume: .1 cubic feet
   e. Tile Bridge: 24 gauge electro-galvanized steel
4. Baffle: Perforated steel with welded/serrated studs for push on installation

B. Acceptable Manufacturers

1. Lowell SQLK-8L
2. Soundolier

3. Approved equal

C. Package to include speaker, back box enclosure, baffle, and tilebridge.

2.15 RECESSED CEILING PAGING SPEAKERS, DETENTION AREAS

A. Specifications

1. Speaker
   a. Continuous Power Rating: 25 watts
   b. Frequency: 110 - 20KHz
   c. Impedance: 8 ohms
   d. Sensitivity: 88 dB, Avg./ 92 dB, Peak
   e. Coaxial: ½' post mounted domed tweeter, 4 inch paper cone speaker with poly-ether foam surround and a 10 oz magnet.
2. Transformer
   a. Primary Voltage: 70.7 volts
   b. Frequency Response: +/- 1 dB, 50-15 kHz
   c. Primary Taps: 1, 2, 4, and 8 watts
   d. Secondary Impedance: 4 and 8 ohms
   e. Insertion Loss: 0.6 dB
3. Back Box
   a. Enclosure Diameter: 5-3/8”
   b. Enclosure Depth: 7-5/8”
   c. Flange Diameter: 7-9/16”
   d. Internal Volume: 0.1 cubic feet
   e. Tile Bridge: 24 gauge electro-galvanized steel
4. Baffle: Atlas VP-161 or equal

B. Acceptable Manufacturers

1. Atlas Sound FAP42T Strategy Series II speaker system package.
2. Lowell

C. Package to include speaker, back box enclosure and baffle.

2.16 SURFACE MOUNT PAGING SPEAKER, NON-DETENTION AREAS

A. Specifications

1. Power Rating: 25 watts (transformer limited)
2. Tap Settings: 70V .25, .5, 1, 2, and 4 watts
3. Frequency Response: 85 Hz – 20 k Hz
4. Sensitivity: 92 dB 1W/1M
5. Cone: 8” dual cone
6. Magnet: 10 oz.
7. Dimensions: 11 ½” x 11 ½” x 5 ½”
8. Assembly: CRS constructed enclosure
9. Provide with steel cage for protection.

B. Acceptable Manufacturer

1. Atlas Sound SBMS series speaker system.
2. Lowell

C. Typical of locations where page speaker is mounted to exposed structure.

2.17 WALL MOUNT PAGE SPEAKER, NON-DETENTION AREAS

A. Specifications

1.	Power Taps:	1, 2, 3.8, 7.5, 15 watts at 70V
2.	Frequency Response:	400 Hz to 14 kHz
3.	Dispersion:	70 degrees
4.	Sensitivity:	106 dB
5.	Power Rating:	15 watts

B. Acceptable Manufacturer

1. Atlas Sound AP-15T loudspeaker.
2. Lowell

2.18 SURFACE MOUNT VANDAL PROOF CEILING SPEAKER, DETENTION AREA

A. Specifications

1.	Speaker Type:	8” dual cone
2.	Magnet Weight:	10 oz
3.	Sensitivity:	97 dB
4.	Frequency Response:	65 Hz to 20 kHz
5.	Insertion Loss:	1.5 db
6.	Transformer:	25/70 volt
7.	Primary Taps:	.25, .5, 1, 2, 5
8.	Provide with steel cage for protection.	

B. Acceptable Manufacturer

1. Atlas Sound SD72 speaker transformer package with VP161A-R8 recessed square baffle and 161SES surface stainless steel enclosure.
2. Lowell

PART 3 - EXECUTION

3.1 INSTALLATION

A. All system programming shall be done at the Trade Contractor’s facility prior to installation on site.

B. Qualified personnel shall install the System in strict compliance with the manufacturer's instructions.

C. Wiring shall be color coded, uniform, and in accordance with national electric codes and manufacturer's instructions.

D. Equipment shall be firmly secured, plumb, and level.

E. All cable runs to the main equipment rack shall be tagged and identified.

F. Coordinate all work with Construction Manager – Avisor and other Trades Contractors.

G. Grounding of cables and peripheral equipment shall be installed per manufacturer's direction to eliminate noise induction and achieve optimum system performance.

H. Install and configure Security local area network as required for control and communication between system devices. When required, provide necessary coordination, termination, and programming associated with integrating Security local area network with facility network.

I. Equipment cabinets shall be assembled in the Trade Contractors shop prior to delivery to the job site.

J. All cabling shall be continuous between field device and equipment cabinet. Terminations shall be to terminal boards with punch down blocks, or on screw terminals. Twisted and taped splices are unacceptable.

K. Carefully match input and output impedance's and signal levels at signal interfaces. Provide matching networks where required.

3.2 SOFTWARE SUPPORT

A. Refer to Section 284620 – PLC Software For Electronic Security for software support and programming requirements.

3.3 SYSTEM INITIALIZING AND PROGRAMMING

A. All programming shall occur in the Trade Contractor's shop prior to installation on site.

B. The System shall be turned on and adjustment made to meet requirements of the specification and on-site conditions.

C. The System shall be programmed to function as specified.

D. Any special programming shall be documented and a written copy given to the Owner.

E. Coordinate integration of other electronic systems as called for in the contract documents.

3.4 SYSTEM TEST PROCEDURES

A. The System shall be completely tested to assure that all components are hooked up and in working order. The System shall be adjusted for optimum intelligibility at peak amplifier output before audio signal clipping occurs. Inspect communications quality between each remote device and master station for buzzes, rattles and audio distortion. Correct all causes of such defects. If the cause is outside of the intercom system, promptly notify the Architect Engineer in writing, indicating the cause of the defect and suggested corrective procedures.

B. The System shall be pre-tested by the Security Equipment Trade Contractor and certified, in writing, to function in accordance with the plans and specification.

C. The Trade Contractor is to verify the system is communicating with all controlled devices.

D. Testing to be performed in the Trade Contractors shop prior to delivery-
1. Test 120VAC power equipment and hardware internal to all equipment racks. Test all conductors for shorts, opens, and polarity.
2. Fully charge all UPS systems that apply to this system. Test unit by removing power thereby causing the unit to switch to battery reserve.
3. Perform impedance sweeps on all speakers. Verify results fall within manufacturer's specifications.
4. Adjust all source level control components and signal processing for optimal gain structure. All components shall be set so they clip simultaneously.

E. Testing to be performed at the job site prior to powering the system

1. Verify correct polarity of all microphone inputs, line level inputs, and speaker cables.
2. Verify all microphone inputs, line level inputs, and speaker cables are free of shorts and opens prior to termination of head end electronics.
3. Repeat impedance sweeps on all speaker systems after they are installed and terminated. Include speaker cable in testing.
4. Test all 120VAC power sources for correct polarity and voltage. Test grounding system for continuity. Notify the Construction Manager – Advisor and Electrical Trade Contractor of any problems.

F. Additional job site testing

1. After installation of head end electronics, verify polarity of signal throughout system.
2. Finalize gain structure of system. Adjust system gain and level so that all components clip at the same time. Adjust so system noise is minimized.
3. Adjust all speaker components for consistency in sound pressure level.

G. Prior to termination of head-end electronics, verify that all speaker lines are free from shorts and opens.

H. Utilizing an impedance meter run test tone through speaker system verifying that all speakers are functioning properly.

I. Terminate head end electronics. Run test tone through system verifying adequate gain structure through electronic signal path.

J. Using a sound level meter, confirm variation in sound pressure level is not more than +/-5 db in all areas. Adjust speaker taps to insure consistency in sound pressure levels throughout the facility.

K. Adjust overall sound pressure level so minimum level is 10 dB above ambient noise level for facility during normal operating conditions.

L. The System shall be completely tested to assure that all components are hooked up and in working order. The System shall be adjusted for optimum intelligibility at peak amplifier output before audio signal clipping occurs. Inspect system for defects. Correct all causes of such defects. If the cause is outside of the scope of the Div 28 series scope of work, promptly notify the Construction Manager – Advisor and the Architect Engineer in writing, indicating the cause of the defect and suggested corrective procedures.

M. The system shall be capable of operating free of hums, buzzes, and rattles under normal operating conditions.

N. Provide written documentation showing all test results.

O. The System shall be final tested in the presence of the Architect Engineer. Trade Contractor is to provide all required testing equipment.

3.5 FIELD QUALITY CONTROL

A. Provide services of a duly factory authorized service representative for this project location to supervise the field assembly and connection of components and the pre-testing, testing, and adjustment of the system.

B. Make observations to verify that units and controls are properly labeled, and interconnecting wires and terminals are identified. Provide a list of final tap settings of paging speaker line matching transformers.

C. Rectify deficiencies indicated by tests and completely re-test work affected by such deficiencies at Trade Contractor's expense. Verify by the system test that the total system meets the Specifications and complies with applicable standards.

3.6 OCCUPANCY ADJUSTMENTS

A. When requested by the Architect Engineer within one year of date of Substantial Completion, provide on-site assistance in adjusting sound levels, resetting matching transformer taps, and adjusting controls to suit actual occupied conditions. Provide up to three (3) visits to the site for this purpose.

3.7 TRAINING

A. Trade Contractor is responsible for providing operational and maintenance training applicable to the entire control system. Training is to include, but not be limited to the following-

1. Review all O+M manuals with Owner’s representatives present for training. Provide Owner with electronic manuals (2 discs).

2. Perform a tour of the entire facility. During the tour the trainer shall point out all intercom/page equipment and provide a brief description of its purpose and use. This is to include but not be limited to intercom substations, intercom master stations, paging speakers, equipment cabinets, and graphic control panels.

3. Typical of graphical user interface consoles-

   a. Demonstrate basic functionality of console.
   b. Demonstrate devices/systems controlled by console.
   c. Review navigation of console screens.
   d. Review control functions of each type.

4. Typical of desktop push to talk microphones-

   a. Demonstrate basic functionality of microphone.
   b. Demonstrate devices/systems associated with microphone.
   c. Review control functions of all push buttons.

5. Explain functionality and operation of integrated systems-

   a. Video follow audio
   b. Answer and zoon, answer no zoom, queuing, etc.

END OF SECTION 285123

SECTION 31 11 00 – CLEARING AND GRUBBING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 – General Requirements Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes the work required for the clearing and grubbing of the site.

B. Related Requirements:

1. Section 31 20 00 – Earth Moving.
2. Section 31 25 00 – Erosion and Sediment Control.

1.3 DEFINITIONS

A. Topsoil: A friable loam surface soil free of subsoil, clay, lumps, weeds, roots, debris, and stones exceeding one inch in any dimension.

1.4 PRECONSTRUCTION CONFERENCE

A. Preconstruction Conference: Conduct conference at Project site.

1. Review methods and procedures related to clearing and grubbing including, but not limited to, the following:

a. Review methodology of clearing and grubbing..
b. Review disposal methods of any wastes/excess materials generated from clearing and grubbing operations.

PART 2 - PRODUCTS (Not used)

PART 3 - EXECUTION

3.1 EXISTING VEGETATION

A. Avoid cutting vegetation outside limits of disturbance area shown on the plans.

3.2 EXISTING UTILITIES

A. Existing utilities are indicated in accordance with available records. Drawings may not represent all utilities that may be encountered or exact locations of utilities known.

B. Before any work is started, contact corporations, companies, individuals, and local authorities owning, maintaining, or regulating conduits, wires, and pipes running to or on the property to make suitable arrangements for handling and disposal of such lines.

C. Maintain existing utilities and structures indicated to remain, keep in service, and protect against damage during demolition operations.

D. Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to governing authorities.

3.3 WASTE/EXCESS MATERIAL DISPOSAL

A. Promptly dispose of waste materials from clearing, grubbing and leftover stockpiles. The waste disposal shall conform to applicable laws, ordinances, rules and regulations. Do not consider work completed until final cleaning, unless otherwise directed.

B. Transport waste materials from the project site to off-site disposal areas.

C. No burning of combustible waste materials is permitted.

END OF SECTION 31 11 00

SECTION 31 20 00 – EARTH MOVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 – General Requirements Specification Sections, apply to this Section.

B. City of Baltimore: Department of Public Works – *Specifications For Materials, Highways, Bridges, Utilities, and Incidental Structures* with all addenda thereto at the time bids are received (DPW Standard Specifications.) Subsections of DPW Standard Specifications describing "Measurement and Payment" shall not apply to this contract.

C. City of Baltimore: Department of Transportation – *Book of Standards* with all addenda thereto at the time bids are received (DOT Standards.) Subsections of DOT Standards describing "Measurement and Payment" shall not apply to this contract.

D. American Society of Testing and Materials International (ASTM) standards and test methods.

E. All work must comply with Maryland Department of Environment 2011 Maryland Standards and Specifications for Soil Erosion and Sediment Control with all addenda thereto at the time bids are received.

1.2 SUMMARY

A. Section includes specifications of materials, equipment, and work required to perform earthwork and grading operations.

B. Related Requirements:

1. Division 01 – General Requirements.
2. Section 02 30 00 – Subsurface Investigation.
3. Division 26 – Electrical.
4. Section 31 11 00 – Clearing and Grubbing.
5. Division 32 – Exterior Improvements.
6. Section 32 90 00 – Plants.
7. Section 32 92 00 – Turf and Grasses.
8. Section 33 10 00 – Water Utilities.
9. Section 33 31 00 – Sanitary Sewer Utilities.
10. Section 33 40 00 – Storm Drain Utilities.

1.3 DEFINITIONS

A. Over-Excavation: Removal of material, beyond sub-grade elevations indicated or specified, without written authorization from the Agency Construction Manager.

B. Unsuitable Materials: Materials located at or below the limits of excavation indicated or specified by the contract documents, which would be detrimental to the proposed construction as determined by the Contractor's Construction Inspection Firm, the State's Construction Inspection and Testing Firm, and the Agency Construction Manager (e.g., peat, muck, organic soils, extremely soft soils, debris, concrete foundations, slabs, walls or other deleterious substances.) In-situ materials with moisture content two percent (2 %) above or below the optimum moisture content for compaction are unsuitable without further moisture conditioning.

C. Fill Materials: Approved materials meeting the criteria specified herein, placed over sub-grade surfaces within the areas and to the elevations indicated or specified.

D. Rock: Material that can be excavated only by air-activated hammers, as directed by the Agency Construction Manager.

E. Settlement Monitoring: Activities, actions procedures and installation of instrumentation performed before and during execution of the Work to monitor and detect movement of ground surfaces, utilities, buildings and structures.

1.4 SUBMITTALS:

A. Provide submittals in compliance with Conditions of contract and Division 01.

B. Product Certificates:

1. Submit certificates, signed by manufacturer and contractor, stating the following fill materials comply with this specification:

   a. Off-site and on-site Structural Fill Material.
   b. Off-site Porous Fill Material.
   c. Off-site Aggregate Fill Material.

2. Submit samples of the following to the Contractor's Construction Inspection and Testing Firm as well as State's Construction Inspection and Testing Firm:

   a. All materials to be used as Structural Fill, Porous Fill, and/or Aggregate Fill.

      1) Sample size: 50 Pounds.
      2) Number of Samples: 1 for each type of material.

3. Submit analysis of materials to be used as Structural Fill, Porous Fill and Aggregate Fill.

C. Settlement Monitoring Program:

1. Submit for review prior to construction, the monitoring program that includes schedule of instrumentation design, layout of instrumentation items, equipment installation details, and monitoring report forms.
2. Provide preconstruction and post-construction assessment reports for structures located within 25 feet of excavations, measured in plan. Include photographs or video of any existing damage to structures in assessment reports.
   Submit settlement monitoring plan for review prior to construction. Identify location of settlement monitoring points, reference benchmarks, survey frequency and procedures, and reporting formats on plan or report.

3. Submit readings of monitoring to State's Construction Inspection and Testing Firm and Agency Construction Manager as soon as readings have been taken.

D. Underpinning:

1. Provide drawings and calculations as necessary to support the design and installation of underpinned utilities and foundations.

1.5 QUALITY CONTROL:

A. Laboratory tests to determine maximum density and field tests to measure in place density of materials will be performed by the Contractor's Construction Inspection and Testing Firm. Tests performed by the Contractor's Construction Inspection and Testing Firm do not relieve the contractor of his responsibility to provide quality control.

B. Suitability of materials for use in backfills and structure fills shall be determined by Contractor's Construction Inspection and Testing Firm.

C. Location of tests shall be mutually acceptable between the representative of the Contractor's Construction Inspection and Testing Firm and State's Construction Inspection and Testing Firm.

D. In the event compacted material does not meet specified in-place density, recompact material and retest this area until specified results are obtained. In the event, if the material itself is unsatisfactory, or if additional rolling or other means fail to produce satisfactory results, remove material in that area down to a level of satisfactory density. Perform removal, replacement, and re-rolling without additional compensation.

E. Allow for shrinkage, provide an excess of at least one percent of total height of Backfill measured from a stripped surface to top of a finished surface or as directed by Agency Construction Manager.

F. Tolerances:

1. Construct finished surfaces, except pavement sub-grades to plus or minus 0.1 foot of elevation indicated or specified by the contract documents.
2. Construct pavement sub-grades to plus or minus 1/4-inch of sub-grade elevations indicated or specified by the contract documents.
3. Complete fill and backfill edges to plus or minus 6 inches of the slope lines indicated or specified by the contract documents.
4. Provide Agency Construction Manager with adequate survey information to verify compliance with the above tolerances.
5. Maintain moisture content of fill material within plus/minus 2 percent of optimum moisture content.

1.6 PROJECT CONDITIONS:

A. Existing Sub-surface Conditions:

1. A sub-surface investigation was conducted at the Project site to determine general sub-surface conditions.
2. The State/Architect/Engineer will not be responsible for interpretations or assumptions made from this information.

a. All sub-surface investigation data are made available only for the Contractor's convenience.

B. Existing Utilities:

1. All existing utilities locations shown on the plans are approximate. Other unknown utilities will likely be encountered.

1.7 CONSTRUCTION SURVEYS:

A. See Division 01.

B. Provide combined horizontal and vertical alignment stakes required to perform earth moving operations to sub-grade elevations indicated or specified, to the tolerance specified.

PART 2 - PRODUCTS

2.1 FILL MATERIALS:

A. General: Material shall be free of frozen matter, debris, muck, peat, roots, grass, leaves, humus, sewage, and other organic material.

1. Obtain and transport fill material to the project site at no increase to the Contract Sum.
2. Submit fill material samples specified.

a. Sample Testing: By the Contractor’s Construction Inspection and Testing Firm.
b. Sample Approval: By the State’s Construction Inspection and Testing Firm and Agency Construction Manager.
c. Do not place fill until approval is obtained from the State’s Construction Inspection and Testing Firm and Agency Construction Manager.
d. Submit samples of each type of material to be used as Fill.
e. Blast furnace slag is prohibited.

B. Structural Fill:

1. Classifications Permitted: GW, GM, GP, GC, SW, SP, SM or SC classified in accordance with ASTM D 2487.
2. Fines Plasticity Index: Not to exceed 10.
3. Liquid Limit: Not to exceed 30.
4. Maximum Dry Density: Not less than 120 pounds per cubic foot determined in accordance with ASTM D 1557 method of testing.
5. Maximum Particle Size: 2 inches.
6. Quality: Free of debris, topsoil, waste materials, muck, organic matter, cobbles, boulders and frozen matter. All materials that fall within the USCS type ML, CL, CL-ML, OL, MH, CH and PT are prohibited for use as Structural Fill.

C. Porous Fill:

1. Coarse Aggregate: ASTM C 33, Size number: #57 aggregate.

D. Aggregate Fill:

1. Crusher Run Aggregate CR-6 defined in DPW Standard Specification Section 32 11 23.10: Table A.

PART 3 EXECUTION

3.1 PROTECTION AND RESTORATION:

A. General:

1. Provide protection to prevent settlement, movement, undermining of, or erosion to, new or existing site improvements, buildings, or utilities.
2. Do not permit heavy equipment to pass over any utility until a minimum of 2 feet of compacted fill or backfill is placed above the top of the utility.
3. Restore damage resulting from lack of protection or improper installation of protection, at no increase to the Contract Sum.

a. Restoration: Approved by the Agency Construction Manager.

B. Existing Utilities:

1. Notify all public utilities 48 hours, excluding weekends and holidays prior to start of earthwork operations. Call Miss Utility (800) 257-7777. The contractor shall pay for services performed by Miss Utility. Should the Contractor require services of any other private company or agency to locate the underground utilities, the Contractor shall pay for those services, without an increase to the Contract Sum.
2. Verify and mark horizontal utility locations prior to start of earthwork operations.
3. Manually excavate and expose utilities as earthwork operations approach marked utility locations at no increase to the Contract Sum.
4. Immediately notify the Agency Construction Manager in the event horizontal or vertical utility locations differ from locations indicated.

a. Provide horizontal and vertical details of differing utility locations as directed by the Agency Construction Manager.
b. Conflicts with proposed construction will be resolved by Agency Construction Manager.
c. The Agency Construction Manager will provide directions and details required to relocate utilities conflicting with construction.

5. Immediately notify the Agency Construction Manager in the event uncharted utilities are encountered during earthwork or subsequent construction operations.

a. Stop all construction operations within immediate area of the uncharted utility.
b. Provide horizontal and vertical details of the uncharted utility locations as directed by the Agency Construction Manager.
c. Conflicts with proposed construction will be resolved by the Agency Construction Manager.
d. Uncharted utilities, not conflicting with construction, are to remain.

6. Protect existing utilities from damage by earthwork or subsequent construction operations.

    a. The Contractor shall restore any utility damaged from any cause at no increase to the Contract Sum.

        1) Restoration will be performed and completed to the satisfaction of the Agency Construction Manager and the utility Owner.

C. Sub-grades:

1. Protect foundation, slab, and pavement sub-grades from saturation by preventing the accumulation of rainwater.
2. Protect foundation and slab sub-grades from frost with the use of insulating materials.
3. Restore sub-grades damaged from lack of protection as directed by the Agency Construction Manager at no increase to the Contract Sum.

D. Support Systems:

1. Provide support systems (e.g., Sheeting, Shoring, Sheet Piling, Cribbing, etc.) at no increase to the Contract Sum.
2. Underpin existing building foundations as indicated or specified by the Contract Documents to protect existing buildings from damage by any construction operations of this project.

    a. Prepare drawings and calculations as necessary to support the design and installation of underpinned foundations. Submit drawings and calculations for review and approval by the Agency Construction Manager prior to earthwork or construction operations.

        1) This action shall be a task in the project schedule.

    b. The Contractor shall restore any portion of any building(s) damaged from any cause at no increase to the Contract Sum.

        1) All Restoration will be performed and completed to the satisfaction of the Agency Construction Manager and the building Owner.

E. Dust Control:

1. Conduct earth-moving operations and maintain work-site in a way to minimize the creation and dispersion of dust. Furnish and spread calcium chloride as directed by Agency Construction Manager for a more effective dust control at no increase to the Contract Sum.

F. Backfill Material:

1. Nature of materials will govern both their acceptability for backfill and methods best suited for their placement and compaction in backfill.

3.2 DE-WATERING:

A. General:

1. The Contractor is advised that groundwater will be encountered in the excavation and therefore groundwater control during construction will be required. The Contractor will be responsible for providing control of groundwater during construction at no increase to the Contract Sum.
2. The purpose of controlling groundwater is to provide a relatively dry and stable subgrade for construction work, reduce hydrostatic pressures on an excavation slope or an excavation support system, and prevent loss of ground that could cause settlement of adjacent facilities.
3. Control of groundwater during construction will include providing dewatering system for the removal and approved disposal of surface water, groundwater and water from other sources.

B. Perform earthwork and grading operations as required to prevent the following:

1. Surface or sub-surface water from flowing into excavations.
2. Surface or sub-surface water from flooding project site or adjacent property.
3. Water accumulations detrimental to sub-grade stability.

C. Provide, install, operate, and maintain pumps, sumps, discharge lines, and related equipment as required.

D. Dispose of pumped or drained water without undue interference to other work, damage to pavements, other surfaces or property. Refer to Section 01 35 43.27 – Liquid Management for the requirements and restrictions for handling and disposal of liquids generated by, or encountered during, construction activities.

3.3 SITE EXCAVATION:

A. Excavate materials encountered within the areas and to the elevations indicated or specified by the contract documents.

B. Removal of boulders, frozen materials, and man-made objects shall not be considered as rock excavation even if an explosive or air-activated hammer is used for their removal.

C. Handle excavated materials without undue interference to other work, damage to pavements, other surfaces, or property. Refer to Section 01 35 43.31 - Soil Management for the requirements and restrictions for handling and disposal of materials generated by, or encountered during, construction activities.

D. Carry out excavation, dewatering, excavation support and bracing operations in such a manner to eliminate possibility of undermining or disturbing foundations of existing structures or of work previously completed under this contract, and as required for safety of personnel.

E. Remove existing underground foundations, caissons, foundation walls, slabs, abandoned pipes encountered during the site excavation to at least three feet below the new structure limits as indicated or specified by the contract documents. The removal of existing facilities shall be considered as incidental to the site excavation and will not be measured and paid separately.

F. Landscape Area and Associated Masonry Walls outside of the New Building:

1. Excavate entire area indicated or specified by the contract documents. The area to be excavated is outside the new building limits and within the property line at the southeast corner of the site.
2. Remove and dispose of excavated materials, slabs, building foundations, foundation walls, pavements, storm drains, and utilities encountered.
3. Verify by penetration testing that the bearing capacity at sub-grade is 2,500 psf.
4. If unacceptable condition is encountered, the area should be over-excavated by not more than two feet.
5. Replace excavated volume with Aggregate Fill to original elevations indicated or specified by the contract documents or specified by the Agency Construction Manager. Place Aggregate Fill as specified in Article 3.10, of this Section.

3.4 FOUNDATION EXCAVATION:

A. General:

1. Excavate to elevations indicated or specified by the contract documents or specified by the Agency Construction Manager.
2. Extend excavations horizontally beyond foundations to permit the following:

    a. Formwork placement and removal.
    b. Support system placement and removal.
    c. Waterproofing.
    d. Perimeter insulation installation.
    e. Inspection.

3. Do not place concrete until the foundation sub-grade is inspected, the bearing capacity is verified by the Contractor's Construction Inspection and Testing Firm and accepted by the State's Construction Inspection and Testing Firm and Agency Construction Manager.
4. Manually trim and shape excavations prior to concrete placement.
5. Carefully clean excavations, removing loose and disturbed earth, prior to concrete placement.
6. Removal of boulders, frozen materials, and man-made objects shall not be considered as rock excavation even if an air-activated hammer is used for their removal.

3.5 UTILITY EXCAVATION:

A. General:

1. Excavate utility trenches to width and depths indicated on the drawings, or as specified.

    a. Excavate trenches to provide widths from trench bottom to 12 inches above top of utility, not to exceed 12 inches clearance on each side of utility.
    b. Excavate trenches for storm drain, water and sanitary sewer lines to six inches below bottom of pipe for full trench width. Excavate trenches for all other utilities to the bottom of utility. Do not over excavate except at pipe bells, if required.

2. Do not excavate trenches more than 50 feet ahead of installation.
3. Removal of underground foundations, foundation walls, pavements, slabs, abandoned pipes encountered during the utility excavation outside the limits of demolition indicated or specified by the Contract Documents shall be considered as incidental to the utility excavation and will not be measured and paid separately. Seal ends of open pipes with masonry bulkheads.
4. Removal of boulders, frozen materials, and man-made objects shall not be considered as rock excavation even if an air-activated hammer is used for their removal.

3.6 UTILITY STRUCTURE EXCAVATION:

A. General:

1. Excavate to sub-grade elevations indicated or specified by the contract documents.
2. Do not place concrete until the foundation sub-grade is inspected, the bearing capacity is verified by the Contractor's Construction Inspection and Testing Firm and accepted by the State's Construction Inspection and Testing Firm and Agency Construction Manager.
3. Trim and shape sub-grades to smooth and even surfaces, free of voids and depressions.
4. Removal of underground foundations, foundation walls, pavements, slabs, abandoned pipes encountered during the utility structure excavation outside the limits of demolition indicated or specified by the contract documents shall be considered as incidental to the utility structure excavation and will not be measured and paid separately. Seal ends of open pipes with masonry bulkheads.
5. Removal of boulders, frozen materials, and man-made objects shall not be considered as rock excavation even if an air-activated hammer is used for their removal.

3.7 UNSUITABLE MATERIAL:

A. Immediately notify the Agency Construction Manager in the event unsuitable material is encountered at subgrade during earthwork or subsequent construction operations.

1. Stop all work within immediate area of Unsuitable Material.
2. Unsuitability of materials shall be determined by Contractor's Construction Inspection and Testing Firm. Provide documentation to Agency Construction Manager.
3. Do not remove Unsuitable Material until authorization is obtained from the Agency Construction Manager.
4. Do not remove Unsuitable Material until proper measurements are obtained, as defined in Article 4.1, of this Section.
5. Upon receipt of authorization, excavate and dispose of all Unsuitable Material off-site. Contractor shall provide an off-site disposal area.
6. Backfill excavated area as specified in Article 3.11, of this Section.

3.8 OVER-EXCAVATION:

A. Over-excavated areas shall be backfilled as specified in Article 3.10, of this Section, at no increase to Contract Sum.

B. Unsuitable Material encountered as a result of over-excavation shall be removed and backfilled as specified in Article 3.11, of this Section, at no increase to Contract Sum. No measurement will be required.

3.9 EXCAVATED MATERIAL STORAGE:

A. Excavated materials not suitable to use as fill and backfill as specified, shall be removed and disposed off-site at no increase to the Contract Sum.

B. Excess materials shall be removed and disposed off-site at no increase to the Contract Sum.

3.10 FILL:

A. Existing Ground Surface Preparation: Remove vegetation and topsoil as specified in Clearing and Grubbing, Division 31.

B. Existing Sub-grade Preparation at Fill Locations:

1. Remove Unsuitable Material as specified in Article 3.7 upon completion of clearing operations.
2. Proof-roll the sub-grade with 35-ton rubber tire roller, or a loaded tandem axle dump truck or equivalent in presence of representative of the Contractor's Construction Inspection and Testing Firm.
3. Remove Unsuitable Material revealed by proof-rolling operations, as specified in Article 3.7.
4. Prior to placing fill, compact top 6 inches of sub-grade to 95% of the maximum dry density determined in accordance with ASTM D 1557.

C. Fill Placement:

1. Place approved fill material only as specified in Article 2.1.
2. Do not place fill on prepared sub-grade, until the sub-grade is inspected, tested, and approved by the representative of Contractor's Construction Inspection and Testing Firm.
3. Do not place fill material when prepared sub-grade, fill material, or previous lift is frozen or muddy.
4. Place fill material in loose lifts not exceeding eight inches (8 in) in thickness and compact as specified.
5. Each lift should be compacted to the specified dry density prior to the addition of subsequent lifts.
6. Each list must be inspected, tested, and approved by the representative of the Contractor's Construction Inspection and Testing Firm prior to the placement of a subsequent lift.
7. Place fill to elevations indicated or specified by the contract documents.

D. Fill Compaction and Moisture Control:

1. Obtain compaction with specified compaction equipment:

    a. Provide suitable compaction equipment to achieve the required degree of compaction for the materials encountered. If the equipment fails to compact the materials as specified, change weight and/or type of equipment.
    b. Provide compaction equipment in good mechanical operating condition.

2. Compact each lift of structural fill and aggregate fill to ninety-five percent (95%) of the maximum dry density, based on maximum dry density determined in accordance with ASTM D 1557.
3. Compact each lift of porous fill with a minimum 10-ton vibratory roller.
4. Compact each lift of porous fill with at least two passes of the roller in vibratory mode and at least two in static mode until there is no visible movement of the material.
5. Moisture Control During Placement and Compaction Operations:

    a. Moisture - Density curves will be provided by the Contractor's Construction Inspection and Testing Firm to assist in moisture control.
    b. Extensive aeration may be required to reduce in-situ moisture content to within 2 percent of optimum moisture content.

        1) Remove and replace or scarify and aerate excessively moist material, until required moisture content is obtained at no increase to Contract Sum or project completion time.

    c. Excessively dry material shall be moistened to bring it to within two percent (2%) of optimum moisture content at no increase to the Contract Sum or project completion time.

3.11 BACKFILL:

A. General:

1. Backfill excavations as promptly as Work permits, but not until completion of all required tests and inspections.

B. Backfill Placement and Compaction:

1. Place approved backfill material only as specified in Article 2.1.
2. Do not place backfill when sub-grade, backfill material, or previous lift is muddy or frozen.
3. Each lift must be inspected, tested, and approved by the Contractor's Construction Inspection and Testing Firm prior to the placement of a subsequent lift.
4. Place backfill material in loose lifts not exceeding 8 inches.
5. Compact each lift to 95% of the maximum dry density determined in accordance with ASTM D 1557.
6. Backfill Adjacent to Structures:

    a. Exercise care in the placement of backfill material adjacent to structures.
    b. Place backfill evenly to prevent wedging action against the structure.
    c. Place backfill uniformly around structure in lifts of equal thickness, not exceeding 8 inches.
    d. Compact each lift as specified above.

7. Bedding:

    a. Place bedding material at trench bottom, around and over pipes for a distance of 6 inches above the top of pipe.
    b. Place bedding material at sub-grade elevation of utility structure for a distance of 6 inches below the bottom of structure.

3.12 SUB-GRADE PREPARATION:

A. Prepare sub-grades as follows:

1. Within Limits of Demolition

    a. Grade as indicated or specified by the contract documents.
    b. Proof-roll the sub-grade with 35-ton rubber tire roller, or a loaded tandem axle dump truck or equivalent in presence of representative of the Contractor's Construction Inspection and Testing Firm.
    c. Remove Unsuitable Material revealed by proof-rolling operations, as specified in Article 3.7.
    d. Compact top 6 inches of sub-grade to 95% of the maximum dry density determined in accordance with ASTM D 1557.

B. Verify utility casting elevations and reset or adjust castings to meet flush with a finished grade. Resetting and/or adjustment to castings are incidental and shall not affect the Contract Sum.

3.13 MAINTENANCE:

A. Maintain all paved access roads in clean, mud- and dust-free condition during earthwork and subsequent construction operations.

B. Maintain completed area of Project site as follows:

1. Keep free of trash and debris.
2. Scarify, re-grade, and re-compact damaged or disturbed sub-grades.

3.14 INSPECTION AND TESTING:

A. The Contractor's Construction Inspection and Testing Firm shall perform the inspections and tests as indicated herein in accordance with Division 01. The work to be performed by the Contractor's Construction Inspection and Testing Firm shall include the following:

1. Preparation of Sub-grade:

    a. Inspect proof-rolling of sub-grades.
    b. Perform density tests on sub-grades:

        1) Test method: ASTM D 1556 or ASTM D 2922.

2) Test frequency: No less than 1 for every 2,000 square feet of sub-grade.
3) Test location: Random and as determined by representatives of the Contractor's Construction Inspection and Testing Firm State's Construction Inspection and Testing Firm and Agency Construction Manager.

2. Foundation Excavation.

a. Verify bearing capacity:

1) Test Method: Penetrometer test, using equipment that can verify the penetration resistance to a depth of eighteen inches (18 IN) below the surface.
2) Testing Frequency: One for every fifty square feet (50 SF) for rectangular or square foundation. One for every fifty linear feet (50 LF) for continuous foundation.
3) Test Location: Random and as determined by representatives of the Contractor's Construction Inspection and Testing Firm State's Construction Inspection and Testing Firm and Agency Construction Manager.

3. Utility and Utility Structure Excavation:

a. Inspect the sub-grade of utility excavation to verify that subgrade conditions are acceptable.

4. Fill and Backfill Material:

a. Perform classification tests on fill and backfill materials:

1) Test Method: ASTM D 2487.
2) Testing Frequency: One for each type of material to be used.

b. Perform moisture-density relationship tests on fill and backfill materials.

1) Test Method: ASTM D 1557.
2) Testing Frequency: 1 for each type of material to be used.

5. Placement and Compaction of Fill and Backfill:

a. Perform in-place density tests during filling and backfilling.

1) Test Method: ASTM D 1556 or ASTM D 2922.
2) Testing Frequency: No less than one for every 2,000 square feet for sub-grade approval; and one for every 250 cubic yards for Structural Fill; one for each lift for every 200 linear feet of trench; 1 for each lift for every 150 linear feet of walkway.
3) Test Location: Random and as determined by representatives of the Contractor's Construction Inspection and Testing Firm State's Construction Inspection and Testing Firm and Agency Construction Manager.

6. Removal of Unsuitable Material:

a. The Contractor shall assist the Agency Construction Manager in determining location and extent of Unsuitable Material.
b. The Agency Construction Manager shall accompany the Contractor during the measurement of quantities of Unsuitable Material.

B. The Contractor shall provide the following to the Contractor's Construction Inspection and Testing Firm at no increase to the Contract Sum:

1. Delivery tickets for each truckload of material imported to the site, indicating the name of supplier and location of borrow pit.
2. Surveying required to measure quantities of Unsuitable Material.

C. The Contractor shall correct all work not conforming with the Contract Documents as directed by the Agency Construction Manager, at no increase to the Contract Sum.

3.15 SETTLEMENT MONITORING:

A. General:

1. Perform settlement monitoring before, during and after the excavation operations. This consists of pre-construction and post-construction surveys of the surfaces around the site, monitoring surface settlement, and monitoring settlement of existing utilities and buildings. This work shall include: structural surveys of all properties, pavements, buildings, structures, and utilities within 25 feet of excavations.
2. Install and maintain instrumentation to monitor and detect movement of ground surfaces, utilities, buildings and structures. Establish monitoring points at intervals of not more than 100 feet for all properties, pavements, buildings, structures, and utilities within 25 feet of excavations. The existing to remain SUI Building (OSTC) shall have instrumentation to monitor and detect movement at each northwest and northeast corner of the building, at 25 feet intervals across the north wall of the building, and down past the project limits along the west side of the building.
3. Measurement of monitoring instruments shall be performed by a Maryland Registered Land Surveyor.
4. Establish survey control points at distance from construction area that avoids disturbance due to ground settlement.
5. Measurement of monitoring instruments shall be performed with an accuracy of 0.05 inch.
6. Instrumentation to monitor settlement may include crackmeters, building monitoring points, surface settlement points, utility settlement points and shallow subsurface settlement points.

B. Reading Frequency and Reporting

1. Record all monitoring points at least once per week starting prior to excavation construction and continuing until the excavation has been backfilled and until no more detectable movement occurs.
2. Record all monitoring points at least three times prior to excavation construction to establish base line measurements.
3. Immediately report to Agency Construction Manager any settlement, movement, or cracking that is detected.
4. If the change in the measured settlement from the base measurements exceeds 1/8-inch, the Contractor shall notify the Agency Construction Manager and take

precautionary measures to prevent further movement, settlement or damage to the effected building, area, utility or structure.

5. Following substantial completion but prior to final completion, make final survey of all monitoring points and report to Agency Construction Manager. Remove all monitoring points as directed by Agency Construction Manager.

3.16 SETTLEMENT REMEDIATION

A. The contractor shall restore to proper grade any settlement or any slab, pavement, utility, structure or lawn etc. affected by any settlement, within one year after final acceptance. All remedial restoration shall be approved by Agency Construction Manager, and shall be carried out without additional compensation.

3.17 USE OF EXPLOSIVES

A. Explosives shall not be used.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT:

A. Removal of Unsuitable Material, below the subgrade elevation, will be measured to the nearest cubic yard, in place, by the average end area method.

1. Unsuitable Material encountered as a result of over-excavation, unless authorized by the Agency Construction Manager, will not be measured for payment.
2. Removal of materials, which became unsuitable due to lack of protection, will not be measured for payment.

B. Excavation for the Contractor's convenience, unauthorized excavation, and backfill of such excavations will not be measured for payment.

C. Off-site borrow used for the Contractor's convenience will not be measured for payment.

D. Stockpiling and re-handling stockpiled material will not be measured separately for payment, but will be considered incidental to the work to which it pertains.

4.2 PAYMENT:

A. Base bid includes Removal of Unsuitable Materials and Replacement with Off-site Borrow. Removal of unsuitable material below subgrade elevation within the areas and to the elevations indicated or specified by the drawings and/or specifications and replacement with fill material will be based on prices quoted in the Unit Price Schedule.

END OF SECTION 31 20 00

SECTION 31 25 00 – EROSION AND SEDIMENT CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. All work must comply with the annotated Code of Maryland Regulations (COMAR), Title 27, Subtitle 17, "Erosion and Sediment Control."

C. All work must comply with Maryland Department of Environment 2011 Maryland Standards and Specifications for Soil Erosion and Sediment Control with all addenda thereto at the time bids are received.

D. Maryland Department of Transportation State Highway Administration Standard Specifications for Construction and Materials (MDOT Standard Specifications) latest edition. Subsections of the MDOT Standard Specifications describing “Measurement and Payment” shall not apply to this contract.

1.2 SUMMARY

A. Section includes: Materials and work required to control soil erosion, prevent flow of sediment from construction site, and contain construction materials (including excavation and backfill) within protected area, to prevent damage to any natural resources within or adjoining the project site.

B. Related Requirements:

1. Division 31 – Earth Work.
2. Division 32 – Exterior Improvements.
3. Division 33 – Utilities.

1.3 DEFINITIONS

A. Temporary Soil Stabilization: Application of, and anchoring mulch over otherwise unprotected soil.

1.4 SUSTAINABLE DESIGN REQUIREMENTS

A. MRc2: Construction Waste Management

1. No less than the specified minimum proportion of all construction waste from the project shall be diverted from disposal in a landfill and/or incineration in accordance with the project requirements for Construction Waste Management. See Section 01 81 13 – Sustainable Design Requirements.

B. MRc4: Recycled Content Material

1. No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the project requirements for Recycled Content Materials. All materials counted toward the computation of the proportion of the Recycled Content Materials shall comply with the standard for the minimum percentages of post-consumer waste materials and for the minimum percentage of pre-consumer waste materials. See Section 01 81 13 – Sustainable Design Requirements.
2. Contractor shall provide LEED credit verification as per section 01 33 00 – Submittal Procedures.

C. MRc5: Regionally manufactured harvested materials

1. No less than the specified proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the project site in accordance with the project requirements for Regionally Manufactured and/or Harvested Materials. See Section 018113 Sustainable Design Requirements.
2. Contractor shall provide LEED credit verification as per Section 01 33 00 – Submittal Procedures.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of products

1. Certificates

a. Submit certificates, signed by Manufacturer and Contractor, stating that the various types of geotextile filter cloth material used on the project complies with this Specification.

2. Descriptions

a. Submit product descriptions and obtain approval from the following, prior to construction of Stabilized Construction Entrances:

1) The Agency Construction Manager (ACM)
2) Maryland Department of Environment (MDE).

B. LEED Submittals:

1. Contractor shall provide LEED credit verification as per Section 01 33 00 – Submittal Procedures

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data:

B. Product Test Reports:

1.7 QUALITY ASSURANCE

A. Contractor must be certified by the Maryland Department of the Environment (MDE). This work must be done under the direct supervision of a person who has satisfactorily completed MDE's approved training program for sediment and erosion control.

B. ACM has the authority to limit surface area of erodible earth material exposed by clearing, grubbing, excavation, borrow and fill operations and to direct immediate permanent or temporary pollution control measures to control natural environmental resource degradation, including construction of temporary berms, dikes, dams, sediment basins, sediment traps, slope drains, and use of temporary mulches, mats or other control devices or methods as necessary to control erosion.

C. The contractor shall at all times maintain a certified copy of the soil erosion and sediment control plan at the construction site.

1.8 PROJECT CONDITIONS

A. See Article 1.7 – Project Conditions in Section 31 20 00 – Earth Moving.

B. Limitations: Work Sequence shall comply with "Sequence of Construction" shown on the Contract Drawings.

1.9 CONSTRUCTION SURVEYS:

A. See Division 01 – General Requirements.

B. Provide horizontal alignment stakes for location of silt fences, at intervals of 50 feet maximum and at each change in direction.

PART 2 - PRODUCTS

2.1 AGGREGATES

A. Coarse Aggregate (2" stone): AASHTO – M 43, Size No. 2 or 24.

2.2 GEOTEXTILE FABRICS

A. For Stabilized Construction Entrance:

1. Non-woven Filter Cloth shall meet the requirements of Section H-1: Standards and Specifications for Materials from the 2011 Maryland Standards and Specifications for Soil Erosion and Sediment Control for Heavy Duty Haul Roads.

B. For all other uses:

1. Filter-X as manufactured by Carthage Mills, Inc., Cincinnati, Ohio, or
2. Mirafi 100X as manufactured by Mirafi, Inc., Charlotte, North Carolina, or

3. Approved equal following Substitutions: Under provisions of Division 01 – General Requirements.

2.3 STABILIZED CONSTRUCTION ENTRANCE

A. The Stabilized Construction Entrance (SCE) shall be installed and maintained per page B.1 and detail B-1 (page B.2) of 2011 Maryland Standards and Specifications for Soil Erosion and Sediment Control. See Contract Drawings for location(s).

2.4 SILT FENCE:

A. Silt Fence shall be installed and maintained per page E.1 and detail E-1 (page E.2 and E.3) of the 2011 Maryland Standards and Specifications for Soil Erosion and Sediment Control. See Contract Drawings for location(s) and length(s).

B. Fence Posts:

1. Type: Steel "T" or "U" channel, with punches or riveted lugs for fence attachment, for silt fence.

   a. Weight: 1 pound per linear foot minimum.
   b. Length: 36 inches minimum.
   c. Pointed one end.

2. Contractor's Option: Hardwood posts.

   a. Size: 2 by 2 inch.
   b. Length: 36 inches minimum.
   c. Pointed one end.

C. Silt Fence Fabric:

1. Type: Woven Silt Film Geotextile Fabric as specified in Table H.1 (page H.1) in Section H – Standards and Specifications for Materials of the 2011 Maryland Standards and Specifications for Soil Erosion and Sediment Control.

2.5 SEED, MULCH, AND SOD:

A. See Section 32 92 00 – Turf and Grasses and the Contract Drawings. If any discrepancies are found between the two the more stringent shall apply.

2.6 PORTABLE SEDIMENT TANK:

A. Portable Sediment Tank (PST) shall be installed and maintained per page F.6 and Detail F-3 (page F.7) of the 2011 Maryland Standards and Specifications for Soil Erosion and Sediment Control.

2.7 TEMPORARY GABION OUTLET STRUCTURE:

A. Temporary Gabion Outlet Structure (TGOS) and transition to Earth Dike shall be installed and maintained per page E.20 and Detail E-8 (pages E-21 and E-22) of the 2011 Maryland Standards and Specifications for Soil Erosion and Sediment Control. See the Contract Drawings for location(s).

2.8 EARTH DIKE

A. Earth Dike (ED) shall be installed and maintained per pages C.1 to C.4 and Detail C-1 (page C.5) of the 2011 Maryland Standards and Specifications for Soil Erosion and Sediment Control. See the Contract Drawings for size and location(s) of ED.

2.9 SUPER SILT FENCE

A. Super Silt Fence (SSF) shall be installed and maintained per page page E.6 and Detail E-3 (page E.7) of the 2011 Maryland Standards and Specifications for Soil Erosion and Sediment Control.

B. Silt Fence Fabric:

1. Type: Woven Silt Film Geotextile Fabric as specified in Table H.1 (page H.1) in Section H – Standards and Specifications for Materials of the 2011 Maryland Standards and Specifications for Soil Erosion and Sediment Control.

2.10 SILT FENCE ON PAVEMENT

A. A. Super Silt Fence (SFOP) shall be installed and maintained per page E.4 and Detail E-2 (page E.5) of the 2011 Maryland Standards and Specifications for Soil Erosion and Sediment Control.

B. Silt Fence Fabric:

1. Type: Woven Silt Film Geotextile Fabric as specified in Table H.1 (page H.1) in Section H – Standards and Specifications for Materials of the 2011 Maryland Standards and Specifications for Soil Erosion and Sediment Control.

2.11 ONSITE CONCRETE WASHOUT STRUCTURE

A. The Onsite Concrete Washout Structure (CWS) shall be installed and maintained per page H.23 and Detail H-6 (pages H.24 and H.25) of the 2011 Maryland Standards and Specifications for Soil Erosion and Sediment Control.

B. The Contractor shall construct a CWS prior to the commencement of any Concrete pouring operations for the purpose of washing out the concrete trucks after placement of concrete. The Contractor may move the CWS between concrete pours; however the breakdown and reloated structure must follow the directions found in the 2011 Maryland Standards and Specifications for Soil Erosion and Sediment Control.

2.12 STOCKPILE

A. The Contractor shall remove any spoils generated by the end of each workday to an approved location. Although demolition rubble is excluded, the rubble shall be removed from the site adequately to keep the remaining pile to a minimal size. The size of the pile shall be at the digression of the Agency Construction Manager.

PART 3 - EXECUTION

3.1 GENERAL:

A. All work shall be done in accordance with the 2011 Maryland Standards and Specifications for Soil Erosion and Sediment Control and the Contract Documents.

3.2 STABILIZED CONSTRUCTION ENTRANCE:

A. Construct Stabilized Construction Entrance (SCE) at location(s) shown on the Contract Drawings, and at the time indicated in the approved sequence of construction. Maintain SCE by cleaning and properly grading at regular intervals until removed. The SCE should be inspected every day and at the end of every rain event.

3.3 SILT FENCE:

A. Construct Silt Fence (SF) at locations shown on the drawings, and maintain all SF in good repair. Re-erect destroyed or damaged fences within 24 hours.

B. Installation:

1. Excavate a trench a minimum of eight inches (8 in) deep along “up stream" side of fence.

2. Set posts plumb not more than six feet (6 ft) on center. Drive posts to a minimum of sixteen inches (16 in) into ground.

3. Install silt fence fabric taut on "up stream" side of posts. Silt fence filter fabric shall be embedded a minimum of 8” vertically into ground.

4. Secure silt fence fabric with wire or staples to posts.

5. Backfill trench and compact

3.4 SUPER SILT FENCE:

A. Construct Super Silt Fence (SSF) at locations shown on the drawings, and maintain all SF in good repair. Re-erect destroyed or damaged fences within 24 hours.

B. Installation:

1. Excavate a trench a minimum of eight inches (8 in) deep along "up stream" side of fence.

2. Set posts plumb not more than 10 feet on center. Drive posts to a minimum of sixteen inches (16 in) into ground.

3. Place silt fence filter fabric on galvanized chain link fence matching bottom edges. Fasten silt fence filter fabric to galvanized chain link fence with wire ties at top, mid-height and bottom of fence every twenty four inches on center along the length of the fence.

4. Install chain link fence with silt fence filter fabric taut on "up stream" side of posts. Both chain link fence and silt fence filter fabric shall be embedded a minimum of 8” vertically into ground.

5. Secure composite fabric with wire or staples to posts.

6. Backfill trench and compact.

3.5 SILT FENCE ON PAVEMENT:

A. Construct Silt Fence On Pavement (SFOP) at locations shown on the drawings, and maintain all SF in good repair. Re-erect destroyed or damaged fences within 24 hours.

B. Silt Fence On Pavement shall be installed in accordance with the instructions provided in the 2011 Maryland Standards and Specifications for Soil Erosion and Sediment Control and the Contract Documents.

3.6 INLET PROTECTION:

A. Construct any type of Inlet Protection at locations shown and at the time indicated on the Drawings.

B. Any type of Inlet Protection shall be installed in accordance with the instructions provided in the 2011 Maryland Standards and Specifications for Soil Erosion and Sediment Control and the Contract Documents.

3.7 SOIL STABILIZATION:

A. General:

1. Provide controls required to prevent soil, sediment, and debris from following on-to adjacent and downstream properties, prior to and/or during work under this Contract.
2. Following initial soil disturbance or re-disturbance, permanent or temporary stabilization of all dikes, swales, ditches, and slopes greater than three horizontal to one vertical (3:1) shall be completed within three (3) calendar days. Stabilization of all other disturbed or graded areas on the project site shall be completed within seven (7) calendar days.
3. Temporarily stabilize topsoil stockpiles within seven (7) calendar days after completion of initial earthwork operations.
4. Temporarily stabilize soil immediately upon completion of grading operations, when no seeding date is applicable.

B. Mulching:

1. Apply mulch uniformly over area to be stabilized.
2. Minimum Application Rate: two (2) tons per acre to a loose depth of one to two inches (1 in - 2 in).

C. Anchoring:

1. Anchor mulch by one of the following methods:

a. Netting Method: Cover and anchor mulch with netting in accordance with netting manufacturer's installation instructions.
b. Organic Binder Method: Apply organic binder mixture uniformly over mulch, in accordance with manufacturer's application instructions and as noted.

1) Mixture Application Rate: 18 gallons per 1000 square feet.

D. Temporary and Permanent Vegetation:

1. Immediately stabilize completed unpaved areas as specified in Section 32 92 00 – Turf and Grasses.
2. Immediately stabilize back-filled utility trenches as specified in Section 32 92 00– Turf and Grasses.
3. Immediately stabilize Planting Areas as specified in Section 32 93 00 – Plantings.

3.8 PORTABLE SEDIMENT TANK:

A. Provide and maintain Portable Sediment Tank(s) (PST) to trap and retain sediment prior to pumping the water to drainage-ways and conveyance systems.

B. Provide and maintains PST's when water is pumped and discharged to drainage-ways.

3.9 MAINTENANCE:

A. General:

1. All sediment and erosion control measures shall be maintained as required by the Contract Drawings, this Article and the 2011 Maryland Standards and Specifications for Soil Erosion and Sediment Control, at no increase to the Contract Sum.
2. Maintain soil erosion and sediment controls, to Project completion date, at no increase to Contract Sum.
3. Inspect and remove silt and debris accumulations from the stabilized construction entrances, silt fences, inlet protection and storm inlet sediment traps at regular intervals, as specified in the 2011 Maryland Standards and Specifications for Soil Erosion and Sediment Control, and when directed by the Agency Construction Manager.

B. Stabilized Construction Entrance:

1. Remove and replace gravel aprons or provide additional gravel top dressing, as directed by the Agency Construction Manager.

C. Silt Fences:

1. Inspect on a weekly basis and/or
2. Inspect immediately after each rain event and daily during prolonged rain event.
3. Remove sediment accumulation as required by the specifications.
4. Remove and replace damaged filter cloth and fence before resuming construction operations.

D. Inlet Protection:

1. Inspect on a weekly basis and/or
2. Inspect immediately after each rain event and daily during prolonged rain event.
3. Repair and/or replace any washout before resuming construction operations.
4. Remove sediment accumulation as required by the specifications.
5. Replace filter fabric when it becomes clogged and rebuild protection as necessary to maintain tight sediment filters at the inlets.

E. Portable Sediment Tank:

1. Inspect immediately after each rain and daily during prolong rainfall or pumping usage.
2. Properly dewater and dispose of accumulated sediment once the sediment has reached the cleanout depth, see specifications.

F. Temporary Gabion Outlet Structure:

1. Inspect immediately after each rain event and daily during prolong rain events or pumping usage.
2. Properly dewater and dispose of accumulated sediment once the sediment has reached the cleanout depth.

G. Earth Dike:

1. Inspect immediately after each rain and daily during prolong rainfall.
2. Repair and/or replace any washouts or eroded areas before resuming construction operations

3.10 REMOVAL:

A. General:

1. Obtain authorization from the Agency Construction Manager and the Authority having jurisdiction for the Sediment Control Inspection and Approval before removing any erosion and/or sediment controls.
2. Do not remove sediment controls before unpaved areas are stabilized with a full stand of vegetation as specified in Section 32 92 00 – Turf and Grasses or Section 32 93 00 - Plants.
3. Once removed all areas disturbed by the removal of the erosion and/or sediment controls shall be permanently stabilized in accordance with the specifications.

3.11 CLEANING:

A. Clean improvements and facilities damaged by any over-spray or hydraulic seeding over-spray, as directed by the Agency Construction Manager.

END OF SECTION 31 25 00

SECTION 32 05 23 – CEMENT AND CONCRETE FOR EXTERIOR IMPROVEMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 – General Requirements Specification Sections, apply to this Section.

B. City of Baltimore: Department of Public Works – Specifications For Materials, Highways, Bridges, Utilities, and Incidental Structures with all addenda thereto at the time bids are received (DPW Standard Specifications.) Subsections of DPW Standard Specifications describing “Measurement and Payment” shall not apply to this contract.

C. City of Baltimore: Department of Transportation – Book of Standards with all addenda thereto at the time bids are received (DOT Standards.) Subsections of DOT Standards describing “Measurement and Payment” shall not apply to this contract.

D. American Society of Testing and Materials International (ASTM) standards and test methods.

E. American Concrete Institute Standard (ACI) – Manual of Concrete Practice with all addenda thereto at the time bids are received.

1.2 SUMMARY

A. Section includes concrete and reinforcing materials and work required for the construction of the following:

1. Incidental structures.
2. Walkways/Concrete Pads not in the City of Baltimore Right-of-way.

B. Related Requirements:

1. Section 31 20 00 – Earth Moving.
2. Section 32 10 00 – Bases, Ballast, and Paving.
3. Section 32 16 00 – Curbs, Gutters, Sidewalks, and Driveways.
4. Section 32 17 00 – Pavement Specialties.
5. Section 33 10 00 – Water Utilities.
6. Section 33 31 00 – Sanitary Sewer Utilities.
7. Section 33 40 00 – Storm Drainage Utilities.

1.3 SUSTAINABLE DESIGN REQUIREMENTS

A. SSc7.1 Reduction of Heat Island Effect - Non-Roof Surfaces

1. All concrete mixes and precast pavers identified as high SRI in the Plans used for exterior paving shall have a Solar Reflective Index rating (SRI) of 29 or

greater in accordance with the project requirements for Reduction of Heat Island Effect - Non-Roof Surfaces. See Section 01 81 13 – Sustainable Design Requirements

2. Contractor shall provide LEED credit verification as per Section 01 33 00 – Submittal Procedures.

B. MRc2: Construction Waste Management

No less than the specified minimum proportion of all construction waste from the project shall be diverted from disposal in a landfill and/or incineration in accordance with the project requirements for Construction Waste Management. See Section 01 81 13 – Sustainable Design Requirements.

C. MRc4: Recycled Content Material

No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the project requirements for Recycled Content Materials. All materials counted toward the computation of the proportion of the Recycled Content Materials shall comply with the standard for the minimum percentages of post-consumer waste materials and for the minimum percentage of pre-consumer waste materials. See Section 01 81 13 – Sustainable Design Requirements.

Contractor shall provide LEED credit verification as per Section 01 33 00 – Submittal Procedures.

D. MRc5: Regionally manufactured harvested materials

1. No less than the specified proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the project site in accordance with the project requirements for Regionally Manufactured and/or Harvested Materials. See Section 01 81 13 – Sustainable Design Requirements.
2. Contractor shall provide LEED credit verification as per Section 01 33 00 – Submittal Procedures.

1.4 ACTION SUBMITTALS

A. General: Provide submittals in compliance with General Conditions of the Contract and Division 01 – General Requirements.

B. Concrete Mix Design:

1. Submit mix design for all classes of concrete to the Agency Construction Manager for review and approval. Do not order or place any concrete before the mix design is approved.
2. Submit certified laboratory test reports for mix design test and aggregates.
3. Post placement testing at the seven (7) day and twenty-eight (28) day intervals shall be given to the Agency Construction Manager for review and acceptance.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Delivery:

1. Schedule delivery operations to avoid unnecessary re-handling.

B. Storage:

1. Store materials in accordance with manufacturer's recommendations.

1.6 PROJECT CONDITIONS

A. Limitations:

1. Underground Utilities:

a. Do not proceed with concrete pavement construction until all underground utility construction is complete, passed testing and accepted by the Agency Construction Manager.

2. Environmental:

a. All provisions of ACI 306R shall be followed for cold weather concrete placement and ACI 305R for hot weather concrete placement.

1.7 CONSTRUCTION SURVEYS

A. See Division 01 – General Requirements.

B. Provide combined horizontal and vertical alignment stakes for construction of pavements on a continuous slope at intervals of 50-foot maximum and/or

C. Provide combined horizontal and vertical alignment stakes for construction of pavements on curves at 25-foot maximum and/or

D. Provide alignment stakes at all horizontal angle points.

PART 2 - PRODUCTS

2.1 PORTLAND CEMENT CONCRETE

A. Portland cement concrete shall be in accordance with Division 03 – Concrete of the DPW Standard Specifications

2.2 CONCRETE REINFORCEMENT

A. Plain Carbon-Steel Bars, ASTM A 615, Grade 60, diameter, length and configuration as indicated on the Contract Drawings.

B. Deformed Bars, ASTM A 615, Grade 60, diameter, length and configuration as indicated on the Contract Drawings.

C. Welded Wire Reinforcement, ASTM A 185, gauge and size as indicated on the Contract Drawings.

2.3 JOINT MATERIALS

A. Expansion and Isolation Joints, ASTM D 994.

1. Type: Bituminous preformed joint filler.
2. Nominal Thickness:

a. Isolation Joints: 1/2-inch.
b. Expansion Joints: 3/4-inch.

2.4 CONCRETE MIXES

A. Concrete Mix No. 2:

1. 28-day Compressive Strength: 3,000 psi.
2. Air Entrainment: 5 - 8%.
3. Mix Contents:

a. Portland Cement: 6-1/2 bags (611 lbs.) per cubic yard.
b. Water: 5-1/4 gallons per bag of cement.

4. Slump Range: 2 - 5 inches.
5. Solar Reflex Index : 29 or higher (when exposed to surface)

B. Concrete Mix No. 6:

1. 7-day Compressive Strength: 3,000 psi.
2. 28-day Compressive Strength: minimum of 4,500 psi.
3. Air Entrainment: 5 - 8%.
4. Mix Contents:

a. Portland Cement Concrete: 7-1/2 bags (705 lbs.) per cubic yard.
b. Water: 5 gallons per bag of cement.

5. Slump: 2 - 4 inches.
6. Solar Reflex Index : 29 or higher (when exposed to the surface).

2.5 CURING MATERIAL

A. Mat Method:

1. Burlap Mats: AASHTO M 182, Class 1.

B. Sheeting Method:

1. Waterproof Paper: ASTM C 171, white type.
2. Polyethylene Film: ASTM C 171, white opaque, 8 mill thick

C. Liquid membrane forming curing materials are prohibited.

2.6 AGGREGATE BASE

A. Graded Aggregate Sub-base (GAB): Graded aggregate for sub-base courses shall meet the gradation requirements of ASTM D 2940 for sub-base. In addition, that material shall meet all the other requirements listed in Division 32 of the DPW Standard Specifications. The granular Base shall be an evenly graded mixture of fine and coarse aggregates to provide, when compacted, a smooth and even surface below slabs on grade.

2.7 GEOTEXTILE FABRICS

A. Class: ST

1. Properties

a.	Type	WOVEN	
b.	Grab Strength (min 15% elongation)	300 lb	ASTM D 4632
c.	Puncture Strength	100 lb	ASTM D 6241
d.	Permittivity	0.05 sec^{-1}	ASTM D 4491
e.	Apparent Opening Size (min)	0.15 mm	ASTM D 4751
f.	Trapezoid Tear Strength	110 lb	ASTM D 4533

2. All property values are based on minimum average roll values in the weakest principle direction.
3. The ultraviolet stability shall be 50 percent after 500 hours of exposure.

PART 3 - EXECUTION

3.1 EXECUTION

A. Excavate, at the locations shown on the Contract Drawings, for incidental structures.

B. Promptly repair slides, slip-outs, wash-outs, settlements, and subsidence which occur for any reasons and re-finish to the correct lines and grades.

C. Remove all unsuitable material located below the limits of excavation and back-fill as specified in Section 31 20 00 – Earth Moving.

D. Place material on prepared sub-grade to depth required to produce compacted thickness indicated on Contract Drawings.

E. Prepare sub-grade for pavements as specified in Section 31 20 00 – Earth Moving.

F. Verify utility casting elevations and reset or adjust castings to meet flush with finished pavement surface. Adjust casting for cross slope, if any.

3.2 BASE COURSE

A. Place a Woven Geotextile Class: ST on top of prepared subgrade, where noted on the Contract Drawings. Place base course on Geotextile to depth required to produce compacted thickness indicated on Contract Drawings.

B. Compact to 95% of the maximum dry density determined in accordance with ASTM D 1557.

3.3 EXPANSION JOINTS

A. Install expansion joints at 30-foot intervals, or as indicated on Contract Drawings.

B. Place expansion joints perpendicular to concrete surface.

C. Place expansion joints with top edge 1/4-inch below concrete surface, unless otherwise noted on the Contract Documents.

3.4 CONTRACTION JOINTS

A. Provide contraction joints at 10-foot intervals, or as indicated on the Contract Drawings.

B. Form contraction joints, perpendicular to concrete surface, with removable 1/8 inch form spreader plates or tool joint with a 1-inch jointing tool.

3.5 ISOLATION JOINTS

A. Install isolation joints where concrete abuts buildings, walls, utility structures, foundations, and castings.

B. Place isolation joint with top edge 1/4-inch below concrete surface.

3.6 CONCRETE PLACEMENT

A. Place concrete carefully to prevent joint material dislocation.

B. Consolidate concrete by tamping or vibrating to prevent honeycomb.

3.7 FINISHING

A. Strike off top surfaces to top of forms and to a smooth and uniform texture.

B. Finish edges and joints with 1/8-inch radius edging tool.

C. Provide broom finish or as directed on the Contract Drawings.

D. Maintain forms in place for a minimum of 12 hours after concrete placement.

E. Correct defects (e.g., holes, honeycomb, broken edges, etc.) upon removal of forms with cement mortar unless directed otherwise by the Agency Construction Manager, at no increase to the Contract Sum.

3.8 CURING:

A. Mat Method:

1. Moisten mats thoroughly with water before placing on concrete.
2. Place mats on exposed concrete surfaces with 6 inch joint overlaps.
3. Maintain mats in continuously moist condition for 7 calendar days.
4. Repair or replace damaged mats.

B. Sheeting Method:

1. Moisten concrete surface with a fine spray of water before sheeting placement.
2. Place sheeting on exposed concrete surfaces with light-colored side up and 12 inch joint overlaps.
3. Anchor sheeting securely in place.
4. Maintain sheeting in place for seven (7) calendar days.
5. Repair or replace damaged sections of sheeting.

3.9 INSPECTION AND TESTING:

A. The Contractor's Construction Inspection Testing Firm shall inspect the placement of concrete and perform tests in accordance with Division 01 – General Requirements and this Section of these specifications. The inspection and testing shall include the following:

1. Inspect excavation and form-work prior to the placement of concrete.
2. Inspect the placement of base course.
3. Perform base course laboratory tests.

    a. Moisture-Density Relationship Test Method: ASTM D 1557 and ASTM D 4253.
    b. Gradation Tests: ASTM C 136.
    c. Testing Frequency: one (1) for each type of base course material submitted for use by the Contractor.

4. Perform base course in place density tests.

    a. Test Method: ASTM D 1556 or ASTM D 3017.
    b. Frequency of Test: one (1) for every 200 linear feet of base course.

5. Inspect all reinforcement to assure proper placement, cover, number of bars, adequately tied and conforms to all of the Contract Documents.

6. Inspect concrete placement.
7. Sample and test concrete.

    a. Slump Test:

        1) Test Method: ASTM C 143/C 143M.
        2) Testing Frequency: one (1) per truck load.

b. Air Content Test:

1) Test Method: ASTM C 231.
2) Testing Frequency: one (1) for every fifty cubic yards (50 cy) of concrete placed with a minimum of one (1) for each work day concrete is placed.

c. Make cylindrical test specimens.

1) Test Method: ASTM C 31C 31M.
2) Testing Frequency: one (1) set of four (4) for every fifty cubic yards (50 cy) of concrete placed with a minimum of a set of 4 for each day concrete is placed.

d. Compressive Strength of Concrete Cylinders:

1) Test Method: ASTM C 39.
2) Testing Frequency: two (2) at seven (7) days and two (2) at twenty-eight (28) days after molding.

8. Mowing Strip and Pavement Surface Smoothness Test:

a. Tolerance: Not to exceed 3/8-inch between any two (2) surface contacts on a ten foot (10 ft) straight-edge.
b. Test Locations: Random and as determined by the representative of the Contractors Construction Inspection Test Firm.

B. In the event that the compressive strength of any concrete cylinder falls below the specified strength, the test results shall be analyzed in accordance with the ACI Manual of Concrete Practice (ACI 214) by the Contractors Construction Inspection Test Firm. The results of the analysis shall be provided to the Agency Construction Manager . The Contractor shall obtain core samples of the concrete, if directed by the Agency Construction Manager, at no increase to the Contract Sum. The core samples shall be collected in accordance with ASTM C 42 and the samples shall be tested by the Contractors Construction Inspection Test Firm in accordance with ASTM C 39.

C. The Contractor shall provide delivery tickets for each truck load of concrete to the Contractors Construction Inspection Test Firm. The ticket shall indicate the name of the concrete supplier, mix design of the concrete, whether the concrete is ready mix or transit mix, time of mixing, and volume of concrete.

D. The Contractor shall provide a 10-foot straight-edge for performing concrete surface smoothness tests.

3.10 CORRECTIVE WORK:

A. All work not conforming to the Contract Documents (drawings and specifications) shall be corrected by the Contractor as directed by the Agency Construction Manager at no increase to the Contract Sum.

END OF SECTION 32 05 23

SECTION 32 10 00 – BASES, BALLAST, AND PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 – General Requirements Specification Sections, apply to this Section.

B. City of Baltimore: Department of Public Works – *Specifications For Materials, Highways, Bridges, Utilities, and Incidental Structures* with all addenda thereto at the time bids are received (DPW Standard Specifications.) Subsections of DPW Standard Specifications describing "Measurement and Payment" shall not apply to this contract.

C. City of Baltimore: Department of Transportation – *Book of Standards* with all addenda thereto at the time bids are received (DOT Standards.) Subsections of DOT Standards describing "Measurement and Payment" shall not apply to this contract.

D. American Society of Testing and Materials International (ASTM) standards and test methods.

E. American Association of State Highway and Transportation Officials (AASHTO) *Standard Specifications for Transportation Materials and Methods of Sampling and Testing* and *A policy of Geometric Design of Highways and Streets*.

F. Federal Highway Administration – *Manual on Uniform Traffic Control Devices* (MUTCD.)

1.2 SUMMARY

A. Section includes:

1. Flexible and Rigid Pavements
2. Construction of aggregate sub-base.

B. Related Requirements:

1. Section 31 20 00 – Earth Moving.
2. Section 32 05 23 – Cement and Concrete for Exterior Improvements.

C. Description

1. Selected materials and method for the work in this section are in accordance with the applicable provisions of the Baltimore City DPW Standard Specifications. Subsections of the specifications describing "Measurement and Payment" shall not apply to this work.

1.3 SUSTAINABLE DESIGN REQUIREMENTS

A. SSc7.1 Reduction of Heat Island Effect - Non-Roof Surfaces

1. All concrete mixes and precast pavers identified as high SRI in the Contract Drawings used for exterior paving shall have a Solar Reflective Index rating (SRI) of 29 or greater in accordance with the project requirements for Reduction of Heat Island Effect - Non-Roof Surfaces. See Section 01 81 13 Sustainable Design Requirements.
2. Contractor shall provide LEED credit verification as per section 01 33 00 Submittal Procedures.

B. MRc2: Construction Waste Management

1. No less than the specified minimum proportion of all construction waste from the project shall be diverted from disposal in a landfill and/or incineration in accordance with the project requirements for Construction Waste Management. See Section 01 81 13 Sustainable Design Requirements.

C. MRc4: Recycled Content Material

1. No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the project requirements for Recycled Content Materials. All materials counted toward the computation of the proportion of the Recycled Content Materials shall comply with the standard for the minimum percentages of post-consumer waste materials and for the minimum percentage of pre-consumer waste materials. See Section 01 81 13 Sustainable Design Requirements.
2. Contractor shall provide LEED credit verification as per section 01 33 00 Submittal Procedures.

D. MRc5: Regionally manufactured harvested materials

1. No less than the specified proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the project site in accordance with the project requirements for Regionally Manufactured and/or Harvested Materials. See Section 018113 Sustainable Design Requirements.
2. Contractor shall provide LEED credit verification as per Section 01 33 00 Submittal Procedures.

1.4 SUBMITTALS

A. Field Test Reports

1. Compaction Tests

B. Certificates

1. Materials

1.5 PROJECT CONDITIONS

A. Coordination: Article "Project Conditions" in Section 31 20 00 – Earth Moving.

B. Vehicular and Pedestrian Maintenance of Traffic must be provided in accordance with Sections 01 55 26, 01 55 27, and 01 55 28 of the DPW Standard Specifications, and as allowed by the City of Baltimore.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Pavement Operations and Maintenance: See DPW Standard Specification, Section 32 01 00.

B. Aggregate Subbase: See DPW Standard Specification, Section 32 11 00.

C. Hot Mix Asphalt Materials: See DPW Standard Specification, Section 32 12 00.

D. Concrete: See DPW Standard Specification, Section 32 13 00.

PART 3 - EXECUTION

3.1 MAINTENANCE OF TRAFFIC (MOT):

A. The Contractor shall be responsible for the MOT, pedestrian and vehicular, on all public and private roads while working on or near such roads and within the project site as required for this project for safe and continuous maintenance of traffic throughout the area affected by the project work. All cost associated with the maintenance of traffic, pedestrian and vehicular, shall be included in the base bid.Items used for maintenance of traffic shall be removed from the project site when no longer needed.

B. MOT shall be in accordance with DPW Standard Specifications and the latest Manual on Uniform Traffic Control Devices (MUTCD), as directed by the City of Baltimore.

3.2 PROTECTION AND RESTORATION:

A. Bituminous Concrete Pavement:

1. Protect improvements and facilities during prime coat application and tack coat application to prevent over-spray damage.
2. Protect completed surface from damage.

    a. Do not permit heavy equipment on completed surface.
    b. Do not permit vehicular traffic on bituminous concrete pavement until it has set sufficiently to prevent marking.
    c. Restore damaged pavement as directed by, and to the satisfaction of the Agency Construction Manager at no increase to the Contract Sum.

B. Pavement Marking:

1. Do not permit vehicular or pedestrian traffic on completed marked pavement until paint or other marking materials has set and are hardened.

2. Restore damaged paint marking as directed by the Agency Construction manager.

3.3 SUB-GRADE PREPARATION:

A. See Section 31 20 00 – Earth Moving.

B. Verify sub-grade elevations and correct discrepancies before proceeding with sub-base course construction.

C. Verify utility casting elevations and reset or adjust castings to meet flush with finished pavement surface. Adjust castings for road cross slope, if any.

D. Do not place base material on frozen or muddy sub-grade.

3.4 SUB-BASE COURSE:

A. Place material on prepared sub-grade to depth required to produce compacted thickness indicated on Contract Drawings.

B. Shape material to sections and elevations indicated with blade grader and compact with steel drum vibratory rollers to 95% of the maximum dry density determined in accordance with ASTM D 1557.

C. Proof-roll the base course with 10-ton pneumatic tire roller or equivalent in the presence of representative from the State Construction Inspection and Testing Firm, and the Contractors Construction Inspection and Testing Firm. Correct all irregularities without an increase to the Contract Sum unless otherwise noted herein.

3.5 BITUMINOUS CONCRETE PAVEMENT FOR ROADWAYS AND SIDEWALKS:

A. Prime Coat:

1. Remove loose material from surface of compacted sub-base course before applying prime coat.
2. Apply prime coat material uniformly to surface at a rate of 0.30 gallon per square yard. Prime coat shall cure a minimum of 24 hours prior to construction of bituminous concrete pavement or as long as required for prime coat to attain proper penetration.

B. Tack Coat:

1. Apply tack coat at a rate of 0.05 gal/sq. yd. over asphalt base.
2. Apply tack coat material to the following surfaces in contact with bituminous concrete pavement:

    a. Previously placed bituminous concrete.
    b. Existing pavement.
    c. Utility castings.
    d. Structures abutting or projecting into bituminous concrete.

C. Joints: See DPW Standard Specifications, Section 32 12 16.13 Part 3.8.

D. Compaction: See DPW Standard Specifications, Section 32 12 16.13 Part 3.7.

3.6 CONCRETE PAVEMENT FOR ROADWAYS:

A. See DPW Standard Specifications, Section 32 13 13 and the Contract Drawings.

3.7 UTILITY CASTINGS, MANHOLE COVERS, INLET GRATES

A. Verify utility casting, manhole cover and inlet grate elevations and reset or adjust to meet flush with a finished grade.

3.8 INSPECTION AND TESTING:

A. The inspection and testing of all work specified in this Section shall be performed by the Inspection and Testing Agency in accordance with Division 01. The work to be performed by the Inspection and Testing Agency and shall include the following:

1. Inspect the placement of the sub-base course.
2. Perform sub-base course laboratory tests.

    a. Moisture-Density Relationship Test Method: ASTM D 1557, Method D 4253.
    b. Gradation Tests: ASTM C 136.
    c. Testing Frequency: one (1) for each type of base course material submitted for use by the Contractor.

3. Perform sub-base course in place density tests.

    a. Test Method: ASTM D 1556 or ASTM D 3017.
    b. Frequency of Test: one (1) for every 1,200 square feet of paved surface.

4. Perform sub-base course thickness test.

    a. Test Method: Test holes.
    b. Testing Locations: Random and as determined by the representative of the Inspection and Testing Agency.

5. Inspect the construction of bituminous concrete pavements for compliance with the Articles of this Section.
6. Perform bituminous concrete pavement density tests.

    a. Test Method: ASTM D 2950.
    b. Testing Frequency: one (1) for every 1,200 square feet of paved surface.

7. Perform bituminous concrete surface course smoothness test.

    a. Test Locations: Random and as determined by the representative of the Inspection and Testing Agency.
    b. Tolerance: Not to exceed one-quarter of an inch (1/4 in) between any two (2) surface contacts on ten foot (10 ft) straight-edge.

3.9 The Contractor shall provide the following to the Inspection and Testing Agency at no increase to the Contract Sum:

1. Delivery tickets for each truck load of the graded aggregate sub-base indicating the name of the supplier, location of the source, and gradation of material.
2. The Marshall density value of bituminous concrete mixture for each day of paving.
3. Delivery ticket for each truck of bituminous concrete showing the name of the plant, quantity of bituminous concrete mix, mix temperature, gradation of aggregate, and asphalt content in percentage.
4. 10-foot straight-edge for performing smoothness and alignment tests.

B. All work not conforming to the Contract Drawings and the Contract Specifications shall be corrected by the Contractor to the satisfaction of the Agency Construction Manager at no increase to the Contract Sum.

3.10 CLEANING:

A. See Division 01 – General Requirements.

B. Clean improvements and facilities damaged by prime coat over-spray or tack coat over-spray, as directed by the Agency Construction Manager at no increase to the Contract Sum.

END OF SECTION 32 10 00

SECTION 32 14 43 - POROUS UNIT PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Porous paving consisting of **Belgian Blocks** set in aggregate setting beds.
2. Edge restraints.

1.2 SUBMITTALS

A. Product Data: For materials other than aggregates.

B. Sieve Analyses: For aggregate materials, according to ASTM C 136.

C. Samples for unit pavers, 4” x 8”x 4” Grey Granite Belgian Block, aggregate fill and edge restraints. Label Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.

1.3 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

B. Samples: Submit Belgian Block samples, 3 to 5 pavers, which represent the colors, size, shape, and quality of the pavers for approval.

PART 2 - PRODUCTS

2.1 BELGIAN BLOCKS

A. Regional Materials: Belgian Blocks shall be manufactured within 500 miles of Project site from granite that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project Site.

B. All pavers and join materials identified as high SRI in the Plans used for exterior paving shall have a Solar Reflective Index rating (SRI) of 29 or greater in accordance with the project requirements for Reduction of Heat Island Effect - Non-Roof Surfaces. Products: Belgian Blocks within tree wells shall match in quantity, fabrication and style those shown on plans and as follows:

1. 4" x 8"x 4" Grey Granite Belgian Block as manufactured by Harwood Landscaping Products, 4534 Old Solomons Island Road, Harwood, MD. 20776. 1-800-990-STONE, or approved equals.

2.2 ACCESSORIES

A. Steel Edge Restraints: Painted steel edging, 3/16 inch (4.8 mm) thick by 4 inches (100 mm) high], with loops pressed from or welded to face to receive stakes at 36 inches (900 mm) o.c., and with steel stakes 15 inches (380 mm) long for each loop.

Steel Edge Restraints shall be as manufactured by Border Concepts, Inc. or approved equal.

1. Color: Black

2.3 AGGREGATE SETTING-BED MATERIALS

A. Graded Aggregate for Subbase: Sound crushed stone or gravel complying with ASTM D 448 for Size No. 2 for subbase.

B. Graded Aggregate for Base Course: Sound crushed stone or gravel complying with ASTM D 448 for Size No. 57 for base-course material

C. Graded Aggregate for Leveling Course: Sound crushed stone or gravel complying with ASTM D 448 for Size No.8.

D. Graded Aggregate for Porous Paver Fill: Sound crushed stone or gravel complying with ASTM D 448 for Size No. 8.

1. No. 8 stone color to match the color of Belgian Blocks

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Extra care shall be taken when installing granite Belgian Blocks to prevent damage or injury to street trees and flowering trees at the entrance during construction.

B. Do not use unit pavers with chips, cracks, voids, discolorations, and other defects that might be structurally unsound or visible in finished work.

C. Care shall be taken so that no damage occurs to the pavers during handling. All pavers shall be free of foreign matter before installation.

D. Provide edge restraints as indicated. Install edge restraints before placing unit pavers.

E. Appropriate ground prep tool is required for soil preparation. All installations require gloves, a hammer or rubber mallet, and a cutting tool.

F. Setting bed material shall be stored with a waterproof covering to prevent exposure to rainfall.

G. Schedule and coordinate work to permit other subcontractors to install their work prior to installing the concrete sand setting bed and the pavers.

H. Cut unit pavers with motor-driven masonry saw equipment or a block splitter to provide clean, sharp, unchipped edges. Cut units to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting where possible. Hammer cutting is not acceptable.

I. Tolerances:

1. Variation in Plane between Adjacent Units (Lipping): Do not exceed 1/16-inch (1.5-mm) unit-to-unit offset from flush.
2. Variation from Level: Do not exceed 1/8 inch in 24 inches (3 mm in 600 mm) and 1/4 inch in 10 feet (6 mm in 3 m).

3.2 SETTING-BED INSTALLATION

A. Spread No. 2 stone as the subbase material in 6” think lift. Compact the No. 2 stone with a static roller made of 10 ton steel drum roller. The roller should be in vibratory mode for the first few passes and static mode (no vibration) for the final passes.

B. Spread the No. 57 base layer over No. 2 stone and compact it as one 4” lift with a heavy plate compactor. Moist stone surfaces to make compacting a bit easier.

C. When al lifts are compacted, the surface shall be convered with a 2” thick layer of moist No. 8 crushed stone. Screed and level No. 8 stone over No.57 stones base. No. 8 stone shall not be compacted. The surface tolerance of the screeded No. 8 stone shall be ½” over 10 feet.

D. Construction equipment and foot traffic shall be kept off the screeded layer.

3.3 PAVER INSTALLATION

A. Set unit pavers on leveling course. Be careful not to disturb leveling base. Place pavers with a 1/16-inch minimum and 1/8-inch maximum joint width.

B. Compact pavers into leveling course with a low-amplitude plate vibrator capable of a 3500- to 5000-lbf compaction force at 80 to 90 Hz.

C. Place graded aggregate, No. 8 stones, fill immediately after vibrating pavers into leveling course. Spread and screed aggregate fill level with tops of pavers.

D. Remove and replace pavers that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Provide new units to match adjoining units and install in same manner as original units, with same joint treatment and with no evidence of replacement.

END OF SECTION 32 14 43

SECTION 32 16 00 - CURBS, GUTTERS, SIDEWALKS, AND DRIVEWAYS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 – General Requirements Specification Sections, apply to this Section.

B. City of Baltimore: Department of Public Works – *Specifications For Materials, Highways, Bridges, Utilities, and Incidental Structures* with all addenda thereto at the time bids are received (DPW Standard Specifications.) Subsections of DPW Standard Specifications describing “Measurement and Payment” shall not apply to this contract.

C. City of Baltimore: Department of Transportation – *Book of Standards* with all addenda thereto at the time bids are received (DOT Standards.) Subsections of DOT Standards describing “Measurement and Payment” shall not apply to this contract.

D. American Society of Testing and Materials International (ASTM) standards and test methods.

E. American Concrete Institute Standard (ACI) – Manual of Concrete Practice with all addenda thereto at the time bids are received.

1.2 SUMMARY

A. Section includes concrete and reinforcing materials and work required for the construction of the following:

1. Cast-in-Place: Curbs, Gutters, Sidewalks and Driveways situated in the City of Baltimore Right-of-way or Easement.

B. Related Requirements:

1. Section 31 20 00 – Earth Moving.
2. Section 32 17 00 – Pavement Specialties.
3. Section 33 10 00 – Water Utilities.
4. Section 33 40 00 – Storm Drainage Utilities.
5. Section 33 31 00 – Sanitary Sewer Utilities.
6. Section 32 10 00 – Bases, Ballast, and Paving.

1.3 SUSTAINABLE DESIGN REQUIREMENTS

A. SSc7.1 Reduction of Heat Island Effect - Non-Roof Surfaces

1. All concrete mixes and precast pavers identified as high SRI in the Plans used for exterior paving shall have a Solar Reflective Index rating (SRI) of 29 or greater in accordance with the project requirements for Reduction of Heat Island

Effect - Non-Roof Surfaces. See Section 01 81 13 – Sustainable Design Requirements

2. Contractor shall provide LEED credit verification as per Section 01 33 00 – Submittal Procedures.

B. MRc2: Construction Waste Management

No less than the specified minimum proportion of all construction waste from the project shall be diverted from disposal in a landfill and/or incineration in accordance with the project requirements for Construction Waste Management. See Section 01 81 13 – Sustainable Design Requirements.

C. MRc4: Recycled Content Material

No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the project requirements for Recycled Content Materials. All materials counted toward the computation of the proportion of the Recycled Content Materials shall comply with the standard for the minimum percentages of post-consumer waste materials and for the minimum percentage of pre-consumer waste materials. See Section 01 81 13 – Sustainable Design Requirements.

Contractor shall provide LEED credit verification as per Section 01 33 00 – Submittal Procedures.

D. MRc5: Regionally manufactured harvested materials

1. No less than the specified proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the project site in accordance with the project requirements for Regionally Manufactured and/or Harvested Materials. See Section 01 81 13 – Sustainable Design Requirements.
2. Contractor shall provide LEED credit verification as per Section 01 33 00 – Submittal Procedures.

1.4 ACTION SUBMITTALS

A. General: Provide submittals in compliance with General Conditions of the Contract and Division 01 – General Requirements.

B. Concrete Mix Design:

1. Submit mix design for all classes of concrete to the Agency Construction Manager for review and approval. Do not order or place any concrete before the mix design is approved.
2. Submit certified laboratory test reports for mix design test and aggregates.
3. Post placement testing at the seven (7) day and twenty-eight (28) day intervals shall be given to the Agency Construction Manager for review and acceptance.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Delivery:

1. Schedule delivery operations to avoid unnecessary re-handling.

B. Storage:

1. Store materials in accordance with manufacturer's recommendations.

1.6 PROJECT CONDITIONS

A. Limitations:

1. Underground Utilities:

a. Do not proceed with concrete pavement construction until all underground utility construction is complete, passed testing and accepted by the Agency Construction Manager.

2. Environmental:

a. All provisions of ACI 306R shall be followed for cold weather concrete placement and ACI 305R for hot weather concrete placement.

1.7 CONSTRUCTION SURVEYS

A. See Division 01 – General Requirements.

B. Provide combined horizontal and vertical alignment stakes for construction of curbs, gutters, sidewalks and/or driveways on a continuous slope at intervals of 50-foot maximum and/or

C. Provide combined horizontal and vertical alignment stakes for construction of curbs, gutters, sidewalks and/or driveways on curves at 25-foot maximum and/or

D. Provide alignment stakes at all horizontal angle points.

PART 2 - PRODUCTS

2.1 PORTLAND CEMENT CONCRETE

A. Portland cement concrete shall be in accordance with Division 03 – Concrete of the DPW Standard Specifications

2.2 CONCRETE REINFORCEMENT

A. Plain Carbon-Steel Bars, ASTM A 615, Grade 60, diameter, length and configuration as indicated on the Contract Drawings and in accordance with DPW Standard Specifications and DOT Standards.

B. Deformed Bars, ASTM A 615, Grade 60, diameter, length and configuration as indicated on the Contract Drawings and in accordance with DPW Standard Specifications and DOT Standards.

C. Welded Wire Reinforcement, ASTM A 185, gauge and size as indicated on the Contract Drawings and in accordance with DPW Standard Specifications and DOT Standards.

2.3 JOINT MATERIALS

A. Expansion and Isolation Joints, ASTM D 994.

1. Type: Bituminous preformed joint filler.
2. Nominal Thickness:

a. Isolation Joints: 1/2-inch.
b. Expansion Joints: 3/4-inch.

2.4 CONCRETE MIXES

A. Concrete Mix No. 2:

1. 28-day Compressive Strength: 3,000 psi.
2. Air Entrainment: 5 - 8%.
3. Mix Contents:

a. Portland Cement: 6-1/2 bags (611 lbs.) per cubic yard.
b. Water: 5-1/4 gallons per bag of cement.

4. Slump Range: 2 - 5 inches.
5. Solar Reflex Index : 29 or higher (when exposed to surface)

B. Concrete Mix No. 6:

1. 7-day Compressive Strength: 3,000 psi.
2. 28-day Compressive Strength: minimum of 4,500 psi.
3. Air Entrainment: 5 - 8%.
4. Mix Contents:

a. Portland Cement Concrete: 7-1/2 bags (705 lbs.) per cubic yard.
b. Water: 5 gallons per bag of cement.

5. Slump: 2 - 4 inches.
6. Solar Reflex Index : 29 or higher (when exposed to the surface).

2.5 CURING MATERIAL

A. Mat Method:

1. Burlap Mats: AASHTO M 182, Class 1.

B. Sheeting Method:

1. Waterproof Paper: ASTM C 171, white type.
2. Polyethylene Film: ASTM C 171, white opaque, 8 mill thick

C. Liquid membrane forming curing materials are prohibited.

2.6 AGGREGATE BASE

A. Graded Aggregate Sub-base (GAB): Graded aggregate for sub-base courses shall meet the gradation requirements of ASTM D 2940 for sub-base. In addition, that material shall meet all the other requirements listed in Division 32 of the DPW Standard Specifications. The granular Base shall be an evenly graded mixture of fine and coarse aggregates to provide, when compacted, a smooth and even surface.

2.7 GEOTEXTILE FABRICS

A. Class: ST

1. Properties

a.	Type	WOVEN	
b.	Grab Strength (min 15% elongation)	300 lb	ASTM D 4632
c.	Puncture Strength	100 lb	ASTM D 6241
d.	Permittivity	0.05 sec^{-1}	ASTM D 4491
e.	Apparent Opening Size (min)	0.15 mm	ASTM D 4751
f.	Trapezoid Tear Strength	110 lb	ASTM D 4533

2. All property values are based on minimum average roll values in the weakest principle direction.
3. The ultraviolet stability shall be 50 percent after 500 hours of exposure.

PART 3 - EXECUTION

3.1 EXECUTION

A. Excavate, at the locations shown on the Contract Drawings for curbs, gutters, sidewalks and/or driveways.

B. Promptly repair slides, slip-outs, wash-outs, settlements, and subsidence which occur for any reasons and re-finish to the correct lines and grades.

C. Remove all unsuitable material located below the limits of excavation and back-fill as specified in Section 31 20 00 – Earth Moving.

D. Place material on prepared sub-grade to depth required to produce compacted thickness indicated on Contract Drawings.

E. Prepare sub-grade for curbs, gutters, sidewalks and/or driveways as specified in Section 31 20 00 – Earth Moving.

F. Verify utility casting elevations and reset or adjust castings to meet flush with finished surfaces of sidewalks and/or driveways. Adjust casting for cross slope, if any.

G. If the Contractor determines that any casting will be located in a curb and/or gutter then prior to the placement of concrete the Contractor shall notify and obtain remediation measures from the Agency Construction Manager.

3.2 BASE COURSE

A. Place a Woven Geotextile Class: ST on top of prepared subgrade, where noted on the Contract Drawings. Place base course on Geotextile to depth required to produce compacted thickness indicated on Contract Drawings.

B. Compact to 95% of the maximum dry density determined in accordance with ASTM D 1557.

3.3 EXPANSION JOINTS

A. Install expansion joints at 30-foot intervals, or as indicated on Contract Drawings.

B. Place expansion joints perpendicular to concrete surface.

C. Place expansion joints with top edge 1/4-inch below concrete surface, unless otherwise noted on the Contract Documents.

3.4 CONTRACTION JOINTS

A. Provide contraction joints at 10-foot intervals, or as indicated on the Contract Drawings.

B. Form contraction joints, perpendicular to concrete surface, with removable 1/8 inch form spreader plates or tool joint with a 1-inch jointing tool.

3.5 ISOLATION JOINTS

A. Install isolation joints where concrete abuts buildings, walls, utility structures, foundations, and castings.

B. Place isolation joint with top edge 1/4-inch below concrete surface.

3.6 CONCRETE PLACEMENT

A. Place concrete carefully to prevent joint material dislocation.

B. Consolidate concrete by tamping or vibrating to prevent honeycomb.

3.7 FINISHING

A. Strike off top surfaces to top of forms and to a smooth and uniform texture.

B. Finish edges and joints with 1/8-inch radius edging tool.

C. Provide broom finish or as directed on the Contract Drawings.

D. Maintain forms in place for a minimum of 12 hours after concrete placement.

E. Correct defects (e.g., holes, honeycomb, broken edges, etc.) upon removal of forms with cement mortar unless directed otherwise by the Agency Construction Manager, at no increase to the Contract Sum.

3.8 CURING:

A. Mat Method:

1. Moisten mats thoroughly with water before placing on concrete.
2. Place mats on exposed concrete surfaces with 6 inch joint overlaps.
3. Maintain mats in continuously moist condition for 7 calendar days.
4. Repair or replace damaged mats.

B. Sheeting Method:

1. Moisten concrete surface with a fine spray of water before sheeting placement.
2. Place sheeting on exposed concrete surfaces with light-colored side up and 12 inch joint overlaps.
3. Anchor sheeting securely in place.
4. Maintain sheeting in place for seven (7) calendar days.
5. Repair or replace damaged sections of sheeting.

3.9 INSPECTION AND TESTING:

A. The Contractor's Construction Inspection Testing Firm shall inspect the placement of concrete and perform tests in accordance with Division 01 – General Requirements and this Section of these specifications. The inspection and testing shall include the following:

1. Inspect excavation and form-work prior to the placement of concrete.
2. Inspect the placement of base course.
3. Perform base course laboratory tests.

    a. Moisture-Density Relationship Test Method: ASTM D 1557 and ASTM D 4253.
    b. Gradation Tests: ASTM C 136.
    c. Testing Frequency: one (1) for each type of base course material submitted for use by the Contractor.

4. Perform base course in place density tests.

    a. Test Method: ASTM D 1556 or ASTM D 3017.
    b. Frequency of Test: one (1) for every 200 linear feet of base course.

5. Inspect all reinforcement to assure proper placement, cover, number of bars, adequately tied and conforms to all of the Contract Documents.

6. Inspect concrete placement.
7. Sample and test concrete.

    a. Slump Test:

        1) Test Method: ASTM C 143/C 143M.
        2) Testing Frequency: one (1) per truck load.

b. Air Content Test:

1) Test Method: ASTM C 231.
2) Testing Frequency: one (1) for every fifty cubic yards (50 cy) of concrete placed with a minimum of one (1) for each work day concrete is placed.

c. Make cylindrical test specimens.

1) Test Method: ASTM C 31C 31M.
2) Testing Frequency: one (1) set of four (4) for every fifty cubic yards (50 cy) of concrete placed with a minimum of a set of 4 for each day concrete is placed.

d. Compressive Strength of Concrete Cylinders:

1) Test Method: ASTM C 39.
2) Testing Frequency: two (2) at seven (7) days and two (2) at twenty-eight (28) days after molding.

8. Mowing Strip and Pavement Surface Smoothness Test:

a. Tolerance: Not to exceed 3/8-inch between any two (2) surface contacts on a ten foot (10 ft) straight-edge.
b. Test Locations: Random and as determined by the representative of the Contractors Construction Inspection Test Firm.

B. In the event that the compressive strength of any concrete cylinder falls below the specified strength, the test results shall be analyzed in accordance with the ACI Manual of Concrete Practice (ACI 214) by the Contractors Construction Inspection Test Firm. The results of the analysis shall be provided to the Agency Construction Manager . The Contractor shall obtain core samples of the concrete, if directed by the Agency Construction Manager, at no increase to the Contract Sum. The core samples shall be collected in accordance with ASTM C 42 and the samples shall be tested by the Contractors Construction Inspection Test Firm in accordance with ASTM C 39.

C. The Contractor shall provide delivery tickets for each truck load of concrete to the Contractors Construction Inspection Test Firm. The ticket shall indicate the name of the concrete supplier, mix design of the concrete, whether the concrete is ready mix or transit mix, time of mixing, and volume of concrete.

D. The Contractor shall provide a 10-foot straight-edge for performing concrete surface smoothness tests.

3.10 CORRECTIVE WORK:

A. All work not conforming to the Contract Documents (drawings and specifications) shall be corrected by the Contractor as directed by the Agency Construction Manager at no increase to the Contract Sum.

END OF SECTION 32 05 23

SECTION 32 17 00 – PAVEMENT SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. City of Baltimore: Department of Public Works – *Specifications For Materials, Highways, Bridges, Utilities, and Incidental Structures* with all addenda thereto at the time bids are received (DPW Standard Specifications.) Subsections of DPW Standard Specifications describing "Measurement and Payment" shall not apply to this contract.

C. City of Baltimore: Department of Transportation – *Book of Standards* with all addenda thereto at the time bids are received (DOT Standards.) Subsections of DOT Standards describing "Measurement and Payment" shall not apply to this contract.

D. American Society of Testing and Materials International (ASTM) standards and test methods.

E. American Association of State Highway and Transportation Officials (AASHTO) *Standard Specifications for Transportaiton Mterails and Methods of Sampling and Testing* and *A policy of Geometric Design of Highways and Streets*.

F. Federal Highway Administration – *Manual on Uniform Traffic Control Devices* (MUTCD.)

1.2 SUMMARY

A. Section includes:

1. Pavement markings
2. Precast Concrete Parking Bumpers.

B. Related Requirements:

1. Section 32 10 00 – Bases, Ballast, and Paving.
2. Section 32 05 23 – Cement and Concrete for Exterior Improvements.

C. Description

1. Selected materials and method for the work in this section are in accordance with the applicable provisions of the DPW Standard Specifications. Subsections of the DPW Standard Specifications describing "Measurement and Payment" shall not apply to this work.

1.3 SUSTAINABLE DESIGN REQUIREMENTS

A. SSc7.1 Reduction of Heat Island Effect - Non-Roof Surfaces

1. All concrete mixes and precast pavers identified as high SRI in the Plans used for exterior paving shall have a Solar Reflective Index rating (SRI) of 29 or greater in accordance with the project requirements for Reduction of Heat Island Effect - Non-Roof Surfaces. See Section 01 81 13 – Sustainable Design Requirements.
2. Contractor shall provide LEED credit verification as per Section 01 33 00 – Submittal Procedures.

B. MRc2: Construction Waste Management

1. No less than the specified minimum proportion of all construction waste from the project shall be diverted from disposal in a landfill and/or incineration in accordance with the project requirements for Construction Waste Management. See Section 01 81 13 – Sustainable Design Requirements.

C. MRc4: Recycled Content Material

1. No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the project requirements for Recycled Content Materials. All materials counted toward the computation of the proportion of the Recycled Content Materials shall comply with the standard for the minimum percentages of post-consumer waste materials and for the minimum percentage of pre-consumer waste materials. See Section 01 81 13 – Sustainable Design Requirements.
2. Contractor shall provide LEED credit verification as per Section 01 33 00 – Submittal Procedures.

D. MRc5: Regionally manufactured harvested materials

1. No less than the specified proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the project site in accordance with the project requirements for Regionally Manufactured and/or Harvested Materials. See Section 01 81 13 – Sustainable Design Requirements.
2. Contractor shall provide LEED credit verification as per Section 01 33 00 – Submittal Procedures.

1.4 SUBMITTALS

A. Certificates

1. Materials

1.5 PROJECT CONDITIONS

A. The Maintenance of Traffic, vehicular and pedestrian, must be provided in accordance with Sections 01 55 26, 01 55 27, and 01 55 28 of the DPW Standard Specifications, and as allowed by the City of Baltimore.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Pavement Operations and Maintenance: See DPW Standard Specifications, Section 32 01 00.

B. Concrete: See DPW Standard Specification, Section 32 13 00.

C. Pavement Marking: See DPW Standard Specification, Section 32 17 23.

D. Precast Concrete Parking Bumpers shall be furnished as detailed on the Contract Drawings.

PART 3 - EXECUTION

3.1 MAINTENANCE OF TRAFFIC:

A. The Contractor shall be responsible for the Maintenance of Traffic (MOT), pedestrian and vehicular, on all public and private roads while working on or near such roads and within the project site as required for this project for safe and continuous maintenance of traffic throughout the area affected by the project work. All cost associated with the maintenance of traffic, pedestrian and vehicular, shall be included in the base bid. Items used for MOT shall be removed from the project site when no longer needed.

B. MOT shall be in accordance with DPW Standard Specifications and the latest Manual on Uniform Traffic Control Devices (MUTCD), and as directed by the City of Baltimore.

3.2 PAVEMENT MARKING REMOVAL:

A. Remove pavement markings, as required and as indicated on Contract Drawings, in a manner acceptable to Agency Construction Manager and the City of Baltimore.

3.3 PAVEMENT MARKING PROTECTION AND RESTORATION:

A. Do not permit vehicular or pedestrian traffic on completed marked pavement until paint or other marking materials has set and are hardened.

B. Restore damaged paint marking as directed by the Agency Construction manager and the City of Baltimore.

3.4 PAVEMENT MARKING APPLICATION:

A. Apply pavement markings to the pavement conforming to MUTCD, AASHTO, DPW Standard Specifications, and DOT Standards.

B. Preparation:

1. Clean pavement surface removing loose material, grease, oil, mud, and foreign materials.
2. Allow pavement to cool and set for 5 calendar days prior to application of paint.
3. Do not apply paint to a wet or damp surface. Allow surface to dry an additional 8 hours after appearing dry.
4. Lay out markings to dimensions indicated on Contract Drawings.

C. Application:

1. Apply paint with spray equipment, producing markings with sharp parallel edges, clean square ends, and with uniform width of 4 inches.
2. Application rate shall be no less than 100 square feet per gallon.

3.5 PRECAST PARKING BUMPERS

A. Precast Parking Bumpers shall be installed in each parking space as shown on the Contract Drawings. The bumpers shall be placed centered from left to right in each space and four feet from the end, opposite of the drive aisle, of the parking space.

3.6 INSPECTION AND TESTING:

A. The inspection and testing of all work specified in this Section shall be performed by the Inspection and Testing Agency in accordance with Division 01 – General Requirements.

B. All work not conforming to the Contract Drawings and the Contract specifications shall be corrected by the Contractor to the satisfaction of the Agency Construction Manager at no increase to the Contract Sum.

3.7 CLEANING:

A. See Division 01 – General Requirements.

B. Clean improvements and facilities damaged by paint over-spray, as directed by the Agency Construction Manager at no increase to the Contract Sum.

END OF SECTION 32 17 00

SECTION 32 17 26 – TACTILE WARNING SURFACE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 – General Requirements Specification Sections, apply to this Section.

B. City of Baltimore: Department of Public Works – *Specifications For Materials, Highways, Bridges, Utilities, and Incidental Structures* with all addenda thereto at the time bids are received (DPW Standard Specifications.) Subsections of DPW Standard Specifications describing "Measurement and Payment" shall not apply to this contract.

C. City of Baltimore: Department of Transportation – *Book of Standards* with all addenda thereto at the time bids are received (DOT Standards.) Subsections of DOT Standards describing "Measurement and Payment" shall not apply to this contract.

D. American Society of Testing and Materials International (ASTM) standards and test methods.

E. American Association of State Highway and Transportation Officials (AASHTO) *Standard Specifications for Transportaiton Mterails and Methods of Sampling and Testing* and *A policy of Geometric Design of Highways and Streets*.

F. Federal Highway Administration – *Manual on Uniform Traffic Control Devices* (MUTCD.)

G. United States of America: *Americans with Disabilities ACT* with all addenda thereto at the time bids are received (ADA).

1.2 SUMMARY

A. Section includes materials and specifications for the installation of tactile (detectable) warning surfaces.

B. Related Requirements:

1. Section 32 10 00 – Bases, Ballast, and Paving.
2. Section 32 05 23 – Cement and Concrete for Exterior Improvements.
3. The tactile (detectable) warning surface shall conform to the most recent accessibility guidelines of the Americans with Disabilities Act (ADA) under Section R304 of the Public Rights-of-Way guidelines.

C. Description

1. Selected materials and method for the work in this section are in accordance with the applicable provisions of the DPW Standard Specifications. Subsections of the DPW Standard Specifications describing "Measurement and Payment" shall not apply to this work.

2. Detectable warning surfaces are required at street crossings and signalized intersections and wherever sidewalk ramps are installed.
3. The work includes the removal and disposal of the existing sidewalk or other materials necessary for the construction and installation of the detectable warning surfaces.

1.3 SUSTAINABLE DESIGN REQUIREMENTS

A. SSc7.1 Reduction of Heat Island Effect - Non-Roof Surfaces

1. All concrete mixes and precast pavers identified as high SRI in the Plans used for exterior paving shall have a Solar Reflective Index rating (SRI) of 29 or greater in accordance with the project requirements for Reduction of Heat Island Effect - Non-Roof Surfaces. See Section 01 81 13 – Sustainable Design Requirements.
2. Contractor shall provide LEED credit verification as per Section 01 33 00 – Submittal Procedures.

B. MRc2: Construction Waste Management

1. No less than the specified minimum proportion of all construction waste from the project shall be diverted from disposal in a landfill and/or incineration in accordance with the project requirements for Construction Waste Management. See Section 01 81 13 – Sustainable Design Requirements.

C. MRc4: Recycled Content Material

1. No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the project requirements for Recycled Content Materials. All materials counted toward the computation of the proportion of the Recycled Content Materials shall comply with the standard for the minimum percentages of post-consumer waste materials and for the minimum percentage of pre-consumer waste materials. See Section 01 81 13 – Sustainable Design Requirements.
2. Contractor shall provide LEED credit verification as per Section 01 33 00 – Submittal Procedures.

D. MRc5: Regionally manufactured harvested materials

1. No less than the specified proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the project site in accordance with the project requirements for Regionally Manufactured and/or Harvested Materials. See Section 01 81 13 – Sustainable Design Requirements.
2. Contractor shall provide LEED credit verification as per Section 01 33 00 – Submittal Procedures.

1.4 SUBMITTALS

A. Certificates

1. Materials

1.5 PROJECT CONDITIONS

A. Maintenance of Traffic, vehicular and pedestrian, must be provided in accordance with Sections 01 55 26, 01 55 27, and 01 55 28 of the DPW Standard Specifications, DOT Standards and as allowed by City of Baltimore.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Tactile (Detectable) Warning Surface

1. Composition: The surface shall be of rigid composition
2. Size: The surface standard size shall have a minimum side distance of 24” in the direction of pedestrian travel and extend the full width of the curb ramp landing. The detectable warning surface shall not encroach on the blended slope transition areas.
3. Shape: The system shall consist of a surface of truncated domes aligned in a square grid pattern as specified in the Contract Documents or as directed by the Engineer.

    a. The domes shall be 0.2” in height and 0.9” to 1.4” in diameter.
    b. The domes shall be spaced perpendicularly 1.6” to 2.35” from center of domes.
    c. Truncated dome surfaces shall be fabricated to provide full domes only.

4. Color: The detectable warning surfaces shall contrast visually with adjacent - gutter, street or highway, or walkway surfaces, either light-on-dark or dark-on-light.
5. Friction: The surfaces shall have a minimum coefficient of friction of 0.8 when tested in conformance with ASTM C 1028.

PART 3 - EXECUTION

3.1 MAINTENANCE OF TRAFFIC:

A. The Contractor shall be responsible for the Maintenance of Traffic (MOT), pedestrian and vehicular, on all public and private roads while working on or near such roads and within the project site as required for this project for safe and continuous maintenance of traffic throughout the area affected by the project work. All cost associated with the MOT, pedestrian and vehicular, shall be included in the base bid.

B. Items used for maintenance of traffic shall be removed from the project site when no longer needed.

C. MOT shall be in accordance with DPW Standard Specifications and the latest Manual on Uniform Traffic Control Devices (MUTCD), DOT Standards and as directed by the City of Baltimore.

3.2 TACTILE (DETECTABLE) WARNING SURFACE INSTALLATION

A. The tactile (detectable) warning surfaces shall be either surface applied or cast in place.

B. The Contractor shall install the system in conformance with the manufacturer's recommendations. These recommendations shall address the conditions of the concrete surface on which the system will be applied; surface finish, presence of curing compound, length of cure, and other installation practices to ensure the longevity of the detectable warning surfaces.

C. The detectable warning surface shall be located so that the edge nearest the curb line is 6" – 8" from the face of curb. For skewed applications, detectable warning surfaces shall be placed such that the domes closest to the back of curb are no less than 0.5" and no more than 1" from the back of curb. Truncated dome surfaces shall be fabricated to provide full domes only.

3.3 INSPECTION AND TESTING:

A. The inspection and testing of all work specified in this Section shall be performed by the Inspection and Testing Agency in accordance with Division 01 – General Requirements.

B. All work not conforming to the drawings and these specifications shall be corrected by the Contractor to the satisfaction of the Agency Construction Manager at no increase to the Contract Sum.

3.4 CLEANING:

A. See Division 01 – General Requirements.

END OF SECTION 32 17 00

SECTION 32 31 13.53 - HIGH-SECURITY FENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Steel high-security fences.

B. Related Requirements:
1. Division 04 Section “Unit Masonry” for brick wall

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:

a. Fence rails, and fittings.

B. Shop Drawings: For each type of fence and gate assembly.

1. Include plans, elevations, sections, details, and attachments to other work.

C. Samples for Initial Selection: For each type of factory-applied finish.

D. Samples for Verification: For each type of component with factory-applied finish, prepared on Samples of size indicated below:

1. Polymer-Coated Components: In 6-inch (150-mm) lengths for components and on full-sized units for accessories.

E. Delegated-Design Submittal: For structural performance of chain-link fence and gate frameworks, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing fence grounding; member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

1.5 FIELD CONDITIONS

A. Field Measurements: Verify layout information for chain-link fences and gates shown on Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

1.6 WARRANTY

A. All structural fence components (i.e. rails, pickets, and posts) shall be warranted within specified limitations, by the manufacturer for a period of 15 years. Warranty shall cover any defects in material finish, including cracking, peeling, chipping, blistering or corroding.

PART 2 - PRODUCTS

2.1 STEEL FENCE

A. Basis-of-Design Product: Subject to compliance with requirements, provide Impasse II-Gauntlet as manufactured by Ameristar. or a comparable product by one of the following:
1. Long Fence
2. Hercules Fence

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design chain-link fence and gate frameworks.

B. Structural Performance: Chain-link fence shall withstand the design wind loads and stresses for fence height(s) and under exposure conditions indicated according to ASCE/SEI 7:

1. Design Wind Load: As indicated on Drawings.

a. Minimum Post Size and Maximum Spacing: Provide line posts of size and in spacing indicated, but not less than sizes and spacings determined according to CLFMI WLG 2445, based on mesh size and pattern specified.

C. Deflection Limits: Fence deflections shall be within the following limits:

1. Fence Post Rigidity: Maximum 3/4 inch (19 mm) when a 50-lbf (222-N) force is applied at midheight of every eighth post along the fence line. Measure post movement from the relaxed position at the point where the force is applied.

2.3 MATERIALS

A. Steel material for fence framework when galvanized prior to forming, shall conform to the requirements of ASTM A924/A924M, with a minimum yield strength of 45,000 psi (310 MPa). The steel shall be hot-dip galvanized to meet the requirements of ASTM A653/A653M with a minimum zinc coating weight of 0.90 oz/ft^2 (276 g/m^2), Coating Designation G-90.

2.4 FITTINGS

A. Provide fittings according to ASTM F 626.

B. Post Caps: Provide for each post.

1. Provide line post caps with loop to receive tension wire or top rail.

C. Rail and Brace Ends: For each gate, corner, pull, and end post.

D. Rail Fittings: Provide the following:

1. Top-Rail Sleeves: Pressed-steel or round-steel tubing not less than 6 inches (152 mm) long.
2. Rail Clamps: Line and corner boulevard clamps for connecting intermediate and bottom rails to posts.

E. Tension and Brace Bands, Tension Bars, and Truss Rod Assemblies: According to ASTM F 2611.

F. Power-Driven Fabric Fasteners: As recommended in writing by manufacturer.

G. Finish:

1. Metallic Coating for Pressed Steel or Cast Iron: Not less than 1.2 oz. /sq. ft. (366 g/sq. m) of zinc.

a. Polymer coating over metallic coating.

2. Aluminum: Mill finish.

2.5 GROUT AND ANCHORING CEMENT

A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout, recommended in writing by manufacturer, for exterior applications.

B. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating, and that is recommended in writing by manufacturer for exterior applications.

PART 3 - EXECUTION

3.1 CHAIN-LINK FENCE INSTALLATION

A. Install chain-link fencing according to ASTM F 567 and more stringent requirements specified.

B. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.

C. Terminal Posts: Install terminal end, corner, according to ASTM F 567 and terminal pull posts at changes in horizontal or vertical alignment of 15 degrees or more, at any abrupt change in grade, and at intervals not greater than 500 feet (152 m). For runs exceeding 500 feet (152 m), space pull posts an equal distance between corner or end posts..

Post Bracing and Intermediate Rails: Install according to ASTM F 567, maintaining plumb position and alignment of fence posts.

D. Tension Wire: Install according to ASTM F 567, maintaining plumb position and alignment of fence posts. Pull wire taut, without sags. Fasten fabric to tension wire with 0.120-inch- (3.05-mm-) diameter hog rings of same material and finish as fabric wire, spaced a maximum of 24 inches (610 mm) o.c. Install tension wire in locations indicated before stretching fabric. Provide horizontal tension wire at the following locations:

E. Top Rail: Install according to ASTM F 567, maintaining plumb position and alignment of fence posts. Run rail continuously through line post caps, bending to radius for curved runs and terminating into rail end attached to posts or post caps fabricated to receive rail at terminal posts. Provide expansion couplings as recommended in writing by fencing manufacturer.

F. Bottom Rails: Secure to posts with fittings; anchor rail at midspan to concrete brick wall.

G. Tie Wires: Power-fastened or manually fastened ties configured to wrap a full 360 degrees around rail or post and a minimum of one complete diamond of fabric. Twist ends one and one-half machine twists or three full manual twists, and cut off protruding ends to preclude untwisting by hand.

H. Fasteners: Install nuts for tension bands and carriage bolts on the side of fence opposite the fabric side. Peen ends of bolts or score threads to prevent removal of nuts.

I. Provisions for Electronic Detection System: Eliminate wind-induced vibrations and rattles of fabric against posts and rails by placing additional tie wires where necessary. Eliminate rattles from bolted end fittings and other component connections by applying additional tightening or diagonal truss rods secured to fabric with tie wires.

ND OF SECTION 323113.53

SECTION 32 93 00 - PLANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Plants.
2. Planting soils.

1.2 DEFINITIONS

A. Backfill: The earth used to replace or the act of replacing earth in an excavation.

B. Duff Layer: The surface layer of native topsoil that is composed of mostly decayed leaves, twigs, and detritus.

C. Finish Grade: Elevation of finished surface of planting soil.

D. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.

E. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.

F. Pests: Living organisms that occur where they are not desired, or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.

G. Planting Soil: Standardized topsoil; existing, native surface topsoil; existing, in-place surface soil; imported topsoil; or manufactured topsoil that is modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.

H. Root Flare: Also called "trunk flare." The area at the base of the plant's stem or trunk where the stem or trunk broadens to form roots; the area of transition between the root system and the stem or trunk.

I. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

J. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

K. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated, including soils.

B. Samples of mineral mulch and shredded hardwood mulch.

C. Product certificates.

D. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of plants during a calendar year.

1.4 QUALITY ASSURANCE

A. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.

1. Pesticide Applicator: State licensed, commercial.

B. Soil Analysis: For each unamended soil type, furnish soil analysis and a written report by a qualified soil-testing laboratory.

1. The soil-testing laboratory shall oversee soil sampling.
2. Report suitability of tested soil for plant growth.

a. State recommendations for nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory planting soil suitable for healthy, viable plants.
b. Report presence of problem salts, minerals, or heavy metals; if present, provide additional recommendations for corrective action.

C. Provide quality, size, genus, species, and variety of plants indicated, complying with applicable requirements in ANSI Z60.1.

D. Preinstallation Conference: Conduct conference at the site location

1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not prune trees before delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees in such a manner as to destroy their natural shape. Provide protective covering of plants during shipping and delivery. Do not drop plants during delivery and handling.

B. Handle planting stock by root ball.

C. Deliver plants after preparations for planting have been completed, and install immediately. If planting is delayed more than six hours after delivery, set plants and trees in their appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist.

1.6 WARRANTY

A. Special Warranty: Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Death and unsatisfactory growth, except for defects resulting from abuse, lack of adequate maintenance, or neglect by Owner, or incidents that are beyond Contractor's control.
b. Structural failures including plantings falling or blowing over.

2. Warranty Periods from Date of Planting Completion Substantial Completion

a. Trees and Ornamental Grasses: 24 months.
b. Perennial: 24 months.

1.7 MAINTENANCE SERVICE

A. Initial Maintenance Service: Provide maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established but for not less than maintenance period below.

1. Maintenance Period for Trees: 24 months from date of planting completion.
2. Maintenance Period for Other Plants: 24 months from date of planting completion.

PART 2 - PRODUCTS

2.1 PLANT MATERIAL

A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in Plant Schedule or Plant Legend shown on Drawings and complying with ANSI Z60.1; and with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.

B. Root-Ball Depth: Furnish trees and shrubs with root balls measured from top of root ball, which shall begin at root flare according to ANSI Z60.1. Root flare shall be visible before planting.

2.2 INORGANIC SOIL AMENDMENTS

A. Lime: ASTM C 602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent and as follows:

1. Class: T, with a minimum of 99 percent passing through No. 8 (2.36-mm) sieve and a minimum of 75 percent passing through No. 60 (0.25-mm) sieve.

2. Class: O, with a minimum of 95 percent passing through No. 8 (2.36-mm) sieve and a minimum of 55 percent passing through No. 60 (0.25-mm) sieve.

B. Sulfur: Granular, biodegradable, and containing a minimum of 90 percent sulfur, with a minimum of 99 percent passing through No. 6 (3.35-mm) sieve and a maximum of 10 percent passing through No. 40 (0.425-mm) sieve.

C. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.

D. Aluminum Sulfate: Commercial grade, unadulterated.

E. Perlite: Horticultural perlite, soil amendment grade.

F. Agricultural Gypsum: Minimum 90 percent calcium sulfate, finely ground with 90 percent passing through No. 50 (0.30-mm) sieve.

G. Sand: Clean, washed, natural or manufactured, and free of toxic materials.

H. Diatomaceous Earth: Calcined, 90 percent silica, with approximately 140 percent water absorption capacity by weight.

I. Zeolites: Mineral clinoptilolite with at least 60 percent water absorption by weight.

2.3 ORGANIC SOIL AMENDMENTS

A. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1/2-inch (13-mm) sieve; soluble salt content of 5 to 10 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:

B. Sphagnum Peat: Partially decomposed sphagnum peat moss, finely divided or granular texture, with a pH range of 3.4 to 4.8.

C. Muck Peat: Partially decomposed moss peat, native peat, or reed-sedge peat, finely divided or of granular texture, with a pH range of 6 to 7.5, and having a water-absorbing capacity of 1100 to 2000 percent.

D. Wood Derivatives: Decomposed, nitrogen-treated sawdust, ground bark, or wood waste; of uniform texture and free of chips, stones, sticks, soil, or toxic materials.

E. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, debris, and material harmful to plant growth.

2.4 FERTILIZERS

A. Bonemeal: Commercial, raw or steamed, finely ground; a minimum of 1 percent nitrogen and 10 percent phosphoric acid.

B. Superphosphate: Commercial, phosphate mixture, soluble; a minimum of 20 percent available phosphoric acid.

C. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:

1. Composition: 1 lb/1000 sq. ft. (0.45 kg/92.9 sq. m) of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.

D. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:

1. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.

E. Planting Tablets: Tightly compressed chip type, long-lasting, slow-release, commercial-grade planting fertilizer in tablet form. Tablets shall break down with soil bacteria, converting nutrients into a form that can be absorbed by plant roots.

1. Size: 5-gram tablets.
2. Nutrient Composition: 20 percent nitrogen, 10 percent phosphorous, and 5 percent potassium, by weight plus micronutrients.

2.5 PLANTING SOILS

A. Planting Soil shall be ASTM D 5268 topsoil, with pH range of 5.5 to 7, a minimum of 2 percent organic material content] [Existing, native surface topsoil formed under natural conditions with the duff layer retained during excavation process or Imported topsoil or manufactured topsoil from off-site sources; do not obtain from agricultural land, bogs or marshes. Verify suitability of soil to produce viable planting soil. Clean soil of roots, plants, sod, stones, clods, clay lumps, pockets of coarse sand, concrete slurry, concrete layers or chunks, cement, plaster, building debris, and other extraneous materials harmful to plant growth. Mix soil with the following soil amendments and fertilizers in the following quantities to produce planting soil:

1. Ratio of Loose Compost to Topsoil by Volume: 1:3
2. Weight of Lime per 1000 Sq. Ft. (92.9 Sq. m):
3. Weight of Sulfur Iron Sulfate Aluminum Sulfate per 1000 Sq. Ft. (92.9 Sq. m):
4. Weight of Agricultural Gypsum per 1000 Sq. Ft. (92.9 Sq. m):
5. Volume of Sand Plus 10 Percent Diatomaceous Earth Zeolites per 1000 Sq. Ft. (92.9 Sq. m):
6. Weight of Bonemeal per 1000 Sq. Ft. (92.9 Sq. m):
7. Weight of Superphosphate per 1000 Sq. Ft. (92.9 Sq. m):
8. Weight of Commercial Fertilizer per 1000 Sq. Ft. (92.9 Sq. m): one pound
9. Weight of Slow-Release Fertilizer per 1000 Sq. Ft. (92.9 Sq. m):

2.6 MULCHES

A. Organic Mulch: Shredded hardwood.

2.7 WEED-CONTROL BARRIERS

A. Nonwoven Geotextile Filter Fabric: Polypropylene or polyester fabric, 3 oz./sq. yd. (101g/sq. m) minimum.

B. Composite Fabric: Woven, needle-punched polypropylene substrate bonded to a nonwoven polypropylene fabric, 4.8 oz./sq. yd. (162 g/sq. m).

2.8 PESTICIDES

A. General: Pesticide registered and approved by EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

PART 3 - EXECUTION

3.1 PLANTING AREA ESTABLISHMENT

A. Loosen subgrade of planting areas to a minimum depth of 12 inches (300 mm) or as indicated on plans. Remove stones larger than 1 inch (25 mm) in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.

1. Apply superphosphate fertilizer directly to subgrade before loosening.
2. Thoroughly blend planting soil off-site before spreading or spread topsoil, apply soil amendments and fertilizer on surface, and thoroughly blend planting soil.
3. Spread planting soil to a depth of as indicated on plans. but not less than required to meet finish grades after natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.

B. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

3.2 EXCAVATION FOR TREES

A. Planting Pits and Trenches: Excavate circular planting pits with sides sloping inward at a 45-degree angle. Excavations with vertical sides are not acceptable. Trim perimeter of bottom leaving center area of bottom raised slightly to support root ball and assist in drainage away from center. Do not further disturb base. Ensure that root ball will sit on undisturbed base soil to prevent settling. Scarify sides of planting pit smeared or smoothed during excavation.

1. Excavate approximately three times as wide as ball diameter.
2. Excavate at least 12 inches (300 mm) wider than root spread and deep enough to accommodate vertical roots for bare-root stock.
3. Do not excavate deeper than depth of the root ball, measured from the root flare to the bottom of the root ball.

B. Subsoil and topsoil removed from excavations may be used as planting soil.

3.3 TREE

A. Before planting, verify that root flare is visible at top of root ball according to ANSI Z60.1.

B. Remove stem girdling roots and kinked roots. Remove injured roots by cutting cleanly; do not break.

C. Set stock plumb and in center of planting pit.

1. Use planting soil as indicated on plan for backfill.
2. Balled and Burlapped: After placing some backfill around root ball to stabilize plant, carefully cut and remove burlap, rope, and wire baskets from tops of root balls and from sides, but do not remove from under root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.
3. Container-Grown: Carefully remove root ball from container without damaging root ball or plant.
4. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
5. Place planting tablets in each planting pit when pit is approximately one-half filled; in amounts recommended in soil reports from soil-testing laboratory. Place tablets beside the root ball about 1 inch (25 mm) from root tips; do not place tablets in bottom of the hole.
6. Continue backfilling process. Water again after placing and tamping final layer of soil.

D. When planting on slopes, set the plant so the root flare on the uphill side is flush with the surrounding soil on the slope; the edge of the root ball on the downhill side will be above the surrounding soil. Apply enough soil to cover the downhill side of the root ball.

3.4 TREE PRUNING

A. Remove only dead, dying, or broken branches. Do not prune for shape.

B. Prune, thin, and shape trees, shrubs, and vines according to standard professional horticultural and arboricultural practices. Unless otherwise indicated by Landscape Architect, do not cut tree leaders; remove only injured, dying, or dead branches from trees and shrubs; and prune to retain natural character.

3.5 GROUND COVER PLANTING

A. Set out and space ground cover and plants as indicated on plans in even rows with triangular spacing.

B. Use planting soil as shown on plan for backfill.

C. Dig holes large enough to allow spreading of roots.

D. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.

E. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.

F. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

3.6 PLANTING AREA MULCHING

A. Install weed-control barriers before mulching according to manufacturer's written instructions. Completely cover area to be mulched, overlapping edges a minimum of 6 inches (150 mm)] [12 inches (300 mm) and secure seams with galvanized pins.

B. Mulch backfilled surfaces of planting areas and other areas indicated.

1. Shredded hardwood mulch in Planting Areas: Apply 3-inch (75-mm) average thickness of mulch extending 12 inches (300 mm) beyond edge of individual planting pit or trench and over whole surface of planting area, and finish level with adjacent finish grades.

3.7 PLANT MAINTENANCE

A. Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, restoring planting saucers, resetting to proper grades or vertical position, and performing other operations as required to establish healthy, viable plantings. Spray or treat as required to keep trees and shrubs free of insects and disease.

B. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace mulch materials damaged or lost in areas of subsidence.

C. Apply treatments as required to keep plant materials, planted areas, and soils free of pests and pathogens or disease. Use practices to minimize the use of pesticides and reduce hazards.

D. Apply pesticides and other chemical products and biological control agents in accordance with authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.

E. Protect plants from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.

END OF SECTION 32 93 00

SECTION 32 97 00 – BIORETENTION FACILITY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Micro Bioretention Facility.

1.2 DESCRIPTION

A. Bioretention Facilities are small landscape basins intended to provide water quality management by filtering storm water runoff before release into storm drain systems and waterways.

PART 2 - PRODUCTS

2.1 MATERIALS

A. # 57 Stone Aggregate shall conform to ASTM C 33 No. 57.

B. # 8 Stone Aggregate shall conform to ASTM C 33 No. 8.

C. Mulch: 2x Shredded Hardwood Bark. Shredded hardwood bark shall be consist of the bark from hardwood trees which has been milled and screened to a maximum for inches (4'') particle size and provide a uniform texture free from sawdust, toxic substance and foreign material.

D. Plant Materials shall conform to section 329200 Turfgrass Sodding and 329300 Plants

E. Geotextile: Class PE, Type III, nonwoven, shall conform to the Geotextile Acceptance and Quality Assurance Procedure, Maryland Standard Method of Tests (MSMT) 732.

F. Pipe: six inch (6") Polyvinyl Chloride Profile Wall Pipe (PPWP) and Fittings, perforated and nonperforate. Pipe and fittings shall conform to ASTM F949-10 or AASHTO M-304.

G. Planting Soil:

1. The planting soil shall be a friable soil uniform in color and texture and not supplied from the project but must be furnished. The planting soil shall be free from any parts of Johnson grass, Canadian Thistle, or Phragmites. The USDA textural classification of the planting soil shall be loamy sand or sandy loam. The planting soil shall meet the following criteria:

ITEM	CRITERIA	TEST METHOD
Sand (2.0-0.050 mm)	50-85%	T88
Silt (0.050-0.002 mm)	0-50%	T88
Clay (less than 0.002 mm)	5-10%	T88
Organic Matter	1.5-10%	T194

The textural analysis for the planting soil shall be as follows:

SIEVE SIZE	MINIMUM PERCENT
2 inch	100
No.4	90
No. 10	80

2. At least forty-five (45) days prior to the start of construction of Bioretention Facilities, the Contractor shall submit the source of the planting soil to the owner for approval. No time extensions will be granted should the proposed planting soil fail to meet the minimum requirements stated above. Once a stockpile of the planting soil has been sampled, no material shall be added to the stockpile.

3. Planting soil that fails to meet the minimum requirements shall be replaced at no additional cost to the Owner.

H. Bioretention Soil Mixture (BSM). The Bioretention Soil Mixture (BSM) is a mixture of planting soil, mulch and sand consisting of the following:

ITEM	COMPOSITION BY VOLUME	REFERENCE
Planting Soil	30%	See above.
Shredded 2x Hardwood Mulch	20%	See above.
Sand	50%	ASTM C33 Fine Aggregate

1. The BSM shall be a homogeneous mix, free of stones, stumps, roots or other similar objects larger than two inches (2") excluding mulch. No other materials or substances shall be mixed or dumped within the bioretention area that may be harmful to plant growth or prove a hindrance to the planting or maintenance operations. The BSM shall be free of Bermuda grass, Quackgrass, Johnson grass, Mugwort, Nutsedge, Poison Ivy, Canadian Thistle, Teathumb, Phragmites or other noxious weeds as specified in COMAR 15.08.01.05. The BSM shall meet the following criteria:

ITEM	CRITERIA	TEST METHOD
Corrected pH	5.5-7.5	D4972
Magnesium	Minimum 35 ppm	*
Phosphorus (Phosphate-P20 5)	Minimum 75 ppm	*
Potassium (K2O	Minimum 85 ppm	*
Soluble Salts	Not to exceed 500 ppm	*

* University of Maryland, Cooperative Extension Service, Department of Agronomy Test Method.

2. Should the pH fall outside of the acceptable range, it may be modified with limestone (to raise) or iron sulfate (to lower). The limestone or iron sulfate must be mixed uniformly into the BSM prior to use in bioretention facilities.

3. Should the BSM not meet the minimum requirement for magnesium, it may be modified with magnesium sulfate (Epsom salt). Likewise, should the BSM not meet the minimum requirement for potassium, it may be modified with potash. Magnesium sulfate (Epsom salt) and potash must be mixed uniformly into the BSM prior to use in Bioretention Facilities.

4. BSM that fails to meet the minimum requirements shall be replaced at no additional cost to the Owner. Mixing of the corrective additives to the BSM is incidental and shall be at no additional cost to the Owner.

5. Mixing of the BSM to a homogeneous consistency shall be done to the satisfaction of the Engineer. Rototilling any type of amendment to the BSM is insufficient and destroys the unique matrix of the soil and is not be an acceptable mixing procedure.

PART 3 - EXECUTION

3.1 GENERAL

A. Bioretention Facilities shall not be constructed until all contributing drainage areas are stabilized as shown on the Contract Plans and to the satisfaction of the Engineer. Bioretention Facilities shall not be used as sediment control facilities. No heavy equipment shall operate within the perimeter of a Bioretention Facility during excavation, pipe system placement, backfilling, planting or rnulchlnq of the facility.

B. Excavation. The Bioretention Facility shall be excavated to the dimensions, side slopes and elevations shown on the Contract Plans. The method of excavation shall minimize the compaction of the bottom of the Bioretention Facility. Excavators and backhoes, operating on the ground adjacent to the Bioretention Facility shall be used to excavate the facility. No heavy equipment shall be allowed on the bottom of the Bioretention Facility. However, if the configuration of the facility requires that equipment operate on the bottom of the facility during excavation, wide track or marsh track equipment or light equipment with turf tires, shall be used. The use of equipment with narrow tracks or narrow tires, rubber tires with large lugs, or high pressure tires is prohibited.

C. Excavated materials shall be removed from the Bioretention Facility site. Excavated materials shall be used or disposed of in conformance with Division 01.

D. Prior to placing the pipe and the BSM, the bottom of the excavation shall be rototilled to a minimum depth of six inches (6") to alleviate any compaction of the facility bottom. Any substitute method for rototilling must be approved by the Engineer prior to use. Any ponded water shall be removed from the bottom of the facility and the soil shall be friable before rototilling.

3. 2 GEOTEXTILE

A. Following rototilling of the facility bottom, geotextile shall be placed on all sides of the facility as shown on the Contract Plans. Geotextile shall not be placed on the bottom of the facility. Geotextile shall be placed tightly against the facility walls to eliminate voids beneath.

B. Geotextile; wrinkles and folds in the geotextile shall be avoided. A minimum six inches (6") overlap at the geotextile joint ends or breaks shall be maintained. Geotextile joints

and overlaps shall be pinned to securely hold the geotextile in place until placement of the BSM.

C. Damaged geotextile shall be replaced or repaired as directed by the Engineer at no additional cost to the City.

3. 3 PERFORATED PIPE SYSTEM

A. The perforated pipe system using four inch (6") Polyvinyl Chloride Profile Wall Pipe (PPWP) shall be placed on bed of NO.57 aggregate (minimum bed thickness of six inches) that cover the entire bottom. Pipe shall be covered with five inches (5") of No. 57 aggregate and topped with an additional four inch (4") minimum layer of No. 8 aggregate. All aggregate shall be placed according to dimensions shown on the Contract Plans. Pipe outlets shall be outlet into drainage structures.

B. The ends of pipes not terminating in a cleanout, vent or drainage structure shall be capped.

C. All aggregate shall be clean and free of all soil and fines. Care shall be taken to prevent soil and fines from intermixing with the aggregate. All contaminated aggregate shall be removed and replaced with uncontaminated aggregate at no additional cost to the Owner.

3. 4 CLEANOUTS

A. Cleanouts of six inch (6") nonperforated PPWP shall be placed vertically in the bioretention facility as shown on the Contract Plans. The cleanouts shall be connected to the perforated pipe system with the appropriate manufactured connections as shown on the Contract Plans. The cleanouts shall extend six inches (6") above the top elevation of the bioretention facility mulch and shall be capped with a screw cap.

3. 5 OBSERVATION WELLS

A. Observation wells of six inch (6") perforated PPWP (color: white) shall be placed vertically in the bioretention facility as shown on the Contract Plans. The wells shall extend six inches (6") above the top elevation of the bioretention facility mulch and shall be capped with a screw cap. The well shall be supplied with an appropriate geotextile sock as recommended by the manufacturer.

3. 6 BIORETENTION SOIL MIXTURE

A. The Bioretention Soil Mixture (BSM) shall be placed and graded by using excavation hoes operating on the ground adjacent to the Bioretention Facility. No heavy equipment shall be used within the perimeter of the Bioretention Facility before, during or after the placement of the BSM. However, if the configuration of the facility is exceedingly large, wide track or marsh track, equipment or light equipment with turf type tires operating within the perimeter of the facility may be used to place and grade the BSM.

B. The BSM shall be placed in horizontal layers not to exceed 12 inches (12") for the entire area of the Bioretention Facility. The BSM shall be compacted by saturating the entire area of the Bioretention Facility after each lift of BSM is placed until water flows

from the perforated pipe system. Water for saturation shall be applied by spraying or sprinkling. Saturation of each lift shall be performed in the presence of the Engineer. An appropriate sediment control device shall be used to treat any sediment laden water discharged from the perforated pipe system. If the BSM becomes contaminated during the construction of the facility, the contaminated material shall be removed and replaced with uncontaminated material at no additional cost to the City. Final grading of the BSM shall be performed after a twenty-four (24) hour settling period. Final elevations shall be within two inches (2") of elevations shown on the Contract Plans.

3. 7 PLANT INSTALLATION

Refer to Section 329200 (Turfgrass Sodding) and 329300 (Plants).

3. 8 MULCHING

A. Once the plants are in place, the entire Bioretention Facility shall be mulched to a uniform thickness of three inches (3"). Well aged (minimum age of six months) shredded hardwood bark mulch is the only acceptable mulch. If plants cannot be installed into the facility within forty-eight (48) hours of final facility grading, the entire facility shall be temporarily stabilized with mulch at a uniform thickness of one inch (1").

END OF SECTION 32 97 00

SECTION 33 10 00 – WATER UTILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. City of Baltimore: Department of Public Works – *Specifications For Materials, Highways, Bridges, Utilities, and Incidental Structures* with all addenda thereto at the time bids are received (DPW Standard Specifications.) Subsections of DPW Standard Specifications describing "Measurement and Payment" shall not apply to this contract.

C. City of Baltimore: Department of Transportation – *Book of Standards* with all addenda thereto at the time bids are received (DOT Standards.) Subsections of DOT Standards describing "Measurement and Payment" shall not apply to this contract.

1.2 SUMMARY

A. Section specifies materials and work required to construct water services to new buildings.

B. Related Requirements:

1. Division 01 – Field Engineering.
2. Division 21 – Fire Suppression.
3. Division 22 – Plumbing.
4. Division 23 – Heating, Ventilation, and Air Conditioning.
5. Section 31 11 00 – Clearing and Grubbing.
6. Section 31 20 00 – Earth Moving.
7. Section 32 05 23 – Cement and Concrete for Exterior Improvements.
8. Section 31 25 00 – Erosion and Sediment Control

C. STANDARDS

1. American Water Works Association (AWWA).
2. City of Baltimore Department of Public Works (DPW).

1.3 SUBMITTALS

A. Construction Surveys

1. Construction Cut Sheets

a. Submit cut sheets to the Agency Construction Manager for review and approval prior to system construction.

B. Products

1. Submit manufacturer's specifications and installation instructions for the following:

    a. Pipe.
    b. Pipe Joint materials.
    c. Fittings.
    d. Valves.
    e. Accessories.
    f. Concrete buttress.

2. Submit certificate, signed by Manufacturer and Contractor, stating the following comply with this specification:

    a. Pipe.
    b. Pipe Joint material.
    c. Permissible Pipe joint deflection.
    d. Fittings.
    e. Valves.
    f. Accessories.

3. Submit shop drawings or catalog cuts of the following:

    a. Pipe.
    b. Fittings.
    c. Valves.
    d. Accessories.
    e. Concrete Buttress.

C. Test Reports

1. Submit Leakage Test reports, to include the following:

    a. Test gauge manufacturer, model number, and serial number.
    b. Test gauge chart for each test.
    c. Test gauge elevation for each test.
    d. Water meter manufacturer, model number, and serial number.
    e. Water meter readings before and after each test.
    f. Each test date.
    g. Test Section description (e.g. profile station).
    h. Pipe/Fitting joints in each test Section.
    i. Pipe diameter(s) and length of each diameter, for each test Section.
    j. Leakage rate formula computations for each test.

1.4 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Delivery

1. Schedule delivery operations to avoid unnecessary re-handling of materials.

B. Storage

1. Store products in accordance with Manufacturer's recommendations.
2. Store joint materials and lubricants in cool and dry location, free of oil, grease, excessive heat or direct sun rays.

C. Handling

1. Comply with manufacturer's recommendations.
2. Handle all pipes, valves and fittings with care to prevent damage the unit and its lining and coating etc.

1.5 QUALITY ASSURANCE

A. Provide products by one manufacturer for products of same material, classification or type.

1.6 PROJECT CONDITIONS

A. See Article 1.6, Project Conditions, in Section 31 20 00 – Earth Moving.

B. See DPW Standard Specifications Section 33 11 13 Part 3.3 K and as allowed by City of Baltimore regarding connections to existing systems and any disruption of service.

1.7 CONSTRUCTION SURVEYS

A. See Division 01– General Requirements.

B. Provide combined horizontal and vertical alignment stakes for system construction at twenty-five foot (25 ft) intervals, maximum, and at all appurtenances (e.g., fittings, valves, etc.).

C. Prepare construction cut sheets.

1.8 RECORD SURVEYS

A. See Division 01 – General Requirements.

PART 2 - PRODUCTS

2.1 GENERAL

A. Comply with City of Baltimore requirements for pipes, structures, and appurtenances outside of the building.

2.2 DUCTILE IRON PIPE AND FITTINGS

A. Pipe:

1. Type: Ductile Iron AWWA C 151.
2. Size: As indicated on the Contract Drawings.
3. Thickness Class: 54.
4. Interior Lining: AWWA C 104 Cement Mortar, double thickness.
5. Exterior Coating: Bituminous.

6. Laying Length: Standard Manufacture.

B. Pipe Joints:

1. Push on or Mechanical Joints: AWWA C 111.
2. Restrained Joint Manufacturers
   a. American Cast Iron Pipe company.
   b. U.S. Pipe.
   c. Griffin Pipe Products Co.
   d. EBAA Iron Inc.

3. Pipe Clamps and Tie Rods: NSI/NFPA 24.

C. Pipe Fittings:

1. Ductile Iron:

   a. Type: Ductile Iron AWWA C 110 or AWWA C 153.
   b. Size: Pipe size or as indicated on the Contract Drawings.
   c. Pressure Rating: 250 psi.
   d. Interior Lining: AWWA C 104 cement mortar, double thickness.
   e. Exterior Coating: Bituminous.
   f. Buried Fitting Ends: Mechanical joints.

2.3 VALVES

A. Gate Valves, up to 3 inches: Brass or Bronze body, non-rising stem, inside screw, single wedge or disc, compression ends, with control rod, extension body and valve key.

B. Gate Valves, 3 inches and over: ANSI/AWWA C509, Iron Body, bronze trim, non-rising stem with square nut, single wedge, resilient seat, flanged mechanical joint ends, as required, control rod and valve box.

C. Swing Check Valves, From 2 inches to 24 inches: AWWA C508, iron body, bronze trim, 45 degree swing disc, renewable disc and seat, flanged ends.

D. Valve Boxes: Provide cast-iron valve boxes, with boltable cover drilled and tapped for security fasteners (minimum 2 required per cover).

1. Cast-Iron Boxes: Extension type with slide type adjustment, flared base, 3/16 inch minimum thickness of metal.
2. Cast the word “WATER” in cover.

2.4 BEDDING MATERIALS

A. Bedding: As specified in DPW Standard Specifications or as noted on the Contract Drawings.

2.5 THRUST RESTRAINT

A. Restrained Joint manufacturers

1. American Cast Iron Pipe Company.
2. U. S. Pipe.
3. Griffin Pipe Products Co.
4. EBAA Iron Inc.
5. And as allowed by DPW Standard Specifications.

B. Pipe Clamps and Tie Rods: ANSI/NFPA 24.

C. Thrust Blocks/Concrete Buttress: Concrete: Mix 6 or high early strength Portland Cement Concrete, see Article 2.4 in Section 32 05 23 – Cement and Concrete for Exterior Improvements. Thrust Block/Concrete Buttress dimensions as indicated on Contract Drawings, DPW Standard Details and/or Approved Shop Drawings.

2.6 DISINFECTION PRODUCTS

A. Continuous Feed Disinfection Method:

1. Calcium Hypochlorite, Granular Form: AWWA B 300, or Liquid Chlorine AWWA B 301, or Sodium Chlorite AWWA B 303

PART 3 - EXECUTION

3.1 GENERAL

A. Underground water mains, valves and fire hydrants shall be installed, tested and flushed in accordance with NFPA 24.

B. Comply with Baltimore City requirements for all pipe outside the building.

3.2 EXISTING SERVICE PROTECTION AND OPERATION

A. While construction takes place, service will be maintained in all lines not indicated as being abandoned and/or demolished. Controls (e.g. valves, etc.) on existing water distribution system will be operated only by authorized Division of Corrections Personnel and/or City of Baltimore Personal. Requests for water-line shut off and its duration shall be made to the Agency Construction Manager 48 hours (minimum) in advance and as allowed by City of Baltimore.

3.3 CLEARING

A. See Section 31 11 00 – Clearing and Grubbing.

3.4 EXCAVATION, OVER-EXCAVATION, UNSUITABLE MATERIAL AND DE-WATERING

A. See Section 31 20 00 – Earth Moving.

3.5 BEDDING

A. Excavate trench for system construction in accordance with Section 31 20 00 – Earth Moving and Section 32 05 23 – Erosion and Sediment Control for all work in this Section. Hand trim excavation for accurate placement of pipe to elevation indicated.

B. Remove large stones or other hard matter that could damage pipe or impede consistent backfilling or compaction.

C. Place bedding material at trench bottom, level fill materials in one continuous layer as indicated, compact to 95%.

D. Backfill around sides and to top of pipe with fill, tamped in place and compacted to 95%.

E. Maintain optimum moisture content of bedding material to attain required compaction density.

F. Comply with City of Baltimore requirements for all pipe outside the building.

3.6 EXISTING SYSTEM CONNECTIONS

A. The Contractor shall verify that existing system control valves are set in closed position and affected pipe sections are suitably drained and not pressurized.

B. Excavate and expose existing pipe at connection locations indicated on the Contract Drawings.

C. Clean exposed pipe surfaces, removing rust, scale and foreign matter.

D. Disinfect exposed pipe, and pipe and fittings to be installed with five percent (5%) disinfection solution.

E. Install pipe and fittings as required by the Contract Drawings and in accordance with DPW Standard Specifications and DPW Standard Details.

3.7 PIPE

A. General

1. Install in accordance with pipe Manufacturer's installation instructions and as specified on the Contract Drawings.
2. The items below shall be inspected prior to installation to ensure that no damage has occurred before placement in the trench. During installation, care shall be given to all components of the system to prevent any damage. Any components of the system found to be damaged shall be removed and replaced by the Contractor in a timely fashion to prevent any delays in the project schedule. All replaced components shall be furnished by the Contractor at no additional increase to the Contract Sum.

    a. Every pipe section.
    b. All Pipe joint materials.
    c. Every fitting
    d. Every Accessory.

3. Install pipe to horizontal and vertical alignment as indicated on Contract Drawings.
4. Pipe cradle or encasement shall be provided when the situation warrants and as per Contract Drawings, no other blocking shall be permitted.
5. Place fittings at changes in horizontal and vertical alignment as indicated on the Contract Drawings.
6. Temporary bulk heads shall be placed in all open ends of pipes and fittings, whenever pipe laying is not actively pursued. The bulk heads shall be designed to prevent rodents, dirt, debris or water entry. The bulkheads shall be furnished without an increase to the Contract Sum.
7. No pipe laying on frozen or probable-frost in trench bottom.
8. Pipe cutting at job site

    a. Field-cut pipe only where required to complete closures or install fittings.
    b. Cut pipe to smooth square ends with equipment designed for cutting pipe.

9. Mark locations of ends of pipe at building tie-in locations with blue painted stakes protruding 3 feet above finished grade, marked in black with the work ‘WATER’.

B. Ductile Iron Pipe shall be buried per the finished grade profile with four feet (4 ft) minimum cover required and/or per Contract Drawings for any related pipe.

1. Install in accordance with AWWA C 600.
2. Install with bell ends facing direction of laying operations.
3. Place identifying mark on pipe not provided with spigot depth mark.
4. Clean bell and spigot interior and exterior surfaces, removing oil, grit, excess coating and foreign matter.
5. Lubricate pipe ends and gasket in accordance with Manufacturer's instructions.
6. Assemble mechanical joints in accordance with AWWA C 111, Appendix A, "Notes on Installation Of Mechanical Joints."
7. Pipe joint deflection not to exceed limits specified in Table 1, AWWA C 600.

C. Concrete Buttress:

1. Construct Concrete Buttress at each of the following fittings:

    a. Bends (horizontal and vertical)
    b. Tees.
    c. Caps.

3.8 VALVES

A. Set valves on solid bearing

B. Center and plumb valve box over valve. Set box cover flush with finished grade.

C. Install tapping sleeves and valves in accordance with manufacturer’s recommendations.

3.9 SERVICE CONNECTIONS

A. A. Provide water service connection in accordance with utility company requirements, with backflow preventer and valves.

3.10 SYSTEM TESTING

A. General

1. Provide labor, materials and equipment (e.g., pumps, gauges, etc.) required to conduct tests specified below.
2. Do not conduct tests until concrete anchors cure for at least 7 calendar days. If high early strength concrete is used, anchor curing time may be reduced to 36 hours, at the Contractor's risk.
3. Test Observations shall be conducted by representative of the Contractor's Construction Inspection and Testing Firm and the State's Construction Inspecting and Testing Firm.

B. Hydrostatic Pressure Tests

1. All testing shall be directed and witnessed by a representative of Contractor's Construction Inspection and Testing Firm and the State's Construction Inspecting and Testing Firm.
2. Conduct hydrostatic pressure test after back-fill and compaction to 1 foot above top of pipe. When piping is to be insulated or concealed in a structure, test shall be conducted before the pipe is covered.
3. Test Procedure

    a. Slowly fill pipe-test section with water, from lower system elevation, and ensure release of water and entrapped air only at the highest point of the test-section.

        1) Provide equipment (e.g., tapping machines) and install system testing corporation stops at high system elevations not provided with permanent air release appurtenances (e.g., fire hydrants).
        2) Set corporation stops in open position, during filling operations, until steady flow of water is released.

    b. Slowly apply test pressure with manually operated or engine driven pump.
    c. Test Pressure: 150 psi (minimum).
    d. Test Duration: 1 hour (minimum).

4. Inspection

    a. Examine all system joints for leakage.

5. Corrective work

    a. Repair or replace defective products and system construction, prior to completion of back-fill operations, as directed by the Agency Construction Manager.

C. Hydrostatic Leakage Test

1. Conduct hydrostatic leakage test upon completion of back-fill operations.
2. Test Procedure

    a. As specified for hydrostatic pressure test, except as noted.
    b. Reset corporation stops in open position, during filling operations, until steady flow of water is released.

c. Install meter, registering U.S. gallons, in water supply and determine water quantity required to maintain test pressure during test duration.
d. Test Pressure: 150 psi (minimum).
e. Test Duration: 4 hours (minimum).

3. Leakage

a. Conduct a leakage test concurrently with the pressure test.
b. Maximum allowable leakage will be calculated by using following formula:

$$L = (S * D / P) / 133,200$$

Where:
L = maximum allowable leakage, gallons/hour.
S = length of pipe in test section, in feet.
D = nominal diameter of tested pipe, in inches.
P = average test pressure, pounds per square inch which will be computed by averaging the pressure at the low point and the pressure at the high point of the system being tested.

c. Submit leakage test report as specified.

D. Corrective Work

1. Repair or replace defective products and system construction, as directed by the Agency Construction Manager at no increase to the Contract Sum.
2. Retest corrected system as specified.
3. Provide additional corrective work and retesting until system is approved and accepted by the Agency Construction Manager, at no increase to the Contract Sum.
4. Provide corrective work and retesting at no increase to Contract Sum.

3.11 SYSTEM DISINFECTION

A. General

1. Provide labor, materials and equipment required to disinfect system.
2. Disinfect system in accordance with AWWA B301 and as specified in this Section.

B. Continuous Feed Disinfection Method

1. Preliminary Flushing Velocity – two and a half feet per second (2.5 fps).
2. Solution Concentration

a. The Contractor shall maintain the Available Chlorine equal to or greater than a concentration of fifty milligrams per liter (50 mg/l) during the twenty-four hour (24 hr) disinfection period.
b. Available Chlorine Test Interval – Twelve hours (12 hr) Maximum.

3. Final Flushing Velocity – two and one half feet per section (2.5 fps).
4. Flushing and Drainage Locations - Approved by the representative of the Contractor's Construction Inspection and Testing Firm.
5. Repeat flushing operations until residual chlorine concentration is less than one half part per million (0.5 ppm) or equal to water-source concentration levels.

a. Residual Chlorine Tests - Conducted upon completion of final flushing operations.

6. The disposal of chlorinated water from any pipe or structure shall be such that it will not cause damage to any vegetation, fish or animal life.

C. Chlorine Testing:

1. Provide labor, materials and equipment required to conduct available and residual chlorine tests.
2. Test Observations - By the representative of the Contractor's Construction Inspection and Testing Firm and the State's Construction Inspection and Testing Firm.

D. Bacteriologic Quality Testing

1. Water bacteriologic quality tests will be conducted upon completion of final flushing operations as required to comply with Local and State health requirements.
2. Repeat disinfection operations until satisfactory bacteriologic quality tests are obtained at no increase to the Contract Sum.

END OF SECTION 33 10 00

SECTION 33 31 00 – SANITARY SEWER UTILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. City of Baltimore: Department of Public Works – *Specifications For Materials, Highways, Bridges, Utilities, and Incidental Structures* with all addenda thereto at the time bids are received (DPW Standard Specifications.) Subsections of DPW Standard Specifications describing "Measurement and Payment" shall not apply to this contract.

C. City of Baltimore: Department of Transportation – *Book of Standards* with all addenda thereto at the time bids are received (DOT Standards.) Subsections of DOT Standards describing "Measurement and Payment" shall not apply to this contract.

1.2 SUMMARY

A. Section specifies materials and work required to construct gravity sewer systems.

B. Related Requirements:

1. Division 01 – Field Engineering.
2. Section 31 11 00 – Clearing and Grubbing.
3. Section 31 20 00 – Earthwork Moving.
4. Section 31 25 00 – Erosion and Sediment Control.
5. Section 32 05 01 – Miscellaneous Concrete.
6. Division 22 – Plumbing.
7. DPW Standard Specification: Sections 31 23 23 and 21 23 33 – Aggregate Materials

C. STANDARDS

1. American Society for Testing and Materials (ASTM).
2. City of Baltimore Department of Public Works (DPW).
3. American Society of Testing and Materials (ASTM).

1.3 SUBMITTALS

A. Provide submittals in compliance with the conditions of the Contract and Division 01 – General Requirements.

B. Construction Surveys

1. Submit construction cut sheets to the Agency Construction Manager for review and approval prior to system construction.

C. Products

1. Submit manufacturer's specifications and installation instructions for the following:

    a. Pipe
    b. Pipe Joints.
    c. Pipe Fittings.
    d. Cleanouts.
    e. Precast Concrete Manhole.
    f. Cleanout frames and covers.
    g. Manhole frame and covers.

2. Submit certificate, signed by Manufacturer and Contractor, stating that the following comply with this specification:

    a. Pipe.
    b. Pipe Joints.
    c. Pipe Fittings.
    d. Precast concrete Manhole.
    e. Cleanout frames and covers
    f. Manhole frame and covers.

3. Submit shop drawings and catalogue cuts of the following, indicating materials, sizes and clearances

    a. Cleanout frames and covers with security bolt details.
    b. Manhole frame and covers with security bolt details.
    c. Manhole steps.
    d. Method and materials for the connection of dissimilar pipe materials where they connect.
    e. Precast Concrete Manhole.
    f. Leveling Rings brick and mortar or precast concrete.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Provide submittals in compliance with the conditions of the Contract and Division 01 – General Requirements.

B. Delivery

1. Schedule delivery operations to avoid unnecessary re-handling of materials.

C. Storage

1. Store products in accordance with Manufacturer's recommendations.
2. Store joint materials and lubricants in cool and dry location, free of oil, grease, excessive heat or in direct sun rays.

D. Handling

1. Comply with Manufacturer's recommendations.

1.5 QUALITY CONTROL

A. Provide products by only one manufacturer for products of same material, classification or type.

1.6 PROJECT CONDITIONS

A. See Article 1.6, Project Conditions, in Section 31 20 00 – Earth Moving.

B. See DPW Standard Specification Section 33 31 00 and as indicated on the Contract Drawings for maintaining existing flows and services.

1.7 CONSTRUCTION SURVEYS

A. See Division 01 – General Requirements.

B. Provide combined horizontal and vertical alignment stakes for system construction at twenty-five foot (25 ft) intervals maximum and at any cleanout.

C. Prepare construction cut sheets.

1.8 RECORD SURVEYS

A. See Division 01 – General Requirements.

PART 2 - PRODUCTS

2.1 DUCTILE IRON PIPE

A. See Part 2, Products, in Section 33 10 00 – Water Utilities, Products shall be the same except Pipe shall be a minimum of Class 52 and the working pressure shall not apply.

2.2 PVC PIPE

A. See DPW Standard Specifications Section 33 31 00 and as indicated on the Contract Drawings.

2.3 PRECAST CONCRETE MANHOLES

A. See Part 2, Products, in Section 33 40 00 – Storm Drain Utilities.

B. See DPW Standard Specifications Section 33 39 00 and as indicated on the Contact Drawings.

2.4 STRUCTURE CASTINGS

A. Castings Manufactured by Neenah Foundry Company, Neenah, Wisconsin, or approved equal.

1. Cleanout frames and covers (lids):

a. Catalog Number - R-6461-BH, with anchor bolt holes.
b. Lid Bolts - System security bolt pattern.
c. Provide cast-iron frames and covers as indicated and as required for the structure.
d. Provide waterproof, bolt-able covers. Drill and tap frame and cover for security fasteners (minimum four required per frame and cover).
e. Provide removable covers to seat in frames without rocking.
f. Identify covers with cast marking “SANITARY CLEANOUT”. Cast the name and location of manufacturer on the frame and cover.
g. Provide castings free from blowholes, splits, cracks, blisters, mold pull, and other imperfections affecting strength and serviceability.
h. Must be lockable as accepted by the Agency Construction Manager.

2. Manhole frames and covers (lids):

a. Catalog Number - R-1916 F, with anchor bolt holes.
b. Lid Bolts - System security bolt pattern.
c. Provide cast-iron frames and covers as indicated and as required for the structure.
d. Provide waterproof, bolt-able covers. Drill and tap frame and cover for security fasteners (minimum four required per frame and cover).
e. Provide removable covers to seat in frames without rocking.
f. Identify covers with cast marking “SANITARY SEWER”. Cast the name and location of manufacturer on the frame and cover.
g. Provide castings free from blowholes, splits, cracks, blisters, mold pull, and other imperfections affecting strength and serviceability.
h. Must be lockable as accepted by the Agency Construction Manager.

B. Substitutions – See provisions of Division 01.

2.5 STRUCTURE APPURTENANCES

A. See Section 33 40 00- Storm Drain Utilities, Part 2: Products

B. See DPW Standard Specification Section 33 39 00 and as indicated on the Contract Drawings.

2.6 SYSTEM SECURITY BOLTS

A. Security bolt manufactured by Safety Socket Screw Corporation (Blue Devil Tamper Proof), or approved equal.

1. Type – Stainless Steel, hexagonal socket head with interior pin.
2. Size – As required or specified.

2.7 PIPE ENCASEMENT

A. Concrete Mix No. 2, see Section 32 05 01 – Cement and Concrete for Exterior Improvements or as noted on the Contract Drawings or as required by the City of Baltimore.

2.8 FOUNDATION MATERIALS

A. Porous Fill

1. Course Aggregate – ASTM C 33.
2. Size Number 57 Aggregates – See DPW Standard Specification 31 23 23.53
3. Blast furnace slag is prohibited.

2.9 MISCELLANEOUS PRODUCTS

A. Structure Invert Flow Channels

1. Sewer Brick - ASTM C 32, Grade SS.
2. Cement Mortar - ASTM C 270, Type S.
3. As allowed by DPW Standard Specifications.

B. Structure Coating Material

1. Coating material manufactured by Koppers Company, Pittsburgh, Pennsylvania.

   a. Type - "Bitumastic Super Service Black."

2. Substitutions - under provisions of Division 01 – General Requirements.

PART 3 - EXECUTION

3.1 GRAVITY SEWERS: PROTECTION AND RESTORATION

A. See Section 31 20 00 – Earth Moving.

B. General

1. Provide support systems (e.g. sheeting, shoring, etc.) as required, at no increase to Contract Sum.

   a. Trench Shields or Boxes - Exercise care during movement to prevent utility displacement.
   b. Remove timber support systems as backfill proceeds.

C. Seal pipes when construction is not in progress with temporary watertight appurtenances (e.g. stoppers, caps, plugs) to prevent entrance of foreign materials, ground water, earth and debris; at no increase to the Contract Sum.

3.2 CLEARING

A. See Section 31 11 00 – Clearing and Grubbing.

3.3 DEWATERING, EXCAVATION, OVER-EXCAVATION AND UNSUITABLE MATERIAL

A. See Section 31 11 00 – Clearing and Grubbing.

B. Remove large stones or other hard matter which could damage pipe or impede consistent backfilling or compaction

3.4 BEDDING

A. Excavate installation trench for system in accordance with Section 31 20 00 – Earthwork, for work of this Section. Hand trim excavation for accurate placement of pipe to elevation indicated.

B. Place bedding material at trench bottom, level fill materials in one continuous layer as indicated, compact to 95%.

C. Backfill around sides and to top of pipe with fill, tamped in place and compacted to 95%.

D. Maintain optimum moisture content of bedding material to attain required compaction density.

E. Comply with DPW Standard Specifications and DPW Standard Details within the City of Baltimore Right-of-Way and public easements.

3.5 STRUCTURES

A. Precast Concrete Structures

1. Precast Concrete Structure Base

    a. Place granular foundation material on excavation subgrade and compact to the bottom elevation of the precast concrete structure base to meet the pipe inverts as shown on the Contract Drawings.
    b. Install precast concrete structure base on foundation material, level to 1/8 inch in five feet.

2. Clean and lubricate precast concrete structure joints, immediately prior to installation, in accordance with Manufacturer's recommendations.
3. Install precast sections on structure base, plumb to 1/8 inch in five feet.
4. Position each precast concrete section on previously installed section and push joints tightly together.
5. Position top section on structure as indicated on the Contract Drawings or required by job site conditions.
6. Install frame and grate to finished grade, with sewer brick and cement mortar specified.
7. Pipe Connections

a. Seal joints between pipes and structures with brick and cement mortar specified.
b. Neatly cut pipes flush with interior structure walls.

8. Invert Flow Channels

a. Construct invert flow channels smooth and semi-circular in shape.
b. Shape channels with horizontal circular curve radii tangential to inflow pipe alignment(s) and outflow pipe alignment.
c. Neatly form channels in structure base with sewer brick and cement mortar specified.

B. SYSTEM SECURITY BOLTS

1. New Precast Concrete Structures that are constructed inside of the permanent security perimeter shall receive system security bolts.

3.6 PIPE

A. See Article 3.7, Pipe, in Section 33 10 00 – Water Utilities.

B. Comply with DPW Standard Specifications and DPW Standard Details within the City of Baltimore Right-of-Way or public easement.

3.7 BACKFILL

A. See Section 31 20 00 – Earth Moving.

B. Comply with DPW Standard Specifications and DPW Standard Details within the City of Baltimore Right-of-Way or public easement.

3.8 SYSTEM TESTING

A. General

1. Provide labor, materials and equipment (e.g. pumps, gauges, etc.) required to test system as specified.
2. Test system upon completion of backfill operations and after discontinuance of dewatering operations, except at pipe ends.
3. Test Observations - By representative of Contractor's Construction Inspection and Testing Firm and the State's Construction Inspection and Testing Firm.
4. Comply with City of Baltimore and DPW Standard Specification testing requirements.

B. Pipe Alignment Tests

1. Test Locations:

a. Each structure-to-end-of-pipe (e.g. at building connection points) section.

2. Test Equipment - Electric lights approved by representative of Contractor's Construction Inspection and Testing Firm and the State's Construction Inspection and Testing Firm.
3. Test Procedure - Illuminate pipe interior, at each structure, as directed by representative of the Contractor's Construction Inspection and Testing Firm and the State's Construction Inspection and Testing Firm.
4. Test Result Required - Pipe alignment to produce full circle of light when viewed from adjoining structure or end of pipe.

C. Low Pressure Air Test

1. Test Locations:

    a. Each structure-to-end-of-pipe (e.g. at building connection points) section.

2. Contractor may backfill pipe ends prior to test.
3. Pretest Inspection

    a. Do not conduct low pressure air tests until completion of pipe alignment test and approval by the representative of the Contractor's Construction Inspection and Testing Firm and the State's Construction Inspection and Testing Firm

4. Test Equipment - Cherne Air-Loc Equipment Manufactured by Cherne Industrial, Inc., Edina, Minnesota.

    a. Substitutions – Under provisions of Division 01 – General Requirements.
    b. Pneumatic Plugs:

        1) Sealing Length – Equal to or greater than pipe diameter being tested.
        2) Design – To reset or test pressured without external bracing.

5. Testing Air – To pass through single control panel.
6. Test Hoses – Three.

    a. One, from control panel to pneumatic plugs.
    b. One, from control panel to sealed pipe section, for introducing test air.
    c. One, from control panel to sealed pipe section, to continuously monitor air pressure in sealed pipe section.

7. Pneumatic Plug Test

    a. Test pneumatic plugs prior to use in low pressure air test as follows:

        1) Set one laying length of pipe on ground and seal both ends with pneumatic plugs.
        2) Inflate pneumatic plugs to 25.0 PSI gauge.
        3) Pressurize sealed pipe to 5.0 PSI gauge.

    b. Test Result Required - Pneumatic plugs to hold against pressure, without bracing or movement.

8. Low Pressure Air Test Procedure

    a. Clean pipe removing debris, silt and foreign matter.

b. Flush or spray pipe interior with water.
c. nstall pneumatic plugs in pipe at each structure, and inflate to 25.0 PSI gauge.
d. Slowly pressurize pipe section to 4.0 PSI gauge and allow pressurized air temperature to stabilize two minutes.
e. Disconnect air supply hose, from control panel, at end of stabilization period.
f. Time interval for pressure to decrease from 3.5 to 2.5 PSI gauge will be observed and recorded by representative of the Contractor's Construction Inspection and Testing Firm and the State's Construction Inspection and Testing Firm.

9. Acceptable Time Interval

a. Acceptable time interval, for specified pressure decrease: two minutes (2 min) (120 seconds) minimum.

D. Corrective Work

1. Repair or replace defective products and system construction, which fail tests, as directed by the Agency Construction Manager.
2. Retest corrected systems as specified, above.
3. Provide additional corrective work and retesting until system is approved and accepted by the Agency Construction Manager.
4. Provide corrective work and retesting at no increase to Contract Sum.

END OF SECTION 33 31 00

SECTION 33 40 00 – STORM DRAIN UTILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. City of Baltimore: Department of Public Works – *Specifications For Materials, Highways, Bridges, Utilities, and Incidental Structures* with all addenda thereto at the time bids are received (DPW Standard Specifications.) Subsections of DPW Standard Specifications describing "Measurement and Payment" shall not apply to this contract.

C. City of Baltimore: Department of Transportation – *Book of Standards* with all addenda thereto at the time bids are received (DOT Standards.) Subsections of DOT Standards describing "Measurement and Payment" shall not apply to this contract.

D. American Society of Testing and Materials International (ASTM) standards and test methods.

1.2 SUMMARY

A. Section specifies materials and work required to construct storm drain systems.

B. Related Requirements:

1. Division 01 – Field Engineering.
2. Division 22 – Plumbing.
3. Section 31 11 00 – Clearing and Grubbing.
4. Section 31 20 00 – Earth Moving.
5. Section 31 25 00 – Erosion and Sediment Control.
6. Section 32 05 23 – Cement and Concrete for Exterior Improvements.
7. DPW Standard Specifications: Sections 31 23 23 and 21 23 33 – Aggregate Materials.

C. STANDARDS

1. American Concrete Pipe Association (ACPA).
2. American Water Works Associations (AWWA).
3. City of Baltimore Department of Public Works (DPW).
4. American Society of Testing and Materials (ASTM).

1.3 ACTION SUBMITTALS

A. Provide submittals in compliance with the conditions of the Contract and Division 01 – General Requirements.

B. Construction Surveys

1. Submit Construction cut sheets to the Agency Construction Manager for review and approval prior to system construction.

C. Products

1. Submit Manufacturer's specifications and installation instructions for the following:

   a. Pipe
   b. Pipe joints
   c. Manhole frame and covers.
   d. Inlet frame and grates.

2. Submit certificates, signed by Manufacturer and Contractor, stating the following comply with this specification:

   a. Pipe
   b. Pipe joint materials.
   c. Precast Concrete manhole/inlet sections, including top and bottom.
   d. Manhole frame and covers.
   e. Inlet frame and grates.

3. Submit shop drawings and catalogue cuts of the following, indicating materials, sizes and clearances.

   a. Inlet castings/trench drain covers with security bolt details.
   b. Precast concrete manhole/inlet sections, including top and bottom.
   c. Manhole/Inlet steps.
   d. Method and materials with supporting computations for strapping and supporting pipes to walls, ceilings, and other structures including horizontal and vertical runs of pipe.
   e. Method and materials for connecting dissimilar pipe materials where pipes of dissimilar materials connect.
   f. Method and materials for temporary support of other utilities intersecting/crossing storm drain system construction.
   g. Bypass pumping configuration including pump curves reflecting pump is sized accurately sized for pump around task.]
   h. Manhole frame and covers.
   i. Inlet frame and grates.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery

1. Schedule delivery operations to avoid unnecessary re-handling of materials.

B. Storage

1. Store products in accordance with Manufacturer's recommendations.
2. Store joint materials and lubricants in a cool and dry location, free of oil, grease, excessive heat or in direct sun rays.

C. Handling

1. Comply with Manufacturer's recommendations.

2. Handle concrete pipe with care to prevent damage to pipe joints.

1.5 QUALITY ASSURANCE

A. Provide products by only one manufacturer for products of same material, classification or type.

B. Each pipe section and/or structure shall be stamped with manufacturers' name and classification/type of material.

1.6 PROJECT CONDITIONS

A. See Article 1.6 Project Conditions, Section 31 20 00 – Earth Moving.

B. Existing Storm Drain Systems:

1. Provide, install, operate and maintain pumps and related equipment as required to divert stormwater (By-Pass Pumping) during storm drain system construction.

a. Extend pump discharge lines to existing drainage structures or stabilized ditch flowing to an established watercourse.
b. Ponding of stormwater, except in stormwater management facilities designed for it, is prohibited.

1.7 CONSTRUCTION SURVEYS

A. See Division 01 – General Requirements.

B. Provide combined horizontal and vertical alignment stakes for system construction at twenty-five foot (25 ft) intervals, maximum, and at all structure locations.

C. Prepare construction cut sheets.

1.8 RECORD SURVEYS

A. See Division 01 – General Requirements.

PART 2 - PRODUCTS

2.1 CONCRETE PIPE

A. Circular Pipe: ASTM C 76 reinforced concrete.

1. Internal Diameter: As indicated on the Contract Drawings.
2. Class: As indicated on the Contract Drawings or a minimum of Class IV or stronger.
3. Laying Length: Standard per manufacture.
4. Pipe Joints: Modified tongue and groove.

B. Joint Materials:

1. Rubber Gaskets: ASTM C443.
2. Joint Lubricant: Vegetable Oil Soap.

2.2 DUCTILE IRON PIPE

A. See Section 33 10 00 - Water Utilities, Part 2: Products

2.3 UNDERDRAINS

A. See DPW Standard Specification Section 33 41 00 Part 2.1 E.

B. As otherwise approved and allowed by City of Baltimore and the Agency Construction Manager.

2.4 PRECAST CONCRETE MANHOLES AND INLETS

A. General

1. Structural Design Loading – ASTM C 857.
2. Live Load Designation – H-20

B. Precast Structures

1. Precast Structures – Manholes and Inlets – ASTM C478.
2. Joints – ASTM C 443.
3. Base Sections

a. Cast with integral floor and with required pipe openings, as indicated on the Contract Drawings.
b. Inside diameter -.as indicated on the Contract Drawings.

4. Riser Sections

a. Inside diameter - as indicated on the Contract Drawings.

5. Top Sections

a. Eccentric Cone Type.
b. Opening diameter in the top section shall match the interior diameter of the respective casting for the structure.

6. Top Section Accessories

a. Cast with threaded inserts for casting and/or inlet frame anchor bolt installation. Insert locations to match frame anchor bolt hole pattern.

1) Threaded inserts, Type HF, as manufactured by Hohmann and Barnard, Inc., Alexandria, Virginia or approved equal.
2) Substitutions: under provisions of Division 01 – General Requirements.

C. Anchor Bolts - ANSI B18.6.2.

1. Type - Stainless Steel.
2. Threads - ANSI B1.1, Type NC.
3. Nominal Size - 3/4 inch.
4. Head Type - Hexagon.
5. Length - as required.

D. Anchor Bolt Washers - ANSI B27.2.

1. Type - Heavy Stainless Steel.
2. Size - Anchor bolt size specified.

E. Masonry

1. Sewer Brick - ASTM C 32, Grade SS.
2. Mortar - ASTM C 270, Type S.
3. As allowed by DPW Standard Specifications.

2.5 STRUCTURE CASTINGS

A. Manhole and Inlet frames, grates and covers.

1. As indicated in the Contract Drawings.
2. Must be lockable as accepted by the Agency Construction Manager for locations not within City of Baltimore Right-of-way.

B. Provide cast-iron frames and covers as indicated and as required for the structure.

C. Provide boltable covers. Drill and tap frame and cover for security fasteners (minimum four required per frame and cover.)

D. Provide removable covers to seat in frames without rocking.

E. Identify covers with cast marking “STORM DRAIN”. Cast mark the name and location of manufacturer on frame and cover.

F. Provide castings free from blowholes, splits, cracks, blisters, mold pull, and other imperfections affecting strength and serviceability.

G. Substitutions - under provision of Division 01 – General Requirements.

2.6 STRUCTURE APPURTENANCES

A. Steps

1. Steps manufactured by M.A. Industries, Inc., Peachtree City, Georgia or approved equal.

a. Type : PS2-PF
b. Substitutions - under provision of Division 01 – General Requirements.

2. Provide steps in accordance with OSHA regulations.
3. Vertical step spacing - 12 inches on center, measured from top of structure cover.

2.7 SYSTEM SECURITY BOLTS

A. Security bolt manufactured by Safety Socket Screw Corporation (Blue Devil Tamper Proof), or approved equal.

1. Type - Stainless Steel, hexagonal socket head with interior pin.
2. Size - As required or specified.

2.8 FOUNDATION MATERIALS

A. Porous Fill

1. Coarse Aggregate - ASTM C 33.
2. Size Number 57 Aggregates – See DPW Standard Specification 31 23 23.53.
3. Blast furnace slag is prohibited.

2.9 MISCELLANEOUS PRODUCTS

A. Structure Invert Flow Channels

1. Sewer Brick - ASTM C 32, Grade SS.
2. Cement Mortar - ASTM C 270, Type S.
3. As allowed by DPW Standard Specifications.

B. Structure Coating Material

1. Coating material manufactured by Koppers Company, Pittsburgh, Pennsylvania.

a. Type - "Bitumastic Super Service Black."

2. Substitutions - under provisions of Division 01 – General Requirements.

PART 3 - EXECUTION

3.1 PROTECTION AND RESTORATION

A. See Section 31 20 00 – Earth Moving.

B. General

1. Provide support systems (e.g. sheeting, shoring, etc.)as required, at no increase to Contract Sum.

a. Trench Shields or Boxes - Exercise care during movement to prevent utility displacement.

b. Remove timber support system as backfill proceeds.

2. Seal pipes when construction is not in progress with temporary watertight appurtenances (e.g. stoppers, caps, plugs) to prevent entrance by foreign materials, ground water, earth and debris; at no increase to the Contract Sum.

3.2 CLEARING

A. See Section 31 11 00 – Clearing and Grubbing.

3.3 DEWATERING, EXCAVATION, OVER-EXCAVATION AND UNSUITABLE MATERIAL

A. See Section 31 11 00 – Clearing and Grubbing.

B. Remove large stones or other hard matter which could damage pipe or impede consistent backfilling or compaction.

3.4 PIPE

A. General

1. Install in accordance with pipe Manufacturer's installation instructions and as Specified.
2. Inspect the following for defects:

a. Each pipe length/piece.
b. Pipe joint materials.

3. Immediately remove defective products from project site at no increase to the Contract Sum.
4. Install pipe to horizontal and vertical alignment indicated on the Contract Drawings.
5. Begin installation at lowest system elevation and proceed up-grade.
6. Field Pipe Cutting:

a. Field cut pipe only where required to complete structure-to-structure or structure-to-end of pipe sections.
b. Cut pipe to smooth square ends with equipment designed for cutting pipe.

7. Mark locations of pipe at building tie-in locations with painted stakes protruding three feet above finished grade, marked "Storm Drain”.

B. Concrete Pipe

1. Modified tongue and groove pipe
2. Install with pipe tongue end pointing in flow direction.

3.5 Rubber Gasket Joints

A. Clean and lubricate joints, immediately prior to joining pipe, in accordance with Manufacturer's instructions.

B. Position each laying length in previously installed pipe and push or pull joint tightly together with mechanical device designed for pipe joining. Do not use an excavator or a backhoe unless fitted with a properly designed mechanical device as noted above.

C. Ductile Iron Pipe

1. See Section 33 10 00 – Water Utilities

3.6 STRUCTURES

A. Precast Concrete Structures

1. Precast Concrete Structure Base

a. Place granular foundation material on excavation subgrade and compact to elevation of outside bottom of structure base.
b. Install precast structure base on foundation material, level to 1/8 inch in five feet.

2. Clean and lubricate structure joints, immediately prior to installation, in accordance with Manufacturer's recommendations.
3. Install precast sections on structure base, plumb to 1/8 inch in five feet.
4. Position each section on previously installed section and push joints tightly together.
5. Position top section on structure as indicated on Drawings or required by job site conditions.
6. Install frame and grate to finished grade, with sewer brick and cement mortar specified.
7. Pipe Connections

a. Seal joints between pipes and structures with brick and cement mortar specified.
b. Neatly cut pipes flush with interior structure walls.

8. Invert Flow Channels

a. Construct invert flow channels smooth and semi-circular in shape.
b. Shape channels with horizontal circular curve radii tangent to incoming pipe (s) and out flowing pipe, as large as structure will permit.
c. Neatly form channels in structure base with sewer brick and cement mortar specified.

3.7 BACKFILL

A. See Section 31 20 00 – Earth Moving.

END OF SECTION 33 40 00

Set No._____

Project Manual
for
Construction of the

BCDC YOUTH DETENTION CENTER

at the
Baltimore City Detention Center
in the
Division of Pretrial Detention and Services (DPDS)

STATE OF MARYLAND
CONTRACT NO.: DPSCS KT-000-150-C01

5 FEBRUARY 2015

Department of Public Safety & Correctional Services
Stephen T. Moyer Secretary
David Bezanson, Assistant Secretary

Board of Public Works
Lawrence J. Hogan, Jr.,Governor
Peter Franchot, Comptroller
Nancy K. Kopp, Treasurer

Architect (A Joint Venture): **PSA-Dewberry + Penza Bailey Architects**

Joint Venture Prime / Contract Office
Penza Bailey Architects
401 Woodbourne Avenue
Baltimore, MD 21212

Joint Venture Prime / Security
PSA-Dewberry
401 SW Water Street #701
Peoria, IL 61602

Civil / Geotechnical / Environmental Engineer
EBA Engineering, Inc.
4813 Seton Drive
Baltimore, MD 21215

Structural Engineer
Hope Furrer Associates, Inc.
501 Fairmount Ave. Suite 205
Towson, MD 21286

Surveyor
Dewberry & Davis, LLC
3106 Lord Baltimore Drive
Baltimore, MD 21244

Mechanical / Plumbing / Elect. / IT / Telecom / MATV-CATV Fire Protection Engineer
Sidhu Associates, Inc.
11350 McCormick Drive #1000
Hunt Valley, MD 21031

Food Service / Laundry Consultant
R&R Designer, Inc.
5300 Holmes Run Parkway
Suite 1006
Alexandria, VA 22304

Landscape Architect
P.E.L.A. Design, Inc.
7400 York Road, Suite 403
Towson, MD 21204

Cost Estimator
Lewicki Estimating Services, Inc.
13600 Old Chatwood Place
Chantilly, VA 20151

Sustainability Consultant
TerraLogos Eco Architecture
2901 E. Baltimore Street, #300
Baltimore, MD 21224

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Bid documents are available only online from eMaryland Marketplace (eMM). Those are the only official documents to be used by Bidders for this Invitation for Bid (IFB). The Bidders shall print on their own stationary the required documents for submitting their bid (as Construction BID Form, Bid Proposal Affidavit, BID Bond, etc.) and submit to the Owner (DPSCS, Division of Capital Construction and Facilities Maintenance) in a sealed envelope which clearly indicates that it contains a sealed bid for this project with the bid due date and the name and address of the Bidder.

Minority Business Enterprises (MBEs) are encouraged to participate and respond to this request for Bid.

CONFORMED DOCUMENT 3 APRIL 2015: This project manual contains sections revised during bidding, and is published for the Contractor's convenience for use during construction. It does not replace the Contract Documents, which comprise the Bid Documents plus revisions issued as Addenda.

VOLUME 1

DIVISION 00 – BIDDING AND CONTRACT REQUIREMENTS

DIVISION 01 - GENERAL REQUIREMENTS

VOLUME 2

DIVISION 02 – EXISTING CONDITIONS

DIVISION 03 - CONCRETE

DIVISION 04 – MASONRY

DIVISION 05 – METALS

DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

VOLUME 3

DIVISION 08 - OPENINGS

DIVISION 09 - FINISHES

DIVISION 10 - SPECIALTIES

DIVISION 11 - EQUIPMENT

VOLUME 4

DIVISION 21 – FIRE SUPPRESSION

DIVISION 22 – PLUMBING

DIVISION 23 - HEATING VENTILATING AND AIR CONDITIONING

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DIVISION 27 - COMMUNICATIONS

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VOLUME 6

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Limited Hazardous Materials Survey

YOUTH DETENTION CENTER PROJECT
DPSCS #KT-000-110-C01
926 Greenmount Avenue
Baltimore, Maryland 21202

Prepared for:

Penza Bailey Architects
401 Woodbourne Avenue
Baltimore, Maryland 21212

Prepared by:

EBA Engineering, Inc.
4813 Seton Drive | Baltimore, MD 21215
(410) 358-7171 | www.ebaengineering.com

EBA Project No. 3532-01-000

December 24, 2014

LIMITED HAZARDOUS MATERIALS SURVEY

YOUTH DETENTION CENTER PROJECT
DPSCS #KT-000-110-C01
926 Greenmount Avenue
Baltimore, Maryland 21202

EBA Project No. 3532-01-000

December 24, 2014

Submitted To:

Laurie D. Dickeson, AIA, LEED AP, CSI CCS
Penza Bailey Architects
401 Woodbourne Avenue
Baltimore, Maryland 21212

Submitted By:

Sylvan Bonsignore Burch
Environmental Engineer
EBA Engineering, Inc.
4813 Seton Drive
Baltimore, Maryland 21215

Reviewed By:

Sherri D. Waldron
Project Manager
EBA Engineering, Inc.

Limited Hazardous Materials Survey
Youth Detention Center Project

Figures

Appendices

Acronyms

AC	Air Conditioner
ACBM	Asbestos-Containing Building Material
ACM	Asbestos-Containing Material
AHERA	Asbestos Hazard Emergency Response Act
AST	Aboveground Storage Tank
C&D	Construction & Demolition
CAA	Clean Air Act
CFC	Chlorofluorocarbon
CFL	Compact Florescent Light
CFR	Code of Federal Regulations
COMAR	Code of Maryland Annotated Regulations
CT	Ceiling Tile
EPA	Environmental Protection Agency
FT	Floor Tile
HCFC	Hydro Chlorofluorocarbons
HID	High Intensity Discharge
LBP	Lead-Based Paint
LF	Linear Feet
M	Miscellaneous
MDE	Maryland Department of the Environment
NESHAP	National Emission Standards for Hazardous Air Pollutants
NVLAP	National Voluntary Laboratory Accreditation Program
ODC	Ozone Depleting Compound
OSHA	Occupational Safety & Health Administration
PACM	Presumed Asbestos-Containing Material
PCB	Polychlorinated Biphenyl
PLM	Polarized Light Microscopy
PPM	Parts Per Million
RACM	Regulated Asbestos-Containing Material
S	Surfacing Material
SF	Square Feet
TEM	Transmission Electron Microscopy
TSCA	Toxic Substances Control Act
TSI	Thermal System Insulation
UST	Underground Storage Tank
UW	Universal Wastes
XRF	X-Ray Fluorescence

Executive Summary

EBA Engineering, Inc. (EBA) was retained by Penza Bailey Architects to perform a Limited Hazardous Materials Survey of the existing structures associated with the planned Youth Detention Center. The property involved in the planned project generally includes a group of connected structures (Dorm Building, Kitchen/Dining Room, Walk-in Refrigeration/Freezer Units, and Roofing Building) referred to as the Dorm Building, portions of the adjoining State Use Industries (SUI) Building, and portions of the grounds associated with these buildings.

The Dorm Building currently houses the Baltimore Pre-Release Unit (BPRU) program. This building is to be razed in association with the planned project. The planned project also includes renovation of the BPRU-occupied portion (i.e., the northern portion) of the SUI Building as well as certain non-BPRU occupied areas in the building. Lastly, portions of the grounds associated with the buildings will be affected by the planned project. The property (buildings and grounds) associated with the planned Youth Detention Center is hereafter collectively referred to as the Subject Property.

More specifically, the Subject Property included the following areas, identified by building.

Dorm Building:

- the interiors of the dormitory structure, the kitchen/dining room, walk-in refrigeration and freezer units, and the Roofing Building (currently used by OSTC for training);
- the exterior walls and roofing system(s) associated with the connected structures comprising the Dorm Building; and
- an area extending approximately 10 feet outward from the exterior walls of the connected structures comprising the Dorm Building.

SUI Building:

- the interior of the BPRU-occupied portion of the building;
- the interior of the Transportation Office;
- the interior of the former Penitentiary Accounting Office (currently occupied by a computer lab);
- the electrical and mechanical rooms located within the basement of the building;
- the exterior walls associated with the BPRU-occupied portion of the building;
- the portion of the roofing system overlying the BPRU-occupied portion of the building; and
- an area extending approximately 10 feet outward from the exterior walls associated with the BPRU-occupied portion of the building.

Floor plans of the surveyed areas notated with EBA-assigned room numbers are included in **Figure 1**. Photographs taken during the survey are included in **Appendix A**.

This Limited Hazardous Materials Survey was performed to identify hazardous materials that may be impacted when demolition and renovation activities occur. The hazardous materials of concern include Asbestos-Containing Building Materials (ACBMs), Lead-Based Paints (LBPs), liquid phase Polychlorinated Biphenyls (PCBs), Ozone-Depleting Compounds (ODCs), Universal Wastes (UW) and Miscellaneous Materials (MM).

The results of the survey, performed on June 16, 2014 through June 25, 2014, have identified hazardous materials at the Subject Property. A quality assurance and quality control (QA/QC) visit was also performed on July 25, 2014 to verify the field findings and collect additional samples where deemed necessary. The following sections summarize EBA's findings.

Asbestos-Containing Building Materials

The results of the survey have identified asbestos-containing building materials at the Subject Property. A summary of the asbestos-containing building materials (material types and quantities) is provided in the following **Table**. The table also contains a column for information indicating whether or not the material is a regulated asbestos-containing material (RACM) per federal regulations.

Quantities of ACBMs			
Material Type	**Quantity**	**Unit of Measure**	**RACM***
Caulk (Multiple Types)	8,775	Linear Feet	No
Sidewalk Expansion Joint (OM14)	125	Linear Feet	No
Transite Window Insert (OM17) (Referred to as "Insulated Wall Panels" on As-Built Drawings)	3,000	Square Feet	No
Window Glaze (Multiple Types)	5,100	Linear Feet	Yes
Plaster Ceiling (S3)	2,650	Square Feet	Yes
Floor Tile (Multiple Types)	35,585	Square Feet	Yes
Floor Tile Mastic (Multiple Types)	41,835	Square Feet	No
Fitting (Multiple Types) (Tested and Presumed)	438	Each	Yes
Joint Compound (DW/JC1)	22,270**	Square Feet	Yes
Spray Applied Column Fireproofing (Presumed)	3,000	Square Feet	Yes
Vibration Dampener (Assumed)	3	Each	No
Fire Door (Assumed)	173	Each	Yes
Valve Packing (Assumed)	21	Each	No
Cement Asbestos Panel Board (Assumed)	1,100	Square Feet	Yes
Built-Up Roofing System (Assumed)	27,000	Square Feet	No
1" Plaster Fireproofing (Presumed)	1,000	Square Feet	Yes
8" Transite Piping (Assumed)	50	Linear Feet	No

Quantities of ACBMs			
Material Type	**Quantity**	**Unit of Measure**	**RACM***
Caulk Between Masonry and Steel (Assumed)	Unknown	Linear Feet	No
Pipe Insulation (Presumed)	2,100	Linear Feet	Yes

*RACM – Regulated Asbestos-Containing Material
**The quantity listed for joint compound is the estimated quantity of drywall observed at the Subject Property, as the joint compound cannot be economically separated from the wall system.

The spray applied fire column fireproofing, illustrated on as-built drawings on vertical columns, was presumed to contain asbestos. This material was presumed to contain asbestos (rather than sampled/tested), as sampling would have required significant disassembly/dismantling of column enclosures to access and collect samples of the suspected material. Further, the 1" plaster fireproofing (illustrated on as-built drawings covering a horizontal beam in the dining room) was presumed to contain asbestos, as it was not identified during the survey but is assumed to be present at the Subject Property.

The fire doors, valve packings, cement asbestos panel boards, and certain caulk (illustrated on as-built drawings at joints between masonry and steel) were assumed to contain asbestos. These materials were assumed to contain asbestos (rather than sampled/tested), as sampling posed safety risks and/or would have required significant disassembly/dismantling of equipment/building components to access and collect samples of the suspect materials. The vibration dampeners and roofing systems were assumed to contain asbestos as sampling would have damaged the materials and affected their integrity. An 8" transite pipe, illustrated on as-built drawings as buried underground, was assumed to contain asbestos as subsurface exploration for hazardous materials was not included in the scope of work for this project.

It may be cost effective to have these materials sampled and analyzed at an appropriate time so that they can be definitively classified as asbestos-containing building materials. The most appropriate time to sample these materials is typically after the project has been turned over to the demolition and renovation contractor, and dismantling for investigative purposes can occur without consideration for damage to equipment/building components.

The EPA requires that regulated asbestos-containing material be removed before demolition and renovation activities begin. Since demolition and renovation is planned for the Subject Property, proposed demolition and renovation techniques are unknown at this time, and recycling of materials may or may not be performed, it is recommended that all ACM be removed to prevent the potential release of fibers.

The OSHA "Asbestos in Construction Standard" (29 CFR 1926.1101) imposes restrictions on the disturbance of asbestos during demolition, remodeling, and renovation activities.

Removal of the following items identified in the building are considered Class I asbestos work by the OSHA regulation:

- Plaster Ceiling (S3)
- 6” Fitting (TSI1)
- 6” Fitting (TSI2)
- 1” Fitting (TSI3)
- ¾“ Fitting (TSI4)
- 4” Fitting (TSI5)
- Spray Applied Column Fireproofing (Assumed)
- 1” Plaster Fireproofing (Assumed)

Removal of the following items identified in the building are considered Class II asbestos work by the OSHA regulation:

- Door/Window Caulk (OM1)
- Door Caulk (OM10)
- Window Caulk (OM11)
- Expansion Joint (OM14)
- Window Caulk (OM16)
- Window Insert (OM17)
- Window Glaze (OM19)
- Window Glaze (OM20)
- Window Caulk (OM21)
- Floor Tile (FT1)
- Floor Tile Mastic (FT1)
- Floor Tile Mastic (FT2)
- Floor Tile Mastic (FT3)
- Floor Tile Mastic (FT4)
- Floor Tile (FT5)
- Floor Tile Mastic (FT5)
- Floor Tile (FT7)
- Floor Tile Mastic (FT7)
- Floor Tile (FT8)
- Floor Tile Mastic (FT8)
- Floor Tile (FT9)
- Floor Tile Mastic (FT9)
- Floor Tile Mastic (FT13)
- Floor Tile (FT14)
- Floor Tile Mastic (FT14)
- Floor Tile (FT15)
- Floor Tile Mastic (FT15)
- Joint Compound (DW/JC1)
- Transite Window Insert (Insulated Wall Panels) (OM17)

- Vibration Dampener (Assumed)
- Fire Door (Assumed)
- Valve Packing (Assumed)
- Cement Asbestos Panel Board (Assumed)
- Built-Up Roof (Assumed)
- 8" Transite Piping (Assumed)
- Caulk Between Masonry and Steel (Assumed)

Class I and Class II asbestos work must be performed by trained employees using work practices required by the OSHA standard.

Lead-Based Paints

Lead-based paints (LBP) were identified throughout the Subject Property atop exterior and interior building components. Specifically, LBP was identified on the following substrate categories: concrete, metal, wood, and vinyl. In addition, lead-containing paints (i.e., paints containing lead but at concentrations less than the threshold for lead-based paint) were identified on various surfaces. The presence of lead in paint in any concentration triggers OSHA regulatory standards (29 CFR 1926.62) and the presence of lead-based paint triggers EPA regulatory standards.

Demolition debris with LBP may be disposed of as non-hazardous provided the material is not classified as a hazardous waste in accordance with 40 CFR Part 261 and SW-846 (Test Methods for Evaluating Solid Waste Physical/Chemical). Metal objects coated with LBP can be recycled.

Liquid Polychlorinated Biphenyls

EBA identified the following types of equipment suspected of containing liquid phase Polychlorinated Biphenyls (PCBs) at the Subject Property.

Quantities for Equipment Containing PCBs		
Equipment Type	**Quantity**	**Unit of Measure**
Ballast	506	Each
Transformer	2	Each

EBA inspected a portion of the light ballasts at the Subject Property. Based on the absence of a "No-PCBs" stamp, EBA identified one type of ballast suspected of containing PCBs. Further, the inspection included only a portion of the ballasts present at the Subject Property, and the uninspected ballasts are also considered to be suspect at this time. An approximate number of suspect ballasts are listed in the previous **Table**.

Ballasts marked as "No PCBs" can be disposed of as non-hazardous waste. Ballasts lacking the "No PCBs" mark should be removed and disposed of in accordance with EPA's Toxic Substances Control Act (TSCA), 40 CFR Part 761. If an unmarked ballast is not leaking, the associated lighting fixture does not require special handling or disposal. If an unmarked ballast is leaking, any material impacted by the leak should be

treated as hazardous waste. Containers storing unmarked ballasts must be labeled in accordance with EPA labeling requirements specified in 40 CFR Part 262 Subpart C.

EBA identified two exterior pad-mounted transformers situated on the southwest corner of the Subject Property adjacent to the west wall of the northern portion of the SUI Building. Both transformers are owned and operated by Baltimore Gas and Electric Company (BGE). The transformers were not labeled with a PCB classification. If the transformers will need to be removed as a result of the demolition and renovation activities, BGE should be contacted to arrange for their removal.

Ozone-Depleting Compounds

EBA identified several types of equipment suspected of containing Ozone-Depleting Compounds (ODCs) at the Subject Property, as identified in the following **Table**.

Quantities for Equipment Containing ODCs		
Equipment Type	**Quantity**	**Unit of Measure**
Water Fountain	4	Each
Ice Machine	2	Each
Commercial Chiller Unit	2	Each
Household Refrigerator / Freezer	5	Each
Window Air Conditioning Unit	23	Each

Under EPA's rule, refrigerant must be recovered from equipment that is typically dismantled on-site before disposal (e.g., retail food refrigeration, central residential air-conditioning, chillers, and industrial process refrigeration) in accordance with the EPA's requirements for servicing.

Equipment that typically enters the waste stream with the charge intact (e.g., motor vehicle air conditioners, household refrigerators, household freezers, and room air conditioners) is subject to special safe disposal requirements. Under the safe disposal requirements, the final person in the disposal chain (e.g., a scrap metal recycler or landfill owner) is responsible for ensuring that refrigerant is recovered from equipment before the final disposal of the equipment. However, persons "upstream" can remove the refrigerant and provide documentation of its removal to the final person if this is more cost-effective. If the final person in the disposal chain (e.g., a scrap metal recycler or landfill owner) accepts appliances that no longer hold a refrigerant charge, that person is responsible for maintaining a signed statement from whom the appliance(s) is being accepted. The signed statement must include the name and address of the person who recovered the refrigerant, and the date that the refrigerant was recovered, or a copy of a contract stating that the refrigerant will be removed prior to delivery.

Universal Wastes

Universal wastes were identified at the Subject Property in the form of 4', 8', and U-shaped fluorescent light tubes, HID bulbs, CFLs, halogen bulbs, a thermostat, and lead-

acid batteries. The types of universal wastes observed and the recorded quantities are provided in the following **Table**.

Quantities for Universal Waste		
Equipment Type	**Quantity**	**Unit of Measure**
4' Fluorescent Tube	1,254	Each
8' Fluorescent Tube	23	Each
U-Shaped Fluorescent Tube	50	Each
HID Bulb	94	Each
CFL Bulb	67	Each
Halogen Bulb	30	Each
Thermostat	1	Each
Lead-Acid Battery	62	Each

All universal waste is to be placed in a container that is structurally sound, will prevent damage to the contents, is compatible with its contents, and will be kept closed at all times (except when adding items to or removing items from the container). The container must be without damage, or evidence of spillage, that could lead to leakage of the waste contained inside. The disposal of hazardous waste is outlined in the EPA regulations in 40 CFR Part 260 and in Maryland regulations in COMAR Title 26, Subtitle 13.

Miscellaneous Materials

EBA identified the following miscellaneous materials at the Subject Property.

Quantities for MMs		
Equipment Type	**Quantity**	**Unit of Measure**
Fire Extinguisher	30	Each
Lead Vent Pipe	5	Each
Generator	1	Each
Aboveground Fuel Storage Tank	1	Each
Underground Fuel StorageTank	2	Each
Underground Automobile Lift / Hydraulic Reservoir(s)	1	2-Post Lift

The fire extinguishers observed within the Subject Property, if permanently removed from service, should be disposed of in accordance with the publication "Guide to the Disposal of Condemned Fire Extinguishers" published by the Fire Extinguishing Trades Association, Fact File No. 108, dated February 2004.

Non-coated/non-painted vent pipes observed on the roof of the Subject Property contain lead. The disposal of these lead-containing items is regulated by the EPA in 40 CFR 261.

An emergency generator with an internal fuel tank was observed at the Subject Property. If the generator is removed from service as part of the planned project it is recommended that the contents of the internal fuel tank be drained, containerized, and

disposed of in accordance with federal and state regulations prior to the removal of the generator.

An aboveground fuel storage tank was observed at the Subject Property. If the tank is removed from service as part of the planned project it is recommended that it be removed in accordance with MDE recommended guidance practices.

An operational underground fuel storage tank was identified at the Subject Property. Further, a historically-operated underground fuel storage tank was identified. Use of the tank was reportedly terminated in the past; however, it is not known if this tank was removed or closed in place. If the operational tank is removed from service as part of the planned project and/or if the historic tank is discovered during demoltion/future development activities, it is recommended that the tank(s) be removed in accordance with federal and state regulations.

A two-post underground automobile lift was illustrated on drawings inside the Roof Building (a former automotive repair garage). EBA could not determine if the lift components and/or possible associated hydraulic reservoirs are still present, and no staff member could provide information related to the lifts. If the lifts and/or any associated hydraulic reservoirs are discovered during demolition/future development activities, it is recommended that these items be removed in accordance with federal and state regulations.

END OF SECTION

1.0 Introduction

Interior and exterior areas of the Subject Property were inspected to identify certain potentially hazardous materials that may be affected by demolition and renovation activities. Specifically, the hazardous materials of concern for this type of project include Asbestos-Containing Building Materials, Lead-Based Paints, Liquid Polychlorinated Biphenyls, Ozone-Depleting Compounds, Universal Wastes, and Miscellaneous Materials.

Floor plans provided to EBA for the Subject Property have been notated with room numbers assigned by EBA during the survey and are included in **Figure 1**. These notated floor plans are used in conjunction with the Hazardous Materials Summary Table provided in **Figure 2** to identify the locations, by room number, of the hazardous materials at the Subject Property. Photographs taken during the survey are included in **Appendix A**.

1.1 Asbestos-Containing Building Materials

Asbestos means the asbestiform varieties of chrysotile, crocidolite, amosite, anthophyllite, tremolite, and actinolite. Asbestos-containing materials (ACM) means any material or product which contains greater than one percent (1%) asbestos. Asbestos-containing building materials (ACBM) means ACM that is found in or on interior structural members or other parts of a building. ACBM is divided into three categories in the EPA regulations (40 CFR Part 763). These categories are thermal system insulation, surfacing materials, and miscellaneous materials. Each category is generally described as follows:

- Thermal System Insulation (TSI) includes those materials applied to pipes, fittings, boilers, breeching tanks, ducts, or other interior/exterior structural components to prevent heat loss or gain, or water condensation, or for other purposes of maintaining temperatures.
- Surfacing (S) Materials include those materials sprayed on, troweled-on, or otherwise applied to surfaces, such as acoustical plaster on ceilings and fireproofing materials on structural members, or other materials on surfaces for acoustical, fireproofing, or other purposes.
- Miscellaneous (M) Materials include interior/exterior building material on structural components, structural members or fixtures, such as roofing, floor and ceiling tiles, caulks, mastics/adhesives, and does not include surfacing material or thermal system insulation.

The EPA requires that Regulated Asbestos-Containing Materials (RACM) be removed before demolition/renovation begins in accordance with the “National Emission Standards for Hazardous Air Pollutants” (NESHAP) 40 CFR Part 61. The State of Maryland also regulates the removal/abatement of asbestos in buildings (COMAR 26.11.21).

RACM includes the following:

- Friable asbestos material;
- Category I non-friable ACM (flooring, asphalt roofing, packings, gaskets) that has become friable;
- Category I non-friable ACM that will be or has been subjected to sanding, grinding, cutting, or abrading; and
- Category II non-friable ACM that has a high probability of becoming or has become crumbled, pulverized, or reduced to powder by the forces expected to act on the material in the course of demolition or renovation operations regulated in 40 CFR 61 Subpart M.

Asbestos is further classified as either 'Friable' or 'Non-Friable'. Friable asbestos material is defined as any material containing more than 1% asbestos that, when dry, can be crumbled, pulverized or reduced to powder by hand pressure. Non-friable asbestos materials are subcategorized as Category I and Category II, where Category I materials include resilient floor covering, asphalt roofing products, packings, and gaskets. Category II materials include all other non-friable asbestos-containing materials.

1.2 Lead-Based Paints

The Maryland Department of the Environment (MDE) definition of lead-based paint (LBP) is used as the basis for this screening. Lead-based paint is defined as paint or coating that contains lead at a concentration greater than 0.7 milligrams per square centimeter, as determined by an X-Ray Fluorescence (XRF) instrument.

XRF is a common quantitative analytical technique used to measure the concentration of elements in solid or liquid materials. In this technique, the sample is bombarded by some form of ionizing radiation such as X-rays, or gamma-rays, which can cause the atoms of the sample to emit characteristic X-rays. These characteristic X-rays from the sample, known as the fluorescent X-rays, can be detected and analyzed to provide information as to what concentration of atoms are contained in the sample. Since this technique does not harm the sample in any way, it is considered a nondestructive testing technique.

Lead-based paint is also defined by the MDE as paint chips containing greater than 0.5% lead by weight, as determined through laboratory analysis (Method SW846-7420). Since removal of paint chips from the substrate are required, this method is considered a destructive testing technique.

1.3 Liquid Polychlorinated Biphenyls

Polychlorinated Biphenyls (PCBs) are mixtures of synthetic organic chemicals with the same basic chemical structure and similar physical properties ranging from oily liquids to waxy solids. They are produced by attaching one or more chlorine atoms to a

biphenyl molecule. Due to their non-flammability, chemical stability, high boiling point and electrical insulating properties, PCBs were used in hundreds of industrial and commercial applications including electrical, heat transfer, and hydraulic equipment; as plasticizers in paints, plastics and rubber products; in pigments, dyes and carbonless copy paper; and in many other applications. More than 1.5 billion pounds of PCBs were manufactured in the United States prior to cessation of production in 1977 (EPA, 2005).

Concern over the toxicity and occurrence in the environment of PCBs led Congress in 1976 to enact §6(e) of the Toxic Substances Control Act (TSCA) that included among other things, prohibitions on the manufacture, processing, and distribution in commerce of PCBs. Thus, TSCA legislated true "cradle to grave" (i.e., from manufacture to disposal) management of PCBs in the United States (EPA, 2005).

PCB content has been categorized into three classifications by the federal government. Electrical equipment that contains less than 50 parts per million (ppm) of PCBs is defined as non-PCB. Electrical equipment that contains between 50 ppm and less than 500 ppm of PCBs is defined as PCB-contaminated. Electrical equipment with a PCB content of 500 ppm and greater is classified as PCB.

PCBs were commonly sold in the United States of America under the trade name "Arocolor." However, companies that used PCBs in the manufacture of transformers and capacitors often used other trade names. According to the EPA, electrical light ballasts manufactured prior to July 1978 have a greater than 50% chance of containing PCBs at concentrations of 50 ppm or greater. Ballasts manufactured after July 1978 are required to bear a “No PCB” label indicating they do not contain PCBs.

This study did not include inspection or testing for non-liquid PCBs.

1.4 Ozone-Depleting Compounds

Ozone-depleting compounds (ODCs) are generally small organic molecules (less than three carbons) that contain chlorine, fluorine, or bromine. Some uses of ODCs include refrigerants, fire suppressants, and cleaning compounds. Title VI of the United States Clean Air Act Amendments (CAA) of 1990 has classified ozone-depleting substances as belonging to Class I substances (most harmful) or Class II substances (less harmful).

Class I substances are those with an ozone-depletion potential of 0.2 or higher. Class I substances identified in Title VI are chlorofluorocarbons (CFCs), halons, carbon tetrachloride and 1,1,1-trichloroethane (methyl chloroform). These chlorine-based chemicals account for about 80 percent of ozone depletion.

Class II substances are those with an ozone-depletion potential less than 0.2. Currently, all of the hydro chlorofluorocarbons (HCFCs), which are replacing the more harmful ozone-depleting compounds, are listed as Class II substances.

Effective July 1, 1992, Section 608 of the CAA prohibits individuals from knowingly venting ozone-depleting compounds (generally CFCs and HCFCs) used as refrigerants into the atmosphere while maintaining, servicing, repairing, or disposing of air-conditioning or refrigeration equipment.

1.5 Universal Wastes

A universal waste is a common product/material, found in considerable quantities, that exhibits low-level hazards. Universal wastes include batteries, pesticides, mercury-containing equipment, and bulbs/lamps. All universal waste must be handled in a way as to prevent the release of the hazardous substance into the environment, contained in a secure manor, labeled, and safely transported to a destination facility. Definitions of universal waste are detailed in 40 CFR 273.9, and general descriptions of universal wastes are provided as follows.

A battery is an electrochemical cell that receives, stores, and delivers electric energy. Batteries can be disassembled into cells before removal and transportation as described in 40 CFR 273.13 (small quantity handlers) and 40 CFR 273.33 (large quantity handlers).

In general, there are several types of batteries, including primary and secondary. Primary batteries are most common in households and are known as single-use batteries. Primary batteries automatically convert chemical energy into electrical energy using zinc and manganese chemistry. Secondary batteries are known as re-chargeable batteries. Recharging occurs when electrical current is applied to the battery, reversing the chemical reaction that occurs during battery use. Secondary batteries are usually composed of nickel cadmium, nickel metal hydride or lithium ion chemistry. Lead-acid batteries are the oldest type of the secondary batteries and are typically used to power vehicles.

Pesticides include any substance/chemical designed to control and manage pests.

Mercury-containing equipment includes a device or part of a device (including thermostats, but excluding batteries and bulbs/lamps) that contains elemental mercury integral to its function. Thermostats are typically used to control a heating or cooling system. A thermostat is an electro-mechanical on/off switch that is activated by temperature changes. The sensing element is usually a spiral bimetallic strip that coils and uncoils in response to temperature changes because of differential expansion of the two bonded metals. In a mercury-switch thermostat, a ball of mercury rolls between contacts in one or more sealed glass ampoules, which are attached to a metal strip. The switch works when the mercury makes or breaks an electrical circuit, which creates a signal for heating or cooling from a furnace or central air conditioning system. Each glass ampoule contains approximately three grams of mercury, which is approximately the size of a dime. Mercury's unique properties, high conductivity, high surface tension and liquidity at room temperature, have made it a useful component in many electric switches.

A bulb/lamp, also referred to as a universal waste lamp, is the bulb or tube portion of an electric lighting device specifically designed to produce radiant energy. Examples of common universal waste lamps include, but are not limited to, fluorescent, high intensity discharge, neon, mercury vapor, high pressure sodium, and metal halide lamps.

1.6 Miscellaneous Materials

Other hazardous materials that may be present include fuels and hazardous substances stored in aboveground and underground storage tanks, pressurized cylinders, paints, lubricants, degreasers, cleaning compounds, and other potentially hazardous materials in quantities greater than 5-gallons.

1.7 Limitations and Exclusions

The following limitations and exclusions apply to this project:

- Interior areas within the OSTC-occupied portion of the SUI building that will be affected by the installation of new fire alarms were not surveyed and included under this cover.
- Areas above and behind fixed substrates (e.g., plaster, drywall, masonry block, concrete, etc.) were not accessed as the survey was limited to non-intrusive measures due to the occupied nature of the property.
- Sampling of energized components was not performed due to risk of electrical hazards.
- Sampling of roofing systems was not conducted in order to avoid damage to the systems.
- Quantities of hazardous materials identified herein are approximate at the time of this report. Quantities may change in the future due to daily operations at the Subject Property.
- The conclusions presented in this report are based on the visual findings observed on the dates of the survey.
- Subsurface investigation/exploratory measures were not included in the scope of work for this project.
- One room was inaccessible during the survey. The room has been excluded from the findings and is listed as room number 107 in **Figure 1**.

END OF SECTION

2.0 Asbestos-Containing Building Materials

The National Emission Standard for Hazardous Air Pollutants (NESHAP) requires the building owner/operator to perform an asbestos inspection of affected portions of the facility prior to demolition and renovation activities.

Asbestos Hazard Emergency Response Act (AHERA) accredited Asbestos Inspectors performed an asbestos inspection of accessible interior and exterior portions of the Subject Property. Certificates of the inspectors are included in **Appendix B.**

2.1 Inspection and Analytical Methodology

The inspection consisted of performing a records review followed by an investigation to identify suspect asbestos-containing building materials (ACBM) in accessible building areas. The inspection was non-intrusive (i.e., the inspection did not include accessing areas behind walls, above hard ceilings, below hard floors, or behind other hard substrate).

2.1.1 Records Review

A records review consists of reviewing previous asbestos inspection/survey reports, abatement records and/or site drawings, if available, associated with the facility.

2.1.2 On-site Investigation

The on-site investigation involved a combination of visual assessments and minimally destructive sampling methodologies. Visual assessments primarily focused on identifying suspect materials to be assessed during the survey. Sampling was only conducted where suspect ACBM was identified. Where possible, samples were collected from inconspicuous locations. Samples from suspect friable materials were patched in a manner to limit the release of potential asbestos fibers; however, these locations were not permanently repaired.

2.1.3 Sample Collection and Analysis

EBA collected samples of materials that were suspected of containing asbestos in accordance with the Asbestos Hazard Emergency Response Act (AHERA) (40 CFR 763 Subpart E). All areas of surfacing materials, thermal system insulation materials, or miscellaneous materials that were uniform in color and texture were grouped into homogeneous areas and sampled according to the AHERA asbestos sampling protocol as shown in the following **Table**.

Table – AHERA Asbestos Sampling Protocol Per Category		
Surfacing Materials	**Thermal System Insulation**	**Miscellaneous Materials**
3 samples per area ≤ 1,000 ft²	3 samples for each TSI material	Sample in a manner sufficient to determine (Note – EBA's Standard Operating Procedure is to collect at least 2 samples per homogenous area)
5 samples per area > 1,000 ft² but ≤ 5,000 ft²	1 sample per area of patched insulation (<6 linear or square feet)	
7 samples per area > 5,000 ft²	Sample in a manner sufficient per mechanical system not assumed to be ACBM where cement or plaster is used on fittings such as tees, elbows, or valves	

Samples were submitted to AMA Analytical Services, Inc. (AMA) for analysis by Polarized Light Microscopy (PLM) in accordance with the EPA Method for the Determination of Bulk Asbestos Samples (EPA 600M4-82-020). In the event sample results were reported as "trace" by the PLM method, further analysis would be performed by Transmission Electron Microscopy (TEM). AMA is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP) for the analysis of bulk asbestos by PLM and bulk asbestos by TEM.

2.2 Results

2.2.1 Records Review

The following drawings were made available by Penza Bailey Architects for review.

- Central Office and Storage Building for the State use Industries at the Maryland Penitentiary, Office of John A. Ahlers, Project No. K-611, January 1964 (SUI Building)
    - The following components listed on the drawings within the limits of planned renovation were/are suspect asbestos-containing building materials.
        - Vinyl Asbestos (Floor)
        - Asphalt Tile (Floor)
        - White Plaster (Ceiling)
        - Sand Finished Plaster (Ceiling)
        - Acoustical Plaster (Ceiling)
        - Caulk Joints Between Masonry and Steel
        - 2” Fire Proofing Cover on Beams
        - 8” Transite Pipe Run
- Vocational Rehabilitation Center, Maryland Penitentiary, Wrenn, Lewis and Jencks Architects, Project No. K-611-685, June 1969 (Dorm Building)
    - The following components listed on the drawings were/are suspect asbestos-containing building materials.

- Vinyl Asbestos Tile Treads and Risers
- Insulated Wall Panels (Exterior Walls Above and Under Windows)
- Cement Asbestos Panel Board
- Resilient Tile
- Suspended Acoustical Tile
- Caulk
- Built-Up Roof
- 1" Plaster Fireproofing

- Conversion of Central Office to Work Release Housing, Lapicki-Smith, Project No. K-611-751-(3), May 1977 (Dorm Building and SUI Building)

  - The following components listed on the drawings within the limits of planned renovation were/are suspect asbestos-containing building materials.

    - Fireproofing on Columns
    - Plaster on Columns

- Occupational Skills Training Center, Gaudreau, Inc., Project No. ED-000-881-001, February 1991 (SUI Building)

  - No suspect asbestos-containing building materials were identified within the limits of the planned renovation during the review of these drawings.

Appendix C includes portions of the drawings referencing the suspect asbestos-containing building materials. Where observed and accessible, the suspect materials identified on the drawings were inspected and sampled. If the materials were not accessible or were not observed due to obstructions, they were treated as assumed or presumed asbestos-containing building materials.

2.2.2 On-site Investigation and Sampling Results

As a result of the inspection, suspect ACBMs were identified within the Subject Property. Samples of suspect materials were collected and analyzed by a certified laboratory. As a result of the sampling and laboratory analysis, ACBMs were identified and are provided in the following **Table**. The table also contains a column for information indicating whether or not the material is a regulated asbestos-containing material (RACM) per federal regulations.

Summary of Laboratory Analytical Results							
Sample No.	**Material Description**	**Color**	**Location**	**Category***	**Friable (Yes/No)**	**PLM Analysis**	**RACM**
3532-6-23-01	Window Insert Caulk – OM16	Black	Exterior – Dorm Building	M	No	2% Chrysotile	No
3532-6-23-02	Window Insert Caulk – OM16	Black	Exterior – Dorm Building	M	No	2% Chrysotile	No
3532-6-23-05	Expansion Joint – OM14	Black	Exterior – SUI Building	M	No	2% Chrysotile	No
3532-6-23-06	Expansion Joint – OM14	Black	Exterior – SUI Building	M	No	2% Chrysotile	No
3532-6-23-07	Door Caulk – OM10	Gray	Exterior – SUI Building	M	No	2% Chrysotile	No
3532-6-23-08	Door Caulk – OM10	Gray	Exterior – SUI Building	M	No	2% Chrysotile	No
3532-6-23-09	Transite Window Insert – OM17	Gray	Exterior – Dorm Building	M	No	15% Chrysotile	No
3532-6-23-10	Transite Window Insert – OM17	Gray	Exterior – Dorm Building	M	No	15% Chrysotile	No
3532-6-23-13	Window Glaze – OM19	White	Exterior – Dorm Building	M	Yes	2% Chrysotile	Yes
3532-6-23-14	Window Glaze – OM19	White	Exterior – Dorm Building	M	Yes	2% Chrysotile	Yes
3532-6-23-15	Window Glaze – OM20	White	Exterior – Dorm Building (Roofing Building)	M	Yes	2% Chrysotile	Yes
3532-6-23-16	Window Glaze – OM20	White	Exterior – Dorm Building (Roofing Building)	M	Yes	2% Chrysotile	Yes
3532-6-23-17	Window Caulk – OM21	White	Exterior – Dorm Building (Roofing Building)	M	No	2% Chrysotile	No
3532-6-23-18	Window Caulk – OM21	White	Exterior – Dorm Building (Roofing Building)	M	No	2% Chrysotile	No
3532-6-23-21	Window Caulk – OM11	White	Exterior – SUI Building	M	No	2% Chrysotile	No
3532-6-23-22	Window Caulk – OM11	White	Exterior – SUI Building	M	No	2% Chrysotile	No
3532-6-24-51	Door/Window Caulk – OM1	Off-White	Room 27	M	No	2% Chrysotile	No
3532-6-24-52	Door/Window Caulk – OM1	Off-White	Room 2	M	No	2% Chrysotile	No
3532-6-24-71 (Texture)	Plaster Ceiling – S3	White	Room 73	S	No	10% Chrysotile	Yes
3532-6-24-72 (Texture)	Plaster Ceiling – S3	White	Room 73	S	No	10% Chrysotile	Yes
3532-6-24-73 (Texture)	Plaster Ceiling – S3	White	Room 74	S	No	10% Chrysotile	Yes

Summary of Laboratory Analytical Results							
Sample No.	**Material Description**	**Color**	**Location**	**Category***	**Friable (Yes/No)**	**PLM Analysis**	**RACM**
3532-6-24-74 (Texture)	Plaster Ceiling – S3	White	Room 75	S	No	10% Chrysotile	Yes
3532-6-24-79 (Floor Tile)	Floor Tile 12X12– FT1	Cream	Room 9	M	No	2% Chrysotile	Yes
3532-6-24-79 (Mastic)	Floor Tile Mastic – FT1	Black	Room 9	M	No	2% Chrysotile	No
3532-6-24-80 (Floor Tile)	Floor Tile 12X12– FT1	Cream	Room 15	M	No	2% Chrysotile	Yes
3532-6-24-80 (Mastic)	Floor Tile Mastic – FT1	Black	Room 15	M	No	3% Chrysotile	No
3532-6-24-82 (Mastic)	Floor Tile Mastic – FT2	Black	Room 13	M	No	5% Chrysotile	No
3532-6-24-83 (Mastic)	Floor Tile Mastic – FT3	Black	Room 23	M	No	5% Chrysotile	No
3532-6-24-84 (Mastic)	Floor Tile Mastic – FT3	Black	Room 22	M	No	5% Chrysotile	No
3532-6-24-86 (Mastic)	Floor Tile Mastic – FT4	Black	Room 23	M	No	4% Chrysotile	No
3532-6-24-87 (Floor Tile)	Floor Tile 12X12– FT5	Tan	Room 47	M	No	2% Chrysotile	Yes
3532-6-24-87 (Mastic)	Floor Tile Mastic – FT5	Black	Room 47	M	No	4% Chrysotile	No
3532-6-24-88 (Floor Tile)	Floor Tile 12X12– FT5	Tan	Room 36	M	No	2% Chrysotile	Yes
3532-6-24-88 (Mastic)	Floor Tile Mastic – FT5	Black	Room 36	M	No	5% Chrysotile	No
3532-6-24-91 (Floor Tile)	Floor Tile 12X12– FT7	Cream	Room 63	M	No	5% Chrysotile	Yes
3532-6-24-92 (Floor Tile)	Floor Tile 12X12– FT7	Cream	Room 96	M	No	5% Chrysotile	Yes
3532-6-24-92 (Mastic)	Floor Tile Mastic – FT7	Black	Room 96	M	No	2% Chrysotile	No
3532-6-25-93 (Floor Tile)	Floor Tile 9X9 – FT8	Cream	Room 68	M	No	5% Chrysotile	Yes
3532-6-25-93 (Mastic)	Floor Tile Mastic – FT8	Black	Room 68	M	No	2% Chrysotile	No
3532-6-25-94 (Floor Tile)	Floor Tile 9X9 – FT8	Cream	Room 83	M	No	2% Chrysotile	Yes
3532-6-25-95 (Floor Tile)	Floor Tile 9X9 – FT9	Cream	Room 68	M	No	2% Chrysotile	Yes
3532-6-25-95 (Mastic)	Floor Tile Mastic – FT9	Black	Room 68	M	No	2% Chrysotile	No
3532-6-25-96 (Floor Tile)	Floor Tile 9X9 – FT9	Cream	Room 68	M	No	2% Chrysotile	Yes
3532-6-25-96 (Mastic)	Floor Tile Mastic – FT9	Black	Room 68	M	No	2% Chrysotile	No
3532-6-25-103 (Mastic)	Floor Tile Mastic – FT13	Black	Room 127	M	No	2% Chrysotile	No
3532-6-25-104 (Mastic)	Floor Tile Mastic – FT13	Black	Room 126	M	No	2% Chrysotile	No
3532-6-25-105 (Floor Tile)	Floor Tile 12X12 – FT14	Orange	Room 144	M	No	2% Chrysotile	Yes

Summary of Laboratory Analytical Results							
Sample No.	**Material Description**	**Color**	**Location**	**Category***	**Friable (Yes/No)**	**PLM Analysis**	**RACM**
3532-6-25-105 (Mastic)	Floor Tile Mastic – FT14	Black	Room 144	M	No	5% Chrysotile	No
3532-6-25-106 (Floor Tile)	Floor Tile 12X12 – FT14	Orange	Room 146	M	No	2% Chrysotile	Yes
3532-6-25-106 (Mastic)	Floor Tile Mastic – FT14	Black	Room 146	M	No	5% Chrysotile	No
3532-6-25-107 (Floor Tile)	Floor Tile 12X12 – FT15	Beige	Room 73	M	No	2% Chrysotile	Yes
3532-6-25-107 (Mastic)	Floor Tile Mastic – FT15	Black	Room 73	M	No	5% Chrysotile	No
3532-6-25-108 (Floor Tile)	Floor Tile 12X12 – FT15	Beige	Room 73	M	No	2% Chrysotile	Yes
3532-6-25-116	6" Fitting – TSI1	White	Room 13	TSI	No	2% Amosite	Yes
3532-6-25-117	6" Fitting – TSI1	White	Room 13	TSI	No	2% Amosite	Yes
3532-6-25-118	6" Fitting – TSI2	White	Room 13	TSI	No	2% Amosite	Yes
3532-6-25-119	6" Fitting – TSI2	White	Room 13	TSI	No	2% Amosite	Yes
3532-6-25-120	1" Fitting – TSI3	White	Room 25	TSI	No	2% Amosite	Yes
3532-6-25-121	1" Fitting – TSI3	White	Room 30	TSI	No	2% Amosite	Yes
3532-6-25-122	¾" Fitting – TSI4	White	Room 53	TSI	No	2% Amosite	Yes
3532-6-25-123	¾" Fitting – TSI4	White	Room 101	TSI	No	2% Amosite	Yes
3532-7-25-138	4" Fitting – TSI5	White	Room 134	TSI	No	2% Amosite Trace Chrysotile	Yes
3532-7-25-139	4" Fitting – TSI5	White	Room 134	TSI	No	2% Amosite Trace Chrysotile	Yes
3532-7-25-140	Joint Compound – DW/JC1	White	Room 48	M	No	2% Chrysotile	Yes

*Category: S=Surfacing; M=Miscellaneous; TSI=Thermal System Insulation

Representative photographs of the ACBM are included in **Appendix A**. AMA's asbestos laboratory analytical results and a listing of all samples collected at the Subject Property are included in **Appendix D**. Floor plans provided for this project have been notated with room numbers assigned by EBA during the survey and are included in **Figure 1**. These notated floor plans are used in conjunction with the Hazardous Materials Summary Table provided in **Figure 2** to identify the locations, by room number, of all asbestos-containing building materials (as well as other hazardous materials) at the Subject Property.

2.2.3 Presumed Asbestos-Containing Materials

Presumed Asbestos-Containing Materials (PACM) as defined by OSHA include thermal system insulation and surfacing material found in a building constructed no later than 1980. Certain suspect building materials identified during the survey could not be sampled and were presumed to contain asbestos, as sampling would have required significant disassembly/dismantling of building components, as the materials could not be safely accessed, or the material was not identified during the survey but was illustrated on as-built drawings.

The following specific types of building materials were not sampled and are presumed to contain asbestos:

- Spray Applied Column Fireproofing (fireproofing on steel columns in the Dorm and SUI Buildings) (material could not be accessed without significant damage to column enclosures)
- 1" Plaster Fire Proofing (plaster enclosure around steel beams in the Dorm Building) (material was not visually observed, but was illustrated on as-built drawings)
- Pipe Insulation and Pipe Fittings (in crawl space in Dorm Building)(all areas not accessed due to safety hazards)

Quantities and locations of the presumed asbestos-containing building materials are provided in the Hazardous Materials Summary Table in **Figure 2**.

2.2.4 Assumed Asbestos-Containing Building Materials

Assumed ACM includes any material that is suspected to contain asbestos and that was not sampled. Certain suspect building materials identified during the survey could not be sampled; these materials included fire doors, valve packings, cement asbestos panel boards, and caulk (illustrated on as-built drawings at joints between masonry and steel). These materials were assumed to contain asbestos (rather than sampled/tested), as sampling posed safety risks and/or would have required significant disassembly/dismantling of equipment/components to access and collect samples of the suspect materials. The vibration dampeners and roofing systems were assumed to contain asbestos as sampling would have damaged the materials and affected their functionality. An 8" transite pipe, illustrated on as-built drawings as buried underground, was assumed to contain asbestos as subsurface exploration for hazardous materials was not included in the scope of work for this project.

The following specific types of building materials could not be sampled and were assumed to contain asbestos:

- Vibration Dampener
- Fire Door
- Valve Packing

- Cement Asbestos Panel Board (part of roofing system)
- Built-Up Roofing System
- 8" Transite Pipe (underground)

Quantities and locations of assumed asbestos-containing building materials are provided in the Hazardous Materials Summary Table in **Figure 2**.

2.2.5 Homogeneous Areas Documented as Non Asbestos-Containing

The following homogeneous areas were documented as non asbestos-containing based upon laboratory analysis of samples collected during the survey:

- Bathroom Caulk, White (OM2)
- Stair Tread, Black (OM4)
- Sink Caulk, White (OM5)
- Wall Adhesive, Brown (OM7)
- Ductwork Mastic, Gold (OM9)
- Window Glaze, Off-White (OM12)
- Joint Caulk, White (OM13)
- Window Caulk, White/Gray (OM15)
- Window Glaze, Black (OM18)
- Ductwork Mastic, Off-White (OM22)
- Tile Adhesive, Brown (OM23)
- Ceiling Tile (2'x4'), Thin Worming and Pinholes, White (DCT1)
- Ceiling Tile (2'x4'), Pinholes with a Small Amount of Worming, White (DCT2)
- Ceiling Tile (2'x4'), Wide Worming and Pinholes, White (DCT3)
- Ceiling Tile (2'x4'), Long and Multiple Types of Worming, White (DCT4)
- Ceiling Tile (2'x4'), Large and Small Pinholes, White (DCT5)
- Cove Base, Black (CB1)
- Cove Base Mastic, Brown, Associated with CB1
- Cove Base, Gray (CB2)
- Cove Base Mastic, Cream, Associated with CB2
- Cove Base, Black (CB3)
- Cove Base Mastic, Cream, Associated with CB3
- Cove Base, Blue (CB4)
- Cove Base Mastic, Brown, Associated with CB4
- Cove Base, Brown (CB5)
- Cove Base Mastic, Brown, Associated with CB5
- Plaster Ceiling, White (S1)
- Plaster Ceiling/Wall, White (S2) (including plaster column enclosures, referred to on as-built drawings as "extended plaster enclosure")
- Base Coat Ceiling/Wall, Brown (S2)
- Base Coat Ceiling, Brown (S3)

- Spray Applied Fire Proofing, White (S5) (referred to on as-built drawings as " 2" fire proof cover on beams ")
- Gypsum-Fiber Roofing Material, White (S6)
- Drywall, White (DW/JC1)
- Floor Tile, 12"X12", Cream w/Multicolor Streaks (FT2)
- Floor Tile, 12"X12", Cream w/White Specs (FT3)
- Floor Tile, 12"X12", Cream w/Black Specs (FT4)
- Floor Tile, 12"X12", White/Cream w/Blue Streaks (FT6)
- Floor Tile Mastic, Black (Associated with FT6)
- Floor Tile, 12"X12", Black and White Speckle (FT10)
- Floor Tile Mastic, Black (Associated with FT10)
- Floor Tile, 12"X12", Gray w/Dark Gray Blotches (FT11)
- Floor Tile Mastic, Black (Associated with FT11)
- Floor Tile, 12"X12", Slate Blue w/White Streaks (FT12)
- Floor Tile Mastic, Black (Associated with FT12)
- Floor Tile, 12"X12", Light Gray w/Accent (FT13)
- 1 ½" Pipe Insulation, Steam Condensate Pipe Run, White (TSI6)
- 4" Pipe Insulation, Low Pressure Steam Pipe Run, White (TSI7)
- Miscellaneous Fitting (1"-2"), Heat Return Pipe Run, White (TSI8)

2.2.6 Quantities for ACBM

Quantities for ACBMs identified are listed by material type in the following **Table**. The locations as well as the quantities of ACBMs within the limits of the Subject Property are provided in the Hazardous Materials Summary Table in **Figure 2**.

Quantities of ACBMs		
Material Type	**Quantity**	**Unit of Measure**
Caulk (Multiple Types)	8,775	Linear Feet
Sidewalk Expansion Joint (OM14)	125	Linear Feet
Transite Window Insert (OM17) (Referred to on As-Built Drawings as "Insulated Wall Panels")	3,000	Square Feet
Window Glaze (Multiple Types)	5,100	Linear Feet
Plaster Ceiling (S3)	2,650	Square Feet
Floor Tile (Multiple Types)	35,585	Square Feet
Floor Tile Mastic (Multiple Types)	41,835	Square Feet
Fitting (Multiple Types) (Tested and Presumed)	438	Each
Joint Compound (DW/JC1)	22,270*	Square Feet
Spray Applied Column Fireproofing (Assumed)	3,000	Square Feet
Vibration Dampener (Assumed)	3	Each
Fire Door (Assumed)	173	Each
Valve Packing (Assumed)	21	Each
Cement Asbestos Panel Board (Assumed)	1,100	Square Feet

Quantities of ACBMs		
Material Type	**Quantity**	**Unit of Measure**
Built-Up Roofing System (Assumed)	27,000	Square Feet
1” Plaster Fireproofing (Assumed)	1,000	Square Feet
8” Transite Piping (Assumed)	50	Linear Feet
Caulk Between Masonry and Steel (Assumed)	Unknown	Linear Feet
Pipe Insulation (Presumed)	2,100	Linear Feet

*****The quantity listed for joint compound is the estimated quantity of drywall observed at the Subject Property, as the joint compound cannot be economically separated from the wall system.

END OF SECTION

3.0 Lead-Based Paints

A Lead-Based Paint (LBP) Inspector as certified through the Maryland Department of the Environment (MDE), performed a LBP inspection of accessible interior and exterior portions of the Subject Property. A certificate of the inspector is included in **Appendix E.**

3.1 Inspection and Analytical Methodology

EBA performed a limited (screening) survey to identify locations of LBP that may be disturbed by renovation and demolition activities. The survey was intended to determine:

- Whether lead-based paint is present at the Subject Property including the exterior surfaces; and,
- If lead is present, which building components contain lead-based paint?

Building areas and components that appear to have a similar painting history and substrate were grouped together for screening/sampling purposes. This survey was not intended to be a comprehensive surface-by-surface inspection (i.e., HUD level inspection) of the Subject Property, nor is a survey of that type necessary or required for this type of project. The inspection consisted of areas that were readily accessible.

Interior walls throughout the buildings were identified with letters A, B, C, and D. For the purpose of this report, the inspector opted to designate wall A as the wall which encompasses the main entrance door to the specific room/space; subsequent walls follow in a sequential clockwise pattern around the room.

Exterior walls throughout the buildings were also identified with letters A, B, C, and D. For the purposes of this report, the inspector opted to designate wall A as the wall that faces north; subsequent walls follow in a sequential clockwise pattern around the buildings.

3.1.1 Records Review

A records review consists of reviewing previous lead inspection reports, abatement records and/or site drawings, if available, associated with the facility.

3.1.2 XRF Instrumentation

Direct reading X-Ray Fluorescence (XRF) instrumentation was used to identify LBP. Specifically, the Niton Data Transfer instrument manufactured by Thermo Electron, Corp. was utilized for the limited survey. Surface coatings were considered LBP if the XRF result exceeds the State of Maryland definition of LBP of 0.7 milligrams of lead per square centimeter (> 0.7mg/cm^2). An XRF performance characteristic sheet is included

in **Appendix F**. The performance characteristic sheet specifies calibration tolerances, XRF indices for positive, negative, and inconclusive results, and modes of operation.

3.1.3 Paint Chip Analysis

Lead-based paint is also defined by the MDE as paint chips containing greater than 0.5% lead by weight, as determined through laboratory analysis (Method SW846-7420). Paint chip samples are typically collected and analyzed in the event that readings from the XRF are reported as inconclusive. Paint chip samples are also collected in the event there is limited access to or irregularly-shaped surfaces of the substrate.

3.2 Results

3.2.1 Records Review

The following drawings were made available by Penza Bailey Architects for review.

- Central Office and Storage Building for the State use Industries at the Maryland Penitentiary, Office of John A. Ahlers, Project No. K-611, January 1964 (SUI Building)
- Vocational Rehabilitation Center, Maryland Penitentiary, Wrenn, Lewis and Jencks Architects, Project No. K-611-685, June 1969 (Dorm Building)
- Conversion of Central Office to Work Release Housing, Lapicki-Smith, Project No. K-611-751-(3), May 1977 (Dorm Building and SUI Building)
- Occupational Skills Training Center, Gaudreau, Inc., Project No. ED-000-881-001, February 1991 (SUI Building)

No coatings notated as LBPs were identified within the limits of the Subject Property during the review of these drawings.

3.2.2 XRF Results

Lead-based paints were detected at the Subject Property by use of an XRF during the survey as identified in the following **Table**. A complete list of XRF readings is included in **Appendix G**.

Components with Lead-Based Paint (> 0.7 mg/cm^2)						
Reading No.	**Component**	**Member**	**Substrate**	**Color**	**Location (EBA Room No.)**	**Result (mg/cm^2)**
106	Railing	Post	Metal	Gray	23	4.4
107	Railing	Post	Metal	Gray	23	2.4
112	Valve	2”	Metal	Red	23	18.6
113	Valve	2”	Metal	Red	23	20
114	Valve	2”	Metal	Red	23	16
168	Wall	Sink	Metal	White	133	24.2
233	Window	Frame	Wood	Gray	59	1.3
298	Wall	NA	Concrete	Gray	48	1.3

Components with Lead-Based Paint (> 0.7 mg/cm^2)						
Reading No.	**Component**	**Member**	**Substrate**	**Color**	**Location (EBA Room No.)**	**Result (mg/cm^2)**
299	Wall	NA	Concrete	Gray	48	1.5
300	Wall	NA	Concrete	Gray	48	1.4
332	Baseboard	NA	Vinyl	White	89	2.7
333	Baseboard	NA	Vinyl	White	89	3.2
337	Baseboard	NA	Vinyl	White	89	1.4
357	Wall	NA	Concrete	Grey	69	2.1
360	Wall	NA	Concrete	Grey	69	2.3
384	Piping	4”	Metal	Green	Exterior	12.6

Lead-containing paints (paints containing lead but at concentrations less than the threshold for lead-based paint) were also identified on various surfaces tested within the Subject Property and are identified in the XRF data included in **Appendix G**.

Representative photographs of the LBP are included in **Appendix A**. The XRF data from all tested surfaces is included in **Appendix G**.

3.2.3 Paint Chip Analysis

No paint chip samples were collected during the survey.

END OF SECTION

4.0 Liquid Polychlorinated Biphenyls

The on-site inspectors investigated the Subject Property for equipment containing liquid phase PCBs during the survey.

4.1 Inspection and Analytical Methodology

The Subject Property was inspected for equipment that may contain liquid phase PCBs. Such equipment commonly includes light ballasts located within fluorescent light fixtures, electrical transformers, and hydraulic equipment. No laboratory analysis was performed in association with the inspection for suspect PCB-containing equipment. Inspection for materials/items containing non-liquid PCBs was not included in this survey.

4.1.1 Records Review

A records review consists of reviewing previous PCB-containing equipment inspection reports, abatement records, and/or site drawings, if available, associated with the facility.

4.1.2 On-site Investigation

The on-site investigation involved a visual assessment of suspect equipment that may contain PCBs. If required, EBA performed limited dismantling of the equipment in an attempt to visually confirm the presence or absence of oil suspected of containing PCBs. Representative (≈5% of total) fluorescent light fixtures were disassembled and the associated light ballasts were inspected for labels indicating PCB content.

4.1.3 Manufacturer and Utility Review

If the presence or absence of PCBs in suspect equipment could not be confirmed in the field, EBA conducted additional research by contacting the manufacturer and/or utility provider in order to obtain information on the suspect equipment. It should be noted that the manufacturer was not contacted for every piece of suspect equipment present at the Subject Property, as certain types of equipment were present in voluminous quantities (e.g., light ballasts).

4.2 Results

4.2.1 Records Review

The following drawings were made available by Penza Bailey Architects for review.

- Central Office and Storage Building for the State use Industries at the Maryland Penitentiary, Office of John A. Ahlers, Project No. K-611, January 1964 (SUI Building)
- Vocational Rehabilitation Center, Maryland Penitentiary, Wrenn, Lewis and Jencks Architects, Project No. K-611-685, June 1969 (Dorm Building)
- Conversion of Central Office to Work Release Housing, Lapicki-Smith, Project No. K-611-751-(3), May 1977 (Dorm Building and SUI Building)
- Occupational Skills Training Center, Gaudreau, Inc., Project No. ED-000-881-001, February 1991 (SUI Building)

No equipment notated as containing PCBs was identified within the limited of the Subject Property during the review of these drawings.

4.2.2 On-site Investigation

EBA identified light ballasts suspected of containing liquid phase PCBs at the Subject Property. Ballasts lacking a "No PCB" stamp are presumed to contain liquid PCBs. An approximate number of ballasts observed within the Subject Property are listed in the **Table** as follows.

Lighting Ballast Quantity and Type					
Manufacturer	**Cat. No.**	**"No-PCB" Label (Y/N)**	**Quantity Observed**	**Location (EBA Room No.)**	**Unit of Measure**
Advance	VEL-4P32-SC	Y	5	49, 92	Each
Advance	ICN-4P32-SC	Y	3	73	Each
Advance	ICN-2S86	Y	2	83	Each
Advance	V-2S40-1-TP	Y	2	91A	Each
General Electric	**GE-432MAX-N/Ultra**	**N**	**1**	**70**	**Each**
Triad	B232IUNVHP-B	Y	4	89	Each
Triad	B232I277RH-A	Y	5	67, 70	Each
Ulra-Miser	E232PI277G01	Y	2	90	Each
Universal	749-L-S-TC-P	Y	3	47	Each
Unknown	**Unknown**	**Unknown**	**505**	**Throughout**	**Each**

EBA identified other equipment suspected of containing liquid phase PCBs. The equipment included the following.

- Two exterior pad-mounted transformers were observed situated on the southwest corner of the Subject Property, adjacent to the west wall of the northern portion of the SUI Building. Both transformers are owned and operated by Baltimore Gas and Electric Company (BGE). The transformers were not labeled with a PCB classification. If the transformers will need to be removed as a result of the demolition and renovation activities, BGE should be contacted to arrange for their removal.

- One interior pad-mounted three-phase transformer manufactured by Siemens Energy and Automation, Inc. (Siemens) was observed in the basement of a mechanical space in the SUI Building (identified with catalog no. 3F3Y150). The

unit was not labeled as a dry-type transformer. A follow-up with the manufacturer was performed and is discussed in **Section 4.2.3**.

During the survey, EBA identified other types of equipment that could potentially contain fluids and PCBs. However, based on the results of the inspection, the equipment was determined not to contain fluids and/or PCBs. This equipment included the following.

- One interior pad-mounted three-phase transformer manufactured by Siemens Energy and Automation, Inc. (Siemens) was observed in the basement of the Dorm Building with catalog no. 3F3Y030ST. The unit was labeled as a dry-type transformer.

- One interior pad-mounted three-phase transformer manufactured by Siemens Energy and Automation, Inc. (Siemens) was observed in the SUI Building with catalog no. 3F3Y045ST. The unit was labeled as a dry-type transformer.

- One interior pad-mounted three-phase transformer manufactured by Federal Pacific Electrical Company (Federal Pacific) was observed in the Dorm Building with serial no. 20279-019. The unit was labeled as a dry-type transformer.

Representative photographs of the equipment determined to be suspect PCB-containing as a result of inspection and/or manufacturer's review (refer to following section) are included in **Appendix A**.

4.2.3 Manufacturer Review

Siemens' website (www.usa.siemens.com) was used to investigate if the transformer with catalog no. 3F3Y150 contains PCBs. The website listed the unit as a dry-type transformer; therefore, the unit would not contain fluids, or PCBs.

4.2.4 Quantities for Liquid PCBs

Quantities for PCBs are listed by equipment type in the following **Table**. The locations as well as the quantities of suspect PCBs within the limits of the Subject Property are provided in the Hazardous Materials Summary Table in **Figure 2**.

Quantities for PCBs		
Equipment Type	**Quantity**	**Unit of Measure**
Ballast	506	Each
Transformer	2	Each

END OF SECTION

5.0 Ozone-Depleting Compounds

The on-site inspectors investigated the Subject Property for equipment historically known to contain Ozone-Depleting Compounds (ODCs) during the survey. ODCs contain molecules of chlorine, fluorine, or bromine. Title VI of the United States Clean Air Act Amendments (CAA) of 1990 has defined ozone-depleting substances as belonging to Class I (most harmful) and Class II (less harmful).

5.1 Inspection and Analytical Methodology

The Subject Property was inspected for historically known types of equipment containing ODCs. Such equipment commonly includes chlorofluorocarbons (CFCs) within refrigerators, window air-conditioning units, water fountains, and chillers. No laboratory analysis was performed in association with the inspection for equipment containing ODCs.

5.1.1 Records Review

A records review consists of reviewing previous inspection reports, abatement records and/or site drawings, if available, associated with the facility.

5.1.2 On-site Investigation

The on-site investigation involved a visual assessment of suspect equipment that could contain ODCs. If required, EBA performed limited dismantling of equipment that was not currently in operation in an attempt to visually confirm the presence or absence of ODCs.

5.1.3 Manufacturer and Utility Review

If the presence or absence of ODCs in suspect equipment could not be confirmed in the field, EBA conducted additional research by contacting the manufacturer in order to obtain information on the suspect equipment.

5.2 Results

5.2.1 Records Review

The following drawings were made available by Penza Bailey Architects for review.

- Central Office and Storage Building for the State use Industries at the Maryland Penitentiary, Office of John A. Ahlers, Project No. K-611, January 1964 (SUI Building)
- Vocational Rehabilitation Center, Maryland Penitentiary, Wrenn, Lewis and Jencks Architects, Project No. K-611-685, June 1969 (Dorm Building)

- Conversion of Central Office to Work Release Housing, Lapicki-Smith, Project No. K-611-751-(3), May 1977 (Dorm Building and SUI Building)
- Occupational Skills Training Center, Gaudreau, Inc., Project No. ED-000-881-001, February 1991 (SUI Building)

No equipment notated as containing ODCs was identified within the limits of the Subject Property during the review of these drawings.

5.2.2 On-site Investigation

Suspect equipment that may contain ODCs was identified at the Subject Property in the following forms:

- Water Fountain Units – Four (4)
- Ice Machine Units – Two (2)
- Commercial Chiller Units – Two (2)
- Household Refrigerator/Freezer Units – Five (5)
- Air Conditioning (A/C) Units – Twenty-three (23)

Based upon the working condition of the identified equipment, it is anticipated that these units still contain ozone-depleting compounds. These refrigerants have low ozone depletion potential.

Representative photographs of ODCs are included in **Appendix A**

5.2.3 Manufacturer Review

Equipment suspected of containing ODCs were identified; however, contact with the manufacturer was not considered necessary.

5.2.4 Quantities for Ozone-Depleting Compounds

Quantities for equipment containing ODCs are listed by equipment type in the following **Table**. The locations as well as the quantities of ODCs within the limits of the Subject Property are provided in the Hazardous Materials Summary Table in **Figure 2**.

Quantities for Equipment Containing ODCs		
Equipment Type	**Quantity**	**Unit of Measure**
Water Fountain	4	Each
Ice Machine	2	Each
Commercial Chiller Unit	2	Each
Household Refrigerator / Freezer	5	Each
Window Air Conditioning Unit	23	Each

END OF SECTION

6.0 Universal Wastes

The on-site inspectors investigated the Subject Property for items classified as Universal Wastes (UW) during the survey.

6.1 Inspection and Analytical Methodology

The Subject Property was inspected for equipment and items classified as UW. Such equipment commonly includes batteries, pesticides, mercury-containing equipment, and bulbs/lamps. No laboratory analysis was performed in association with the inspection for Universal Wastes.

6.1.1 Records Review

Records review consists of reviewing previous UW inspection reports, abatement records and/or site drawings, if available, associated with the facility.

6.1.2 On-site Investigation

The on-site investigation involved a visual assessment that focused on identifying UW at the Subject Property. EBA performed limited dismantling of suspect equipment in an attempt to visually confirm the presence or absence of a UW.

6.1.3 Manufacturer Review

If the presence or absence of UW (e.g., the presence or absence of mercury in equipment) could not be confirmed in the field, EBA conducted additional research by contacting the manufacturer and obtaining information on the suspect equipment.

6.2 Results

6.2.1 Records Review

The following drawings were made available by Penza Bailey Architects for review.

- Central Office and Storage Building for the State use Industries at the Maryland Penitentiary, Office of John A. Ahlers, Project No. K-611, January 1964 (SUI Building)
- Vocational Rehabilitation Center, Maryland Penitentiary, Wrenn, Lewis and Jencks Architects, Project No. K-611-685, June 1969 (Dorm Building)
- Conversion of Central Office to Work Release Housing, Lapicki-Smith, Project No. K-611-751-(3), May 1977 (Dorm Building and SUI Building)
- Occupational Skills Training Center, Gaudreau, Inc., Project No. ED-000-881-001, February 1991 (SUI Building)

Universal wastes were not notated within the limits of the Subject Property during the review of these drawings.

6.2.2 On-site Investigation

The results of the on-site investigation confirmed the presence of UW at the Subject Property in the following forms:

- Light Tubes – Light fixtures were observed to contain 4', 8', and U-shaped fluorescent tubes.
- Light Bulbs – Light fixtures were observed to contain high-intensity discharge bulbs (HID), compact florescent light bulbs (CFLs), and halogen bulbs.
- Mercury-Containing Thermostat – A thermostat manufactured by Honeywell was partially disassembled by EBA and revealed components that contained mercury.
- Lead-Acid Batteries – Batteries were identified in emergency backup lighting systems and an emergency backup phone system.

During the survey, EBA identified additional thermostats that could potentially contain mercury. However, based on the results of the inspection, the thermostats were determined not to contain mercury. These thermostats are listed as follows by manufacturer.

- Johnson Controls, Inc.
- White-Rodgers
- Honeywell

Representative photographs of UW are included in **Appendix A**.

6.2.3 Manufacturer Review

Universal Waste was identified at the Subject Property; however, contact with the manufacturer was not necessary.

6.2.4 Quantities for Universal Waste

Quantities for UW are listed by equipment type in the following **Table**. The locations as well as the quantities of UW within the limits of the Subject Property are provided in the Hazardous Materials Summary Table in **Figure 2**.

Estimated Quantities for Universal Waste		
Equipment Type	**Quantity**	**Unit of Measure**
4’ Fluorescent Tube	1,254	Each
8’ Fluorescent Tube	23	Each
U-Shaped Fluorescent Tube	50	Each
HID Bulb	94	Each
CFL Bulb	67	Each
Halogen Bulb	30	Each
Thermostat	1	Each
Lead-Acid Battery	62	Each

END OF SECTION

7.0 Miscellaneous Materials

The on-site inspectors investigated the Subject Property for other potentially hazardous or regulated items/materials, referred to as Miscellaneous Materials (MM), during the survey.

7.1 Inspection and Analytical Methodology

The Subject Property was inspected for items/materials that may be hazardous but do not necessarily fit into prior classifications, and for items/materials that may be non-hazardous but are regulated if the item/material is removed or becomes a waste. Such items/materials include aboveground and underground storage tanks and their contents, pressurized cylinders, and containers of paints, lubricants, degreasers and other potentially hazardous liquid/solid materials in quantities greater than 5-gallons. No laboratory analysis was performed in association with the identification and documentation of such items/materials.

7.1.1 Records Review

A records review consists of reviewing previous inspection reports, abatement records and/or site drawings, if available, associated with the facility.

7.1.2 On-site Investigation

The on-site investigation involved a visual assessment that focused on identifying items/materials of concern that do not necessarily fit into prior classifications described previously in this report.

7.1.3 Manufacturer Review

If the hazardous nature of suspect items/materials could not be determined in the field, EBA conducted additional research by contacting the manufacturer and obtaining information on the suspect items/materials.

7.2 Results

7.2.1 Records Review

The following drawings were made available by Penza Bailey Architects for review.

- Central Office and Storage Building for the State use Industries at the Maryland Penitentiary, Office of John A. Ahlers, Project No. K-611, January 1964 (SUI Building)
- Vocational Rehabilitation Center, Maryland Penitentiary, Wrenn, Lewis and Jencks Architects, Project No. K-611-685, June 1969 (Dorm Building)

- Conversion of Central Office to Work Release Housing, Lapicki-Smith, Project No. K-611-751-(3), May 1977 (Dorm Building and SUI Building)
- Occupational Skills Training Center, Gaudreau, Inc., Project No. ED-000-881-001, February 1991 (SUI Building)

During the review of these drawings, a gasoline underground storage tank and associated gas pump was identified within relatively close proximity to the northwestern corner of the Roofing Building (formerly a garage for auto repair) associated with the Dorm Building. The size of the tank was not indicated on the plans. Limited information regarding this tank was obtained from on-site personnel. Reportedly, the tank was decommissioned approximately ten years ago, under the supervision of an unspecified regulatory agency. It is unknown if the decommissioning process involved removal of the tank or closure in-place.

In addition, an underground storage tank was identified on certain drawings in the grass-covered area near the northwest portion of the SUI Building. According to on-site personnel the tank is 5,000-gallons in size and contains heating oil.

Further, a two-post underground automobile lift was illustrated on certain drawings inside the garage. EBA could not determine if the lift components and/or possible associated hydraulic reservoirs are still present, and no staff member could provide information related to the lifts.

Appendix C includes a portion of the drawings referencing the underground storage tanks.

7.2.2 On-site Investigation

Other potentially hazardous or regulated items/materials were observed during the survey and were present in the following forms:

- Pressurized Cylinders
    - Thirty (30) fire extinguishers
- Lead Component Materials
    - Five (5) rooftop lead vent pipes
- Generator
    - One (1) Kohler diesel generator
- Aboveground Storage Tank
    - One (1) diesel storage tank (500-gallon)

- Underground Storage Tanks

  - One (1) 5,000-gallons underground storage tank (described in Section 7.2.1)
  - One (1) former pump island (for the historic gasoline tank (size unknown) described in Section 7.2.1)

- Underground Automobile Lift/Hydraulic Reservoir(s)

  - Metal plates/covers (in approximate areas of automotive lift illustrated on drawings)

Representative photographs of other potentially hazardous or regulated items/materials observed during the survey are included in **Appendix A**.

7.2.3 Manufacturer Review

Items/materials exhibiting other hazardous or regulated characteristics were observed at the Subject Property; however, contact with the manufacturer was not considered necessary.

7.2.4 Quantities for Miscellaneous Materials

Quantities for Miscellaneous Materials are listed by material type in the following **Table**. The locations as well as the quantities of Miscellaneous Materials within the limits of the Subject Property are provided in the Hazardous Materials Summary Table in **Figure 2**.

Estimated Quantities for Miscellaneous Materials		
Equipment Type	**Quantity**	**Unit of Measure**
Fire Extinguisher	30	Each
Lead Vent Pipe	5	Each
Generator	1	Each
500-Gallon Diesel Aboveground Storage Tank	1	Each
5,000-Gallon Heating Oil Underground Storage Tank	1	Each
Unknown-sized Gasoline Underground Storage Tank	1	Each
Underground Automobile Lift / Hydraulic Reservoir(s)	1	2-Post Lift

END OF SECTION

8.0 Conclusions/Recommendations

The results of the survey have identified hazardous materials within the limits of the Subject Property. The disturbance of these hazardous materials during demolition and renovation activities will trigger Federal, State, and Local regulations.

8.1 Asbestos-Containing Building Materials

The results of the survey have identified asbestos-containing building materials (ACBM) in the following categories.

- Surfacing Materials
    - Plaster Ceiling (S3)
    - Spray Applied Column Fireproofing (Presumed)
    - 1” Plaster Fireproofing (Presumed)
- Thermal System Insulation
    - 6” Fitting (TSI1)
    - 6” Fitting (TSI2)
    - 1” Fitting (TSI3)
    - ¾” Fitting (TSI4)
    - 4” Fitting (TSI5)
- Miscellaneous Materials
    - Friable
        - Window Glaze (OM19)
        - Window Glaze (OM20)
    - Category I Non-Friable
        - Floor Tile (FT1)
        - Floor Tile Mastic (FT1)
        - Floor Tile Mastic (FT2)
        - Floor Tile Mastic (FT3)
        - Floor Tile Mastic (FT4)
        - Floor Tile (FT5)
        - Floor Tile Mastic (FT5)
        - Floor Tile (FT7)
        - Floor Tile Mastic (FT7)
        - Floor Tile (FT8)
        - Floor Tile Mastic (FT8)
        - Floor Tile (FT9)

- Floor Tile Mastic (FT9)
- Floor Tile Mastic (FT13)
- Floor Tile (FT14)
- Floor Tile Mastic (FT14)
- Floor Tile (FT15)
- Floor Tile Mastic (FT15)
- Valve Packings (Assumed)
- Built-Up Roofing (Assumed)

➢ Category II Non-Friable

- Door/Window Caulk (OM1)
- Door Caulk (OM10)
- Window Caulk (OM11)
- Expansion Joint (OM14)
- Window Caulk (OM16)
- Window Insert (OM17)
- Window Caulk (OM21)
- Joint Compound (DW/JC1)
- Transite Window Insert (OM17) (Insulated Wall Panels)
- Vibration Dampener (Assumed)
- Fire Door (Assumed)
- Cement Asbestos Panel (Assumed)
- 8” Transite Piping (Assumed)
- Caulk Between Masonry and Steel (Assumed)

The spray applied fire column fireproofing, illustrated on as-built drawings on vertical columns, was presumed to contain asbestos. This material was presumed to contain asbestos (rather than sampled/tested), as sampling would have required significant disassembly/dismantling of column enclosures to access and collect samples of the suspected material. Further, the 1” plaster fireproofing (illustrated on as-built drawings covering a horizontal beam in the dining room) was presumed to contain asbestos, as it was not identified during the survey but is assumed to be present at the Subject Property.

The fire doors, valve packings, cement asbestos panel boards, and caulk (illustrated on as-built drawings at joints between masonry and steel) were assumed to contain asbestos. These materials were assumed to contain asbestos (rather than sampled/tested), as sampling posed safety risks and/or would have required significant disassembly/dismantling of equipment/components to access and collect samples of the suspect materials. The vibration dampeners and roofing systems were assumed to contain asbestos as sampling would have damaged the materials and affected their functionality. An 8” transite pipe, illustrated on as-built drawings as buried underground, was assumed to contain asbestos as subsurface exploration for hazardous materials was not included in the scope of work for this project.

It may be cost effective to have these materials sampled and analyzed at an appropriate time so that they can be definitively classified as asbestos-containing building materials. The most appropriate time to sample these materials is typically after the project has been turned over to the demolition and renovation contractor, and dismantling for investigative purposes can occur without consideration for damage to equipment/building components.

The EPA requires that regulated asbestos-containing material be removed before demolition and renovation activities begin. Since demolition and renovation is planned for the Subject Property, proposed demolition and renovation techniques are unknown at this time, and recycling of materials may or may not be performed, it is recommended that all ACM be removed to prevent the potential release of fibers.

The OSHA "Asbestos in Construction Standard" (29 CFR 1926.1101) imposes restrictions on the disturbance of asbestos during demolition, remodeling, and renovation activities.

Removal of the following items identified in the building are considered Class I asbestos work by the OSHA regulation:

- Plaster Ceiling (S3)
- 6" Fitting (TSI1)
- 6" Fitting (TSI2)
- 1" Fitting (TSI3)
- ¾" Fitting (TSI4)
- 4" Fitting (TSI5)
- Spray Applied Column Fireproofing (Presumed)
- 1" Plaster Fireproofing (Presumed)

Removal of the following items identified in the building are considered Class II asbestos work by the OSHA regulation:

- Door/Window Caulk (OM1)
- Door Caulk (OM10)
- Window Caulk (OM11)
- Expansion Joint (OM14)
- Window Caulk (OM16)
- Window Insert (OM17)
- Window Glaze (OM19)
- Window Glaze (OM20)
- Window Caulk (OM21)
- Floor Tile (FT1)
- Floor Tile Mastic (FT1)
- Floor Tile Mastic (FT2)
- Floor Tile Mastic (FT3)

- Floor Tile Mastic (FT4)
- Floor Tile (FT5)
- Floor Tile Mastic (FT5)
- Floor Tile (FT7)
- Floor Tile Mastic (FT7)
- Floor Tile (FT8)
- Floor Tile Mastic (FT8)
- Floor Tile (FT9)
- Floor Tile Mastic (FT9)
- Floor Tile Mastic (FT13)
- Floor Tile (FT14)
- Floor Tile Mastic (FT14)
- Floor Tile (FT15)
- Floor Tile Mastic (FT15)
- Joint Compound (DW/JC1)
- Transite Window Insert (OM17)(Insulated Wall Panels)
- Vibration Dampeners (Assumed)
- Fire Door (Assumed)
- Valve Packing (Assumed)
- Cement Asbestos Panel (Assumed)
- Built-Up Roof (Assumed)
- 8” Transite Piping (Assumed)
- Caulk Between Masonry and Steel (Assumed)

Class I and Class II asbestos work must be performed by trained employees using work practices required by the OSHA standard.

8.2 Lead-Based Paints

Lead-based paints (LBP) were identified throughout the Subject Property. In addition, lead-containing paints were identified on various surfaces. If disturbed, the presence of lead in paint in any concentration triggers OSHA regulatory standards and the presence of lead-based paint triggers EPA regulatory standards.

Demolition debris with LBP may be disposed of as non-hazardous provided the material is not classified as a hazardous waste in accordance with 40 CFR Part 261 and SW-846 (Test Methods for Evaluating Solid Waste Physical/Chemical). Metal objects coated with LBP can be recycled.

8.3 Liquid Polychlorinated Biphenyls

Suspect Liquid Polychlorinated Biphenyl (PCB) containing equipment was identified in the form of light ballasts and two transformers owned by BGE.

EBA identified one type of ballast suspected of containing PCBs. Further, since our inspection included only a portion of the ballasts present at the Subject Property, the uninspected ballasts are also considered to be suspect at this time.

Ballasts marked as “No PCBs” can be disposed of as non-hazardous waste. Ballasts lacking the “No PCBs” mark should be removed and disposed of in accordance with EPA’s Toxic Substances Control Act (TSCA), 40 CFR Part 761. If an unmarked ballast is not leaking, the associated lighting fixture does not require special handling or disposal. If an unmarked ballast is leaking, any material impacted by the leak should be treated as hazardous waste. Containers storing unmarked ballasts must be labeled in accordance with EPA labeling requirements specified in 40 CFR Part 262 Subpart C.

EBA identified two exterior pad-mounted transformers situated on the southwest corner of the Subject Property, adjacent to the west wall of the northern portion of the SUI Building. Both transformers are owned and operated by Baltimore Gas and Electric Company (BGE). The transformers were not labeled with a PCB classification. If the transformers will need to be removed as a result of the demolition and renovation activities, BGE should be contacted to arrange for their removal.

8.4 Ozone-Depleting Compounds

Ozone-depleting compounds were identified in the form of water fountains, ice machines, commercial chiller units, household refrigerator/freezer units, and window air conditioning units.

Under EPA's rule, refrigerant must be recovered from equipment that is typically dismantled on-site before disposal (e.g., retail food refrigeration, central residential air-conditioning, chillers, and industrial process refrigeration) in accordance with the EPA's requirements for servicing.

Equipment that typically enters the waste stream with the charge intact (e.g., motor vehicle air conditioners, household refrigerators, household freezers, and room air conditioners) is subject to special safe disposal requirements. Under the safe disposal requirements, the final person in the disposal chain (e.g., a scrap metal recycler or landfill owner) is responsible for ensuring that refrigerant is recovered from equipment before the final disposal of the equipment. However, persons "upstream" can remove the refrigerant and provide documentation of its removal to the final person if this is more cost-effective. If the final person in the disposal chain (e.g., a scrap metal recycler or landfill owner) accepts appliances that no longer hold a refrigerant charge, that person is responsible for maintaining a signed statement from whom the appliance(s) is being accepted. The signed statement must include the name and address of the person who recovered the refrigerant, and the date that the refrigerant was recovered, or a copy of a contract stating that the refrigerant will be removed prior to delivery.

8.5 Universal Wastes

EBA identified universal wastes within the Subject Property in the form of 4', 8', and u-shaped fluorescent light tubes, HID bulbs, CFLs, halogen bulbs, a thermostat, and lead-acid batteries.

All universal waste is to be placed in a container that is structurally sound, will prevent damage to the contents, is compatible with its contents, and will be kept closed at all times (except when adding items to or removing items from the container). The container must be without damage, or evidence of spillage, that could lead to leakage of the waste contained inside. The disposal of hazardous waste is outlined in the EPA regulations in 40 CFR Part 260 and in Maryland regulations in COMAR Title 26, Subtitle 13.

8.6 Miscellaneous Materials

Other items/materials that are potentially hazardous or regulated were observed at the Subject Property. These items/materials and EBA's conclusions and recommendations are provided as follows.

The fire extinguishers observed within the Subject Property, if permanently removed from service, should be disposed of in accordance with the publication "Guide to the Disposal of Condemned Fire Extinguishers" published by the Fire Extinguishing Trades Association, Fact File No. 108, dated February 2004.

Non-coated/non-painted vent pipes observed on the roof of the Subject Property contain lead. The disposal of these lead-containing items is regulated by the EPA in 40 CFR 261.

An emergency generator with an internal fuel tank was observed at the Subject Property. If the generator is removed from service as part of the planned project it is recommended that the contents of the internal fuel tank be drained, containerized, and disposed of in accordance with federal and state regulations prior to the removal of the generator.

A diesel aboveground storage tank was observed at the Subject Property. If the tank is removed from service as part of the planned project it is recommended that it be removed in accordance with MDE recommended guidance practices.

An operational heating oil underground storage tank was identified at the Subject Property. Further, a historically-operated gasoline underground storage tank was identified. Use of the tank was reportedly terminated in the past; however, it is not known if this tank was removed or closed in place. If the operational tank is removed from service as part of the planned project and/or if the historic tank is discovered during demoltion/future development activities, it is recommended that the tank(s) be removed in accordance with federal and state regulations.

A two-post underground automobile lift was illustrated on drawings inside the Roof Building (a former automotive repair garage). EBA could not determine if the lift components and/or possible associated hydraulic reservoirs are still present, and no staff member could provide information related to the lifts. If the lifts and/or any associated hydraulic reservoirs are discovered during demolition/future development activities, it is recommended that these items be removed in accordance with federal and state regulations.

END OF SECTION

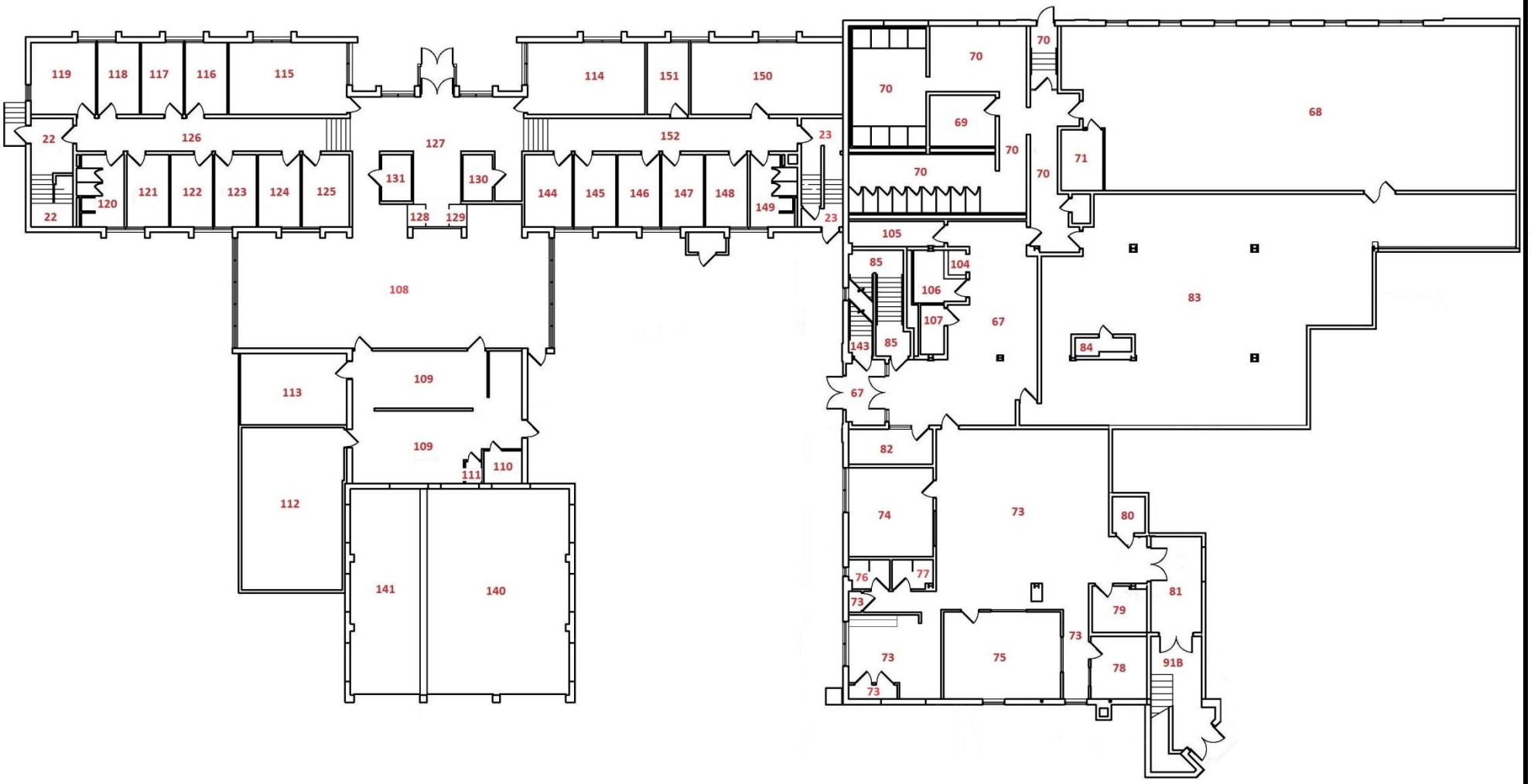
Figure 1 – Building Floor Plans

Limited Hazardous Materials Survey
Youth Detention Center Project
Project No. 3532-01-000

BASEMENT FLOOR PLAN

EBA ENGINEERING

Limited Hazardous Materials Survey
Youth Detention Center Project
Project No. 3532-01-000



FIRST FLOOR PLAN

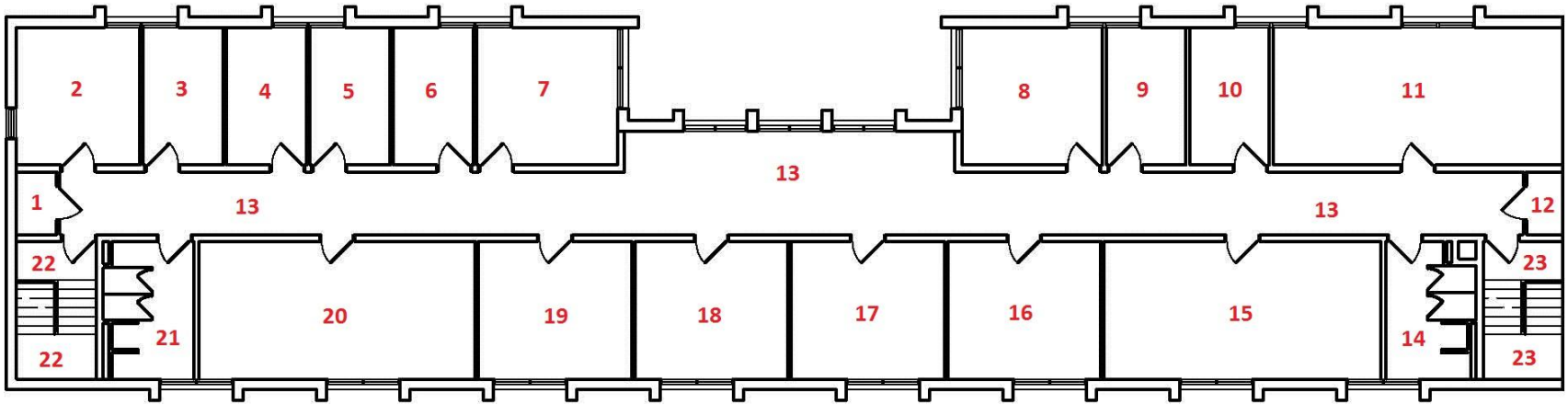
EBA ENGINEERING

Limited Hazardous Materials Survey
Youth Detention Center Project
Project No. 3532-01-000

SECOND FLOOR PLAN

EBA ENGINEERING

Limited Hazardous Materials Survey
Youth Detention Center Project
Project No. 3532-01-000



THIRD FLOOR PLAN

EBA ENGINEERING

Figure 2 – Hazardous Materials Summary Table

Limited Hazardous Materials Summary Table - DRAFT

Youth Detention Center Project

INTERIOR AREAS WITHIN THE OSTC-OCCUPIED PORTION OF THE SUI BUILDING THAT WILL BE AFFECTED BY THE INSTALLATION OF A NEW FIRE ALARM SYSTEM HAVE NOT BEEN SURVEYED

AREA	ASBESTOS																			PCBs		ODCs					UNIVERSAL WASTE									MISCELLANEOUS MATERIALS					
Location (Room No.)	Asbestos Description (Material, Color, Size)	Caulk (LF)	Sidewalk Expansion Joint (LF)	Transite Window Insert (SF)	Window Glaze (LF)	Plaster Ceiling (SF)	Floor Tile (SF)	Floor Tile Mastic (SF)	Fitting (Each)	Joint Compound (SF; based on square footage of drywall)	Spray Applied Column Fireproofing (SF)	Vibration Dampener (Each)	Fire Door (Each)	Valve Packing (Each)	Cement Asbestos Panel Board (SF)	Built-Up Roof (SF)	1" Plaster Fireproofing (SF)	8" Transite Piping (LF)	Caulk Between Masonry and Steel (LF)	Pipe Insulation (LF)	Ballast (Each)	Transformer (Each)	Water Fountain (Each)	Ice Machine (Each)	Commercial Chiller Unit (Each)	Household Refrigerator / Freezer (Each)	Air Conditioning Unit (Each)	Light Bulbs / Tubes (Each)						Thermostat (Each)	Battery (Each)	Fire Extinguisher (Each)	Lead Vent Pipe (Each)	Underground Auto Lift (2-Post Lift)	Generator (Each)	Aboveground Storage Tank (Each)	Underground Storage Tank (Each)
																											4'	*8'*	*U - Shaped*	*HID*	*CFL*	*Halogen*									
1	Floor Tile, Cream w/Green and Gray Blotches, 12X12 (FT1)						50																								1									
1	Floor Tile Mastic, Black (Associated with FT1)							50																																
1	Fire Door (Assumed)												1																											
2	Interior Door/Window Caulk (OM1)	50																													1									
2	Floor Tile, Cream w/Green and Gray Blotches, 12X12 (FT1)						200																																
2	Floor Tile Mastic, Black (Associated with FT1)							200																																
2	Fire Door (Assumed)												1																											
3	Interior Door/Window Caulk (OM1)	25																													1									
3	Floor Tile, Cream w/Green and Gray Blotches, 12X12 (FT1)																																						
3	Floor Tile Mastic, Black (Associated with FT1)							150																																
3	Fire Door (Assumed)												1																											
4	Interior Door/Window Caulk (OM1)	25																													1									
4	Floor Tile, Cream w/Green and Gray Blotches, 12X12 (FT1)						150																																
4	Floor Tile Mastic, Black (Associated with FT1)							150																																
4	Fire Door (Assumed)												1																											
5	Interior Door/Window Caulk (OM1)	25																													1									
5	Floor Tile, Cream w/Green and Gray Blotches, 12X12 (FT1)						150																																
5	Floor Tile Mastic, Black (Associated with FT1)							150																																
5	Fire Door (Assumed)												1																											
6	Interior Door/Window Caulk (OM1)	25																													1									
6	Floor Tile, Cream w/Green and Gray Blotches, 12X12 (FT1)						150																																
6	Floor Tile Mastic, Black (Associated with FT1)							150																																
6	Fire Door (Assumed)												1																											
7	Interior Door/Window Caulk (OM1)	75																													1									
7	Floor Tile, Cream w/Green and Gray Blotches, 12X12 (FT1)						250																																
7	Floor Tile Mastic, Black (Associated with FT1)							250																																
7	Fire Door (Assumed)												1																											
8	Interior Door/Window Caulk (OM1)	75																			1							4												
8	Floor Tile, Cream w/Green and Gray Blotches, 12X12 (FT1)						250																																
8	Floor Tile Mastic, Black (Associated with FT1)							250																																
8	Fire Door (Assumed)												1																											
9	Interior Door/Window Caulk (OM1)	25																													1									
9	Floor Tile, Cream w/Green and Gray Blotches, 12X12 (FT1)						150																																
9	Floor Tile Mastic, Black (Associated with FT1)							150																																
9	Fire Door (Assumed)												1																											
10	Interior Door/Window Caulk (OM1)	25																													1									

Limited Hazardous Materials Summary Table - DRAFT

Youth Detention Center Project

INTERIOR AREAS WITHIN THE OSTC-OCCUPIED PORTION OF THE SUI BUILDING THAT WILL BE AFFECTED BY THE INSTALLATION OF A NEW FIRE ALARM SYSTEM HAVE NOT BEEN SURVEYED

AREA	ASBESTOS																			PCBs		ODCs					UNIVERSAL WASTE									MISCELLANEOUS MATERIALS					
Location (Room No.)	Asbestos Description (Material, Color, Size)	Caulk (LF)	Sidewalk Expansion Joint (LF)	Transite Window Insert (SF)	Window Glaze (LF)	Plaster Ceiling (SF)	Floor Tile (SF)	Floor Tile Mastic (SF)	Fitting (Each)	Joint Compound (SF; based on square footage of drywall)	Spray Applied Column Fireproofing (SF)	Vibration Dampener (Each)	Fire Door (Each)	Valve Packing (Each)	Cement Asbestos Panel Board (SF)	Built-Up Roof (SF)	1" Plaster Fireproofing (SF)	8" Transite Piping (LF)	Caulk Between Masonry and Steel (LF)	Pipe Insulation (LF)	Ballast (Each)	Transformer (Each)	Water Fountain (Each)	Ice Machine (Each)	Commercial Chiller Unit (Each)	Household Refrigerator / Freezer (Each)	Air Conditioning Unit (Each)	Light Bulbs / Tubes (Each)						Thermostat (Each)	Battery (Each)	Fire Extinguisher (Each)	Lead Vent Pipe (Each)	Underground Auto Lift (2-Post Lift)	Generator (Each)	Aboveground Storage Tank (Each)	Underground Storage Tank (Each)
																											4'	*8'*	*U - Shaped*	*HID*	*CFL*	*Halogen*									
10	Floor Tile, Cream w/Green and Gray Blotches, 12X12 (FT1)						150																																	
10	Floor Tile Mastic, Black (Associated with FT1)							150																																
10	Fire Door (Assumed)												1																											
11	Interior Door/Window Caulk (OM1)	75																													2									
11	Floor Tile, Cream w/Green and Gray Blotches, 12X12 (FT1)						500																																	
11	Floor Tile Mastic, Black (Associated with FT1)							500																																
11	Fire Door (Assumed)												1																											
12	Floor Tile, Cream w/Green and Gray Blotches, 12X12 (FT1)						50																								1									
12	Floor Tile Mastic, Black (Associated with FT1)							50																																
12	Fire Door (Assumed)												1																											
13	Interior Door/Window Caulk (OM1)	150																			9		1					36			6		3		4	2				
13	Floor Tile, Cream w/Green and Gray Blotches, 12X12 (FT1)						1400																																	
13	Floor Tile Mastic, Black (Associated with FT1)							1400																																
13	Floor Tile Mastic, Black (Associated with FT2)							25																																
13	6" Pipe Fitting, Strait (TSI1)								10																																
13	6" Pipe Fitting, Elbow (TSI2)								3																																
14	Interior Door/Window Caulk (OM1)	25																			2							4													
14	3/4" Pipe Fitting, Elbow (TSI4)								15																																
14	Fire Door (Assumed)												1																											
15	Interior Door/Window Caulk (OM1)	75																													1									
15	Floor Tile, Cream w/Green and Gray Blotches, 12X12 (FT1)						500																																	
15	Floor Tile Mastic, Black (Associated with FT1)							500																																
15	Fire Door (Assumed)												1																											
16	Interior Door/Window Caulk (OM1)	50																													1									
16	Floor Tile, Cream w/Green and Gray Blotches, 12X12 (FT1)						250																																	
16	Floor Tile Mastic, Black (Associated with FT1)							250																																
16	Fire Door (Assumed)												1																											
17	Interior Door/Window Caulk (OM1)	50																													1									
17	Floor Tile, Cream w/Green and Gray Blotches, 12X12 (FT1)						250																																	
17	Floor Tile Mastic, Black (Associated with FT1)							250																																
17	Fire Door (Assumed)												1																											
18	Interior Door/Window Caulk (OM1)	50																													1									
18	Floor Tile, Cream w/Green and Gray Blotches, 12X12 (FT1)						250																																	
18	Floor Tile Mastic, Black (Associated with FT1)							250																																
18	Fire Door (Assumed)												1																											
19	Interior Door/Window Caulk (OM1)	50																													1									

Limited Hazardous Materials Summary Table - DRAFT

Youth Detention Center Project

INTERIOR AREAS WITHIN THE OSTC-OCCUPIED PORTION OF THE SUI BUILDING THAT WILL BE AFFECTED BY THE INSTALLATION OF A NEW FIRE ALARM SYSTEM HAVE NOT BEEN SURVEYED

AREA	ASBESTOS																			PCBs		ODCs					UNIVERSAL WASTE								MISCELLANEOUS MATERIALS					
Location (Room No.)	Asbestos Description (Material, Color, Size)	Caulk (LF)	Sidewalk Expansion Joint (LF)	Transite Window Insert (SF)	Window Glaze (LF)	Plaster Ceiling (SF)	Floor Tile (SF)	Floor Tile Mastic (SF)	Fitting (Each)	Joint Compound (SF; based on square footage of drywall)	Spray Applied Column Fireproofing (SF)	Vibration Dampener (Each)	Fire Door (Each)	Valve Packing (Each)	Cement Asbestos Panel Board (SF)	Built-Up Roof (SF)	1" Plaster Fireproofing (SF)	8" Transite Piping (LF)	Caulk Between Masonry and Steel (LF)	Pipe Insulation (LF)	Ballast (Each)	Transformer (Each)	Water Fountain (Each)	Ice Machine (Each)	Commercial Chiller Unit (Each)	Household Refrigerator / Freezer (Each)	Air Conditioning Unit (Each)	Light Bulbs / Tubes (Each)						Thermostat (Each)	Battery (Each)	Fire Extinguisher (Each)	Lead Vent Pipe (Each)	Underground Auto Lift (2-Post Lift)	Generator (Each)	Aboveground Storage Tank (Each)	Underground Storage Tank (Each)
																											4'	*8'*	*U - Shaped*	*HID*	*CFL*	*Halogen*								
19	Floor Tile, Cream w/Green and Gray Blotches, 12X12 (FT1)						250																																
19	Floor Tile Mastic, Black (Associated with FT1)							250																															
19	Fire Door (Assumed)												1																									
20	Interior Door/Window Caulk (OM1)	75																													1							
20	Floor Tile, Cream w/Green and Gray Blotches, 12X12 (FT1)						500																															
20	Floor Tile Mastic, Black (Associated with FT1)							500																															
20	Fire Door (Assumed)												1																									
21	Interior Door/Window Caulk (OM1)	25																			2							4											
21	3/4" Pipe Fitting, Elbow (TSI4)								15																														
21	Fire Door (Assumed)												1																									
22	Floor Tile Mastic, Black (Associated with FT2)							225													4							10			6				3				
22	Floor Tile Mastic, Black (Associated with FT3)							50																															
22	Fire Door (Assumed)												4																									
23	Floor Tile Mastic, Black (Associated with FT3)							50													4							12			6				3				
23	Floor Tile Mastic, Black (Associated with FT4)							225																															
23	Fire Door (Assumed)												5																									
24	Floor Tile, Tan w/White and Dark Tan Specs, 12X12 (FT5)						50																								1							
24	Floor Tile Mastic, Black (Associated with FT5)							50																															
24	1" Pipe Fitting, Elbow (TSI3)								3																														
24	Fire Door (Assumed)												1																									
25	Interior Door/Window Caulk (OM1)	50																													1							
25	Floor Tile, Tan w/White and Dark Tan Specs, 12X12 (FT5)						200																															
25	Floor Tile Mastic, Black (Associated with FT5)							200																															
25	1" Pipe Fitting, Elbow (TSI3)								5																														
25	Fire Door (Assumed)												1																									
26	Interior Door/Window Caulk (OM1)	25																													1							
26	Floor Tile, Tan w/White and Dark Tan Specs, 12X12 (FT5)						150																															
26	Floor Tile Mastic, Black (Associated with FT5)							150																															
26	1" Pipe Fitting, Elbow (TSI3)								2																														
26	Fire Door (Assumed)												1																									
27	Interior Door/Window Caulk (OM1)	25																													1							
27	Floor Tile Mastic, Black (Associated with FT3)							150																															
27	1" Pipe Fitting, Elbow (TSI3)								2																														
27	Fire Door (Assumed)												1																									
28	Interior Door/Window Caulk (OM1)	25																													1							
28	Floor Tile, Tan w/White and Dark Tan Specs, 12X12 (FT5)						150																															

Limited Hazardous Materials Summary Table - DRAFT

Youth Detention Center Project

INTERIOR AREAS WITHIN THE OSTC-OCCUPIED PORTION OF THE SUI BUILDING THAT WILL BE AFFECTED BY THE INSTALLATION OF A NEW FIRE ALARM SYSTEM HAVE NOT BEEN SURVEYED

AREA	ASBESTOS																			PCBs		ODCs					UNIVERSAL WASTE									MISCELLANEOUS MATERIALS					
Location (Room No.)	Asbestos Description (Material, Color, Size)	Caulk (LF)	Sidewalk Expansion Joint (LF)	Transite Window Insert (SF)	Window Glaze (LF)	Plaster Ceiling (SF)	Floor Tile (SF)	Floor Tile Mastic (SF)	Fitting (Each)	Joint Compound (SF; based on square footage of drywall)	Spray Applied Column Fireproofing (SF)	Vibration Dampener (Each)	Fire Door (Each)	Valve Packing (Each)	Cement Asbestos Panel Board (SF)	Built-Up Roof (SF)	1" Plaster Fireproofing (SF)	8" Transite Piping (LF)	Caulk Between Masonry and Steel (LF)	Pipe Insulation (LF)	Ballast (Each)	Transformer (Each)	Water Fountain (Each)	Ice Machine (Each)	Commercial Chiller Unit (Each)	Household Refrigerator / Freezer (Each)	Air Conditioning Unit (Each)	Light Bulbs / Tubes (Each)						Thermostat (Each)	Battery (Each)	Fire Extinguisher (Each)	Lead Vent Pipe (Each)	Underground Auto Lift (2-Post Lift)	Generator (Each)	Aboveground Storage Tank (Each)	Underground Storage Tank (Each)
																											4'	*8'*	*U - Shaped*	*HID*	*CFL*	*Halogen*									
28	Floor Tile Mastic, Black (Associated with FT5)							150																																
28	1" Pipe Fitting, Elbow (TSI3)								2																															
28	Fire Door (Assumed)												1																										
29	Interior Door/Window Caulk (OM1)	25																													1								
29	Floor Tile, Tan w/White and Dark Tan Specs, 12X12 (FT5)						150																															
29	Floor Tile Mastic, Black (Associated with FT5)							150																															
29	1" Pipe Fitting, Elbow (TSI3)								2																															
29	Fire Door (Assumed)												1																										
30	Interior Door/Window Caulk (OM1)	75																													1								
30	Floor Tile, Tan w/White and Dark Tan Specs, 12X12 (FT5)						250																															
30	Floor Tile Mastic, Black (Associated with FT5)							250																															
30	1" Pipe Fitting, Elbow (TSI3)								4																															
30	Fire Door (Assumed)												1																										
31	Interior Door/Window Caulk (OM1)	75																													1								
31	Floor Tile, Tan w/White and Dark Tan Specs, 12X12 (FT5)						250																															
31	Floor Tile Mastic, Black (Associated with FT5)							250																															
31	6" Pipe Fitting, Elbow (TSI2)								2																															
31	1" Pipe Fitting, Elbow (TSI3)								4																															
31	Fire Door (Assumed)												1																										
32	Interior Door/Window Caulk (OM1)	25																													1								
32	Floor Tile, Tan w/White and Dark Tan Specs, 12X12 (FT5)						150																															
32	Floor Tile Mastic, Black (Associated with FT5)							150																															
32	1" Pipe Fitting, Elbow (TSI3)								2																															
32	Fire Door (Assumed)												1																										
33	Interior Door/Window Caulk (OM1)	25																													1								
33	Floor Tile, Tan w/White and Dark Tan Specs, 12X12 (FT5)						150																															
33	Floor Tile Mastic, Black (Associated with FT5)							150																															
33	1" Pipe Fitting, Elbow (TSI3)								2																															
33	Fire Door (Assumed)												1																										
34	Interior Door/Window Caulk (OM1)	75																													2								
34	Floor Tile, Tan w/White and Dark Tan Specs, 12X12 (FT5)						500																															
34	Floor Tile Mastic, Black (Associated with FT5)							500																															
34	1" Pipe Fitting, Elbow (TSI3)								4																															
34	Fire Door (Assumed)												1																										
35	Interior Door/Window Caulk (OM1)	25																				2						4												
35	3/4" Pipe Fitting, Elbow (TSI4)								15																															

Limited Hazardous Materials Summary Table - DRAFT

Youth Detention Center Project

INTERIOR AREAS WITHIN THE OSTC-OCCUPIED PORTION OF THE SUI BUILDING THAT WILL BE AFFECTED BY THE INSTALLATION OF A NEW FIRE ALARM SYSTEM HAVE NOT BEEN SURVEYED

AREA	ASBESTOS																			PCBs		ODCs					UNIVERSAL WASTE									MISCELLANEOUS MATERIALS					
Location (Room No.)	Asbestos Description (Material, Color, Size)	Caulk (LF)	Sidewalk Expansion Joint (LF)	Transite Window Insert (SF)	Window Glaze (LF)	Plaster Ceiling (SF)	Floor Tile (SF)	Floor Tile Mastic (SF)	Fitting (Each)	Joint Compound (SF; based on square footage of drywall)	Spray Applied Column Fireproofing (SF)	Vibration Dampener (Each)	Fire Door (Each)	Valve Packing (Each)	Cement Asbestos Panel Board (SF)	Built-Up Roof (SF)	1" Plaster Fireproofing (SF)	8" Transite Piping (LF)	Caulk Between Masonry and Steel (LF)	Pipe Insulation (LF)	Ballast (Each)	Transformer (Each)	Water Fountain (Each)	Ice Machine (Each)	Commercial Chiller Unit (Each)	Household Refrigerator / Freezer (Each)	Air Conditioning Unit (Each)	Light Bulbs / Tubes (Each)						Thermostat (Each)	Battery (Each)	Fire Extinguisher (Each)	Lead Vent Pipe (Each)	Underground Auto Lift (2-Post Lift)	Generator (Each)	Aboveground Storage Tank (Each)	Underground Storage Tank (Each)
																											4'	*8'*	*U - Shaped*	*HID*	*CFL*	*Halogen*									
35	Fire Door (Assumed)												1																											
36	Interior Door/Window Caulk (OM1)	25																													1									
36	Floor Tile, Tan w/White and Dark Tan Specs, 12X12 (FT5)						150																																	
36	Floor Tile Mastic, Black (Associated with FT5)							150																																
36	1" Pipe Fitting, Elbow (TSI3)								2																																
36	Fire Door (Assumed)												1																											
37	Interior Door/Window Caulk (OM1)	25																													1									
37	Floor Tile, Tan w/White and Dark Tan Specs, 12X12 (FT5)						150																																	
37	Floor Tile Mastic, Black (Associated with FT5)							150																																
37	1" Pipe Fitting, Elbow (TSI3)								3																																
37	Fire Door (Assumed)												1																											
38	Interior Door/Window Caulk (OM1)	25																													1									
38	Floor Tile, Tan w/White and Dark Tan Specs, 12X12 (FT5)						150																																	
38	Floor Tile Mastic, Black (Associated with FT5)							150																																
38	1" Pipe Fitting, Elbow (TSI3)								2																																
38	Fire Door (Assumed)												1																											
39	Interior Door/Window Caulk (OM1)	25																													1									
39	Floor Tile, Tan w/White and Dark Tan Specs, 12X12 (FT5)						150																																	
39	Floor Tile Mastic, Black (Associated with FT5)							150																																
39	1" Pipe Fitting, Elbow (TSI3)								1																																
39	Fire Door (Assumed)												1																											
40	Interior Door/Window Caulk (OM1)	75																													3									
40	Floor Tile, Tan w/White and Dark Tan Specs, 12X12 (FT5)						500																																	
40	Floor Tile Mastic, Black (Associated with FT5)							500																																
40	1" Pipe Fitting, Elbow (TSI3)								4																																
40	Fire Door (Assumed)												1																											
41	Interior Door/Window Caulk (OM1)	75																													2									
41	Floor Tile, Tan w/White and Dark Tan Specs, 12X12 (FT5)						500																																	
41	Floor Tile Mastic, Black (Associated with FT5)							500																																
41	1" Pipe Fitting, Elbow (TSI3)								6																																
41	Fire Door (Assumed)												1																											
42	Interior Door/Window Caulk (OM1)	25																													1									
42	Floor Tile, Tan w/White and Dark Tan Specs, 12X12 (FT5)						150																																	
42	Floor Tile Mastic, Black (Associated with FT5)							150																																
42	Fire Door (Assumed)												1																											
43	Interior Door/Window Caulk (OM1)	25																													1									

Limited Hazardous Materials Summary Table - DRAFT

Youth Detention Center Project

INTERIOR AREAS WITHIN THE OSTC-OCCUPIED PORTION OF THE SUI BUILDING THAT WILL BE AFFECTED BY THE INSTALLATION OF A NEW FIRE ALARM SYSTEM HAVE NOT BEEN SURVEYED

AREA	ASBESTOS																			PCBs		ODCs					UNIVERSAL WASTE									MISCELLANEOUS MATERIALS					
Location (Room No.)	Asbestos Description (Material, Color, Size)	Caulk (LF)	Sidewalk Expansion Joint (LF)	Transite Window Insert (SF)	Window Glaze (LF)	Plaster Ceiling (SF)	Floor Tile (SF)	Floor Tile Mastic (SF)	Fitting (Each)	Joint Compound (SF; based on square footage of drywall)	Spray Applied Column Fireproofing (SF)	Vibration Dampener (Each)	Fire Door (Each)	Valve Packing (Each)	Cement Asbestos Panel Board (SF)	Built-Up Roof (SF)	1" Plaster Fireproofing (SF)	8" Transite Piping (LF)	Caulk Between Masonry and Steel (LF)	Pipe Insulation (LF)	Ballast (Each)	Transformer (Each)	Water Fountain (Each)	Ice Machine (Each)	Commercial Chiller Unit (Each)	Household Refrigerator / Freezer (Each)	Air Conditioning Unit (Each)	Light Bulbs / Tubes (Each)						Thermostat (Each)	Battery (Each)	Fire Extinguisher (Each)	Lead Vent Pipe (Each)	Underground Auto Lift (2-Post Lift)	Generator (Each)	Aboveground Storage Tank (Each)	Underground Storage Tank (Each)
																											4'	*8'*	*U - Shaped*	*HID*	*CFL*	*Halogen*									
43	Floor Tile, Tan w/White and Dark Tan Specs, 12X12 (FT5)						150																																	
43	Floor Tile Mastic, Black (Associated with FT5)							150																																
43	1" Pipe Fitting, Elbow (TSI3)								2																															
43	Fire Door (Assumed)												1																											
44	Interior Door/Window Caulk (OM1)	25																												1										
44	Floor Tile, Tan w/White and Dark Tan Specs, 12X12 (FT5)						150																																	
44	Floor Tile Mastic, Black (Associated with FT5)							150																																
44	Fire Door (Assumed)												1																											
45	Interior Door/Window Caulk (OM1)	25																												1										
45	Floor Tile, Tan w/White and Dark Tan Specs, 12X12 (FT5)						150																																	
45	Floor Tile Mastic, Black (Associated with FT5)							150																																
45	1" Pipe Fitting, Elbow (TSI3)								2																															
45	Fire Door (Assumed)												1																											
46	Interior Door/Window Caulk (OM1)	25																																						
46	1" Pipe Fitting, Elbow (TSI3)								2																															
46	3/4" Pipe Fitting, Elbow (TSI4)								15																															
46	Fire Door (Assumed)												1																											
47	Interior Door/Window Caulk (OM1)	150																			5		1					32			6		3		5	2				
47	Floor Tile Mastic, Black (Associated with FT2)							100																																
47	Floor Tile, Tan w/White and Dark Tan Specs, 12X12 (FT5)						1325																																	
47	Floor Tile Mastic, Black (Associated with FT5)							1325																																
47	Floor Tile, Orange w/Cream and Dark Tan Specs, 12X12 (FT14)						15																																	
47	Floor Tile Mastic, Black (Associated with FT14)							15																																
47	1" Pipe Fitting, Elbow (TSI3)								6																															
48	Interior Door/Window Caulk (OM1)	100																			40							80			2		1		2	1				
48	Floor Tile, Cream w/Green and Gray Blotches, 12X12 (FT1)						650																																	
48	Floor Tile Mastic, Black (Associated with FT1)							650																																
48	Floor Tile Mastic, Black (Associated with FT2)							1800																																
48	Joint Compound, Ceiling, White (DW/JC1)									2450																															
48	Spray Applied Column Fireproofing (Presumed) Refer to: Appendix C - As-Built Drawings Conversion of Central Office to Work Release Housing Sheet A-3										200																													
48	Fire Door (Assumed)												5																											
49	Joint Compound, Ceiling, White (DW/JC1)									1000											7							36											
49	Fire Door (Assumed)												2																											
50	Joint Compound, Ceiling, White (DW/JC1)									150											2							4											

Limited Hazardous Materials Summary Table - DRAFT

Youth Detention Center Project

INTERIOR AREAS WITHIN THE OSTC-OCCUPIED PORTION OF THE SUI BUILDING THAT WILL BE AFFECTED BY THE INSTALLATION OF A NEW FIRE ALARM SYSTEM HAVE NOT BEEN SURVEYED

AREA	ASBESTOS																			PCBs		ODCs					UNIVERSAL WASTE									MISCELLANEOUS MATERIALS					
Location (Room No.)	Asbestos Description (Material, Color, Size)	Caulk (LF)	Sidewalk Expansion Joint (LF)	Transite Window Insert (SF)	Window Glaze (LF)	Plaster Ceiling (SF)	Floor Tile (SF)	Floor Tile Mastic (SF)	Fitting (Each)	Joint Compound (SF; based on square footage of drywall)	Spray Applied Column Fireproofing (SF)	Vibration Dampener (Each)	Fire Door (Each)	Valve Packing (Each)	Cement Asbestos Panel Board (SF)	Built-Up Roof (SF)	1" Plaster Fireproofing (SF)	8" Transite Piping (LF)	Caulk Between Masonry and Steel (LF)	Pipe Insulation (LF)	Ballast (Each)	Transformer (Each)	Water Fountain (Each)	Ice Machine (Each)	Commercial Chiller Unit (Each)	Household Refrigerator / Freezer (Each)	Air Conditioning Unit (Each)	Light Bulbs / Tubes (Each)						Thermostat (Each)	Battery (Each)	Fire Extinguisher (Each)	Lead Vent Pipe (Each)	Underground Auto Lift (2-Post Lift)	Generator (Each)	Aboveground Storage Tank (Each)	Underground Storage Tank (Each)
																											4'	*8'*	*U - Shaped*	*HID*	*CFL*	*Halogen*									
50	Fire Door (Assumed)												1																											
51	Joint Compound, Ceiling, White (DW/JC1)									150											2							4												
51	Fire Door (Assumed)												1																											
52	Joint Compound, Ceiling, White (DW/JC1)									50																														
52	Fire Door (Assumed)												1																											
53	Interior Door/Window Caulk (OM1)	50																			3							8												
53	Floor Tile, Tan w/White and Dark Tan Specs, 12X12 (FT5)						300																																	
53	Floor Tile Mastic, Black (Associated with FT5)							300																																
53	3/4" Pipe Fitting, Elbow (TSI4)								13																															
53	Joint Compound, Ceiling, White (DW/JC1)									350																														
53	Fire Door (Assumed)												1																											
54	Joint Compound, Ceiling, White (DW/JC1)									125											2							4												
54	Fire Door (Assumed)												1																											
55	Interior Door/Window Caulk (OM1)	25																			2							8												
55	Floor Tile, Tan w/White and Dark Tan Specs, 12X12 (FT5)						150																																	
55	Floor Tile Mastic, Black (Associated with FT5)							150																																
55	Joint Compound, Ceiling, White (DW/JC1)									125																														
55	Fire Door (Assumed)												1								2							8												
56	Interior Door/Window Caulk (OM1)	25																			2							8												
56	Joint Compound, Ceiling, White (DW/JC1)									125																														
56	Fire Door (Assumed)												1																											
57	Joint Compound, Ceiling, White (DW/JC1)									125											2							8												
57	Fire Door (Assumed)												1																											
58	Interior Door/Window Caulk (OM1)	50																			4							16												
58	Joint Compound, Ceiling, White (DW/JC1)									225																														
58	Fire Door (Assumed)												1																											
59	Joint Compound, Ceiling, White (DW/JC1)									3775											16		1					48			2		2		7	4				
59	Joint Compound, Wall, White (DW/JC1)									150																														
59	Spray Applied Column Fireproofing (Presumed) Refer to: Appendix C - As-Built Drawings Conversion of Central Office to Work Release Housing Sheet A-3										300																													
59	Fire Door (Assumed)												2																											
60	Floor Tile, Cream w/Carmel Streaks, 12X12 (FT7)						175														2							8												
60	Floor Tile Mastic, Black (Associated with FT7)							175																																
60	Joint Compound, Ceiling, White (DW/JC1)									175																														
60	Fire Door (Assumed)												1																											

Limited Hazardous Materials Summary Table - DRAFT

Youth Detention Center Project

INTERIOR AREAS WITHIN THE OSTC-OCCUPIED PORTION OF THE SUI BUILDING THAT WILL BE AFFECTED BY THE INSTALLATION OF A NEW FIRE ALARM SYSTEM HAVE NOT BEEN SURVEYED

AREA	ASBESTOS																			PCBs		ODCs					UNIVERSAL WASTE									MISCELLANEOUS MATERIALS					
Location (Room No.)	Asbestos Description (Material, Color, Size)	Caulk (LF)	Sidewalk Expansion Joint (LF)	Transite Window Insert (SF)	Window Glaze (LF)	Plaster Ceiling (SF)	Floor Tile (SF)	Floor Tile Mastic (SF)	Fitting (Each)	Joint Compound (SF; based on square footage of drywall)	Spray Applied Column Fireproofing (SF)	Vibration Dampener (Each)	Fire Door (Each)	Valve Packing (Each)	Cement Asbestos Panel Board (SF)	Built-Up Roof (SF)	1" Plaster Fireproofing (SF)	8" Transite Piping (LF)	Caulk Between Masonry and Steel (LF)	Pipe Insulation (LF)	Ballast (Each)	Transformer (Each)	Water Fountain (Each)	Ice Machine (Each)	Commercial Chiller Unit (Each)	Household Refrigerator / Freezer (Each)	Air Conditioning Unit (Each)	Light Bulbs / Tubes (Each)						Thermostat (Each)	Battery (Each)	Fire Extinguisher (Each)	Lead Vent Pipe (Each)	Underground Auto Lift (2-Post Lift)	Generator (Each)	Aboveground Storage Tank (Each)	Underground Storage Tank (Each)
																											4'	*8'*	*U - Shaped*	*HID*	*CFL*	*Halogen*									
61	Floor Tile, Cream w/Carmel Streaks, 12X12 (FT7)						175														2							8												
61	Floor Tile Mastic, Black (Associated with FT7)							175																																
61	Joint Compound, Ceiling, White (DW/JC1)									175																														
61	Fire Door (Assumed)												1																											
62	Floor Tile, Cream w/Carmel Streaks, 12X12 (FT7)						175														2							8												
62	Floor Tile Mastic, Black (Associated with FT7)							175																																
62	Joint Compound, Ceiling, White (DW/JC1)									175																														
62	Fire Door (Assumed)												1																											
63	Floor Tile, Cream w/Carmel Streaks, 12X12 (FT7)						175														2							4												
63	Floor Tile Mastic, Black (Associated with FT7)							175																																
63	Joint Compound, Ceiling, White (DW/JC1)									175																														
63	Fire Door (Assumed)												1																											
64	Floor Tile, Cream w/Carmel Streaks, 12X12 (FT7)						175														2							8												
64	Floor Tile Mastic, Black (Associated with FT7)							175																																
64	Joint Compound, Ceiling, White (DW/JC1)									175																														
64	Fire Door (Assumed)												1																											
65	Floor Tile, Cream w/Carmel Streaks, 12X12 (FT7)						175														2							8											1	
65	Floor Tile Mastic, Black (Associated with FT7)							175																																
65	Joint Compound, Ceiling, White (DW/JC1)									175																														
65	Joint Compound, Wall, White (DW/JC1)									50																														
65	Fire Door (Assumed)												1																											
66	Floor Tile, Cream w/Carmel Streaks, 12X12 (FT7)						200														2							4												
66	Floor Tile Mastic, Black (Associated with FT7)							200																																
66	Joint Compound, Ceiling, White (DW/JC1)									200																														
66	Fire Door (Assumed)												1																											
67	Floor Tile, Cream w/Carmel Streaks, 12X12 (FT7)						1125														10							28					1		1	1				
67	Floor Tile Mastic, Black (Associated with FT7)							1125																																
67	Spray Applied Column Fireproofing (Presumed) Refer to: Appendix C - As-Built Drawings Conversion of Central Office to Work Release Housing Sheet A-3										100																													
67	Fire Door (Assumed)												2																											
68	Interior Door/Window Caulk (OM1)	175																			24							59			2		1		2				
68	Floor Tile, Cream w/Carmel Streaks, 12X12 (FT7)						150																																
68	Floor Tile Mastic, Black (Associated with FT7)							150																																
68	Floor Tile, Cream w/Brown and White Specs, 9X9 (FT8)						2400																																
68	Floor Tile Mastic, Black (Associated with FT8)							2400																																

Limited Hazardous Materials Summary Table - DRAFT

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INTERIOR AREAS WITHIN THE OSTC-OCCUPIED PORTION OF THE SUI BUILDING THAT WILL BE AFFECTED BY THE INSTALLATION OF A NEW FIRE ALARM SYSTEM HAVE NOT BEEN SURVEYED

AREA	ASBESTOS																			PCBs		ODCs					UNIVERSAL WASTE									MISCELLANEOUS MATERIALS					
Location (Room No.)	Asbestos Description (Material, Color, Size)	Caulk (LF)	Sidewalk Expansion Joint (LF)	Transite Window Insert (SF)	Window Glaze (LF)	Plaster Ceiling (SF)	Floor Tile (SF)	Floor Tile Mastic (SF)	Fitting (Each)	Joint Compound (SF; based on square footage of drywall)	Spray Applied Column Fireproofing (SF)	Vibration Dampener (Each)	Fire Door (Each)	Valve Packing (Each)	Cement Asbestos Panel Board (SF)	Built-Up Roof (SF)	1" Plaster Fireproofing (SF)	8" Transite Piping (LF)	Caulk Between Masonry and Steel (LF)	Pipe Insulation (LF)	Ballast (Each)	Transformer (Each)	Water Fountain (Each)	Ice Machine (Each)	Commercial Chiller Unit (Each)	Household Refrigerator / Freezer (Each)	Air Conditioning Unit (Each)	Light Bulbs / Tubes (Each)						Thermostat (Each)	Battery (Each)	Fire Extinguisher (Each)	Lead Vent Pipe (Each)	Underground Auto Lift (2-Post Lift)	Generator (Each)	Aboveground Storage Tank (Each)	Underground Storage Tank (Each)
																											4'	*8'*	*U - Shaped*	*HID*	*CFL*	*Halogen*									
68	Floor Tile, Cream w/Brown Specs, 9X9 (FT9)						300																																	
68	Floor Tile Mastic, Black (Associated with FT9)							300																																
68	Fire Door (Assumed)												4																											
69	Floor Tile, Tan w/White and Dark Tan Specs, 12X12 (FT5)						175														2							4								1					
69	Floor Tile Mastic, Black (Associated with FT5)							175																																
69	Fire Door (Assumed)												1																											
70	Floor Tile, Cream w/Green and Gray Blotches, 12X12 (FT1)						15														15							32			2		2		1					
70	Floor Tile Mastic, Black (Associated with FT1)							15																																
70	Floor Tile, Cream w/Carmel Streaks, 12X12 (FT7)						300																																
70	Floor Tile Mastic, Black (Associated with FT7)							300																																
70	Spray Applied Column Fireproofing (Presumed) Refer to: Appendix C - As-Built Drawings Conversion of Central Office to Work Release Housing Sheet A-3										100																													
71	Floor Tile, Cream w/Brown and White Specs, 9X9 (FT8)						100														2							3													
71	Floor Tile Mastic, Black (Associated with FT8)							100																																
72	Fire Door (Assumed)												1																											
73	Ceiling Plaster, Cream, Textured (S3)					1500															12							56		2	6		1		3	1				
73	Floor Tile, Unknown, 12X12 (FT15)						1500																																
73	Floor Tile Mastic, Black (Associated with FT15)							1500																																
73	Joint Compound, Wall, White (DW/JC1)									2400																														
73	Spray Applied Column Fireproofing (Presumed) Refer to: Appendix C - As-Built Drawings Conversion of Central Office to Work Release Housing Sheet A-3										100																													
73	Fire Door (Assumed)												3																											
74	Ceiling Plaster, Cream, Textured (S3)					300															4							16													
74	Floor Tile, Unknown, 12X12 (FT15)						300																																	
74	Floor Tile Mastic, Black (Associated with FT15)							300																																
74	Joint Compound, Wall, White (DW/JC1)									500																														
75	Ceiling Plaster, Cream, Textured (S3)					350															6							24													
75	Floor Tile, Unknown, 12X12 (FT15)						350																																	
75	Floor Tile Mastic, Black (Associated with FT15)							350																																
75	Joint Compound, Wall, White (DW/JC1)									575																														
76	Ceiling Plaster, Cream, Textured (S3)					75															1							4													
76	Joint Compound, Wall, White (DW/JC1)									225																														
77	Ceiling Plaster, Cream, Textured (S3)					75															1							4													
77	Joint Compound, Wall, White (DW/JC1)									300																														

Limited Hazardous Materials Summary Table - DRAFT

Youth Detention Center Project

INTERIOR AREAS WITHIN THE OSTC-OCCUPIED PORTION OF THE SUI BUILDING THAT WILL BE AFFECTED BY THE INSTALLATION OF A NEW FIRE ALARM SYSTEM HAVE NOT BEEN SURVEYED

AREA	ASBESTOS																			PCBs		ODCs					UNIVERSAL WASTE									MISCELLANEOUS MATERIALS					
Location (Room No.)	Asbestos Description (Material, Color, Size)	Caulk (LF)	Sidewalk Expansion Joint (LF)	Transite Window Insert (SF)	Window Glaze (LF)	Plaster Ceiling (SF)	Floor Tile (SF)	Floor Tile Mastic (SF)	Fitting (Each)	Joint Compound (SF; based on square footage of drywall)	Spray Applied Column Fireproofing (SF)	Vibration Dampener (Each)	Fire Door (Each)	Valve Packing (Each)	Cement Asbestos Panel Board (SF)	Built-Up Roof (SF)	1" Plaster Fireproofing (SF)	8" Transite Piping (LF)	Caulk Between Masonry and Steel (LF)	Pipe Insulation (LF)	Ballast (Each)	Transformer (Each)	Water Fountain (Each)	Ice Machine (Each)	Commercial Chiller Unit (Each)	Household Refrigerator / Freezer (Each)	Air Conditioning Unit (Each)	Light Bulbs / Tubes (Each)						Thermostat (Each)	Battery (Each)	Fire Extinguisher (Each)	Lead Vent Pipe (Each)	Underground Auto Lift (2-Post Lift)	Generator (Each)	Aboveground Storage Tank (Each)	Underground Storage Tank (Each)
																											4'	*8'*	*U - Shaped*	*HID*	*CFL*	*Halogen*									
77	Spray Applied Column Fireproofing (Presumed) Refer to: Appendix C - As-Built Drawings Conversion of Central Office to Work Release Housing Sheet A-3										100																													
78	Ceiling Plaster, Cream, Textured (S3)					150															2							8												
78	Floor Tile, Unknown, 12X12 (FT15)						150																																	
78	Floor Tile Mastic, Black (Associated with FT15)							150																																
78	Joint Compound, Wall, White (DW/JC1)									450																														
79	Ceiling Plaster, Cream, Textured (S3)					125															2							4												
79	Floor Tile, Unknown, 12X12 (FT15)						125																																	
79	Floor Tile Mastic, Black (Associated with FT15)							125																																
79	Joint Compound, Wall, White (DW/JC1)									375																														
79	Spray Applied Column Fireproofing (Presumed) Refer to: Appendix C - As-Built Drawings Conversion of Central Office to Work Release Housing Sheet A-3										100																													
79	Fire Door (Assumed)												1																											
80	Floor Tile, Cream w/Brown Specs, 9X9 (FT9)						100																																	
80	Floor Tile Mastic, Black (Associated with FT9)							100																																
80	Fire Door (Assumed)												1																											
81	Floor Tile, Unknown, 12X12 (FT15)						200														4							8			2				1					
81	Floor Tile Mastic, Black (Associated with FT15)							200																																
81	Fire Door (Assumed)												4																											
82	Floor Tile, Cream w/Carmel Streaks, 12X12 (FT7)						150														2						1	4			2				1					
82	Floor Tile Mastic, Black (Associated with FT7)							150																																
82	Fire Door (Assumed)												1																											
83	Floor Tile Mastic, Black (Associated with FT2)							50													10								12		2		1		2	2				
83	Floor Tile, Cream w/Carmel Streaks, 12X12 (FT7)						1100																																	
83	Floor Tile Mastic, Black (Associated with FT7)							1100																																
83	Floor Tile, Cream w/Brown and White Specs, 9X9 (FT8)						2500																																	
83	Floor Tile Mastic, Black (Associated with FT8)							2500																																
83	Spray Applied Column Fireproofing (Presumed) Refer to: Appendix C - As-Built Drawings Conversion of Central Office to Work Release Housing Sheet A-3										500																													
83	Fire Door (Assumed)												4																											
84	Spray Applied Column Fireproofing (Presumed) Refer to: Appendix C - As-Built Drawings Conversion of Central Office to Work Release Housing Sheet A-3										200										1							2												

Limited Hazardous Materials Summary Table - DRAFT

Youth Detention Center Project

INTERIOR AREAS WITHIN THE OSTC-OCCUPIED PORTION OF THE SUI BUILDING THAT WILL BE AFFECTED BY THE INSTALLATION OF A NEW FIRE ALARM SYSTEM HAVE NOT BEEN SURVEYED

AREA	ASBESTOS																			PCBs		ODCs					UNIVERSAL WASTE									MISCELLANEOUS MATERIALS					
Location (Room No.)	Asbestos Description (Material, Color, Size)	Caulk (LF)	Sidewalk Expansion Joint (LF)	Transite Window Insert (SF)	Window Glaze (LF)	Plaster Ceiling (SF)	Floor Tile (SF)	Floor Tile Mastic (SF)	Fitting (Each)	Joint Compound (SF; based on square footage of drywall)	Spray Applied Column Fireproofing (SF)	Vibration Dampener (Each)	Fire Door (Each)	Valve Packing (Each)	Cement Asbestos Panel Board (SF)	Built-Up Roof (SF)	1" Plaster Fireproofing (SF)	8" Transite Piping (LF)	Caulk Between Masonry and Steel (LF)	Pipe Insulation (LF)	Ballast (Each)	Transformer (Each)	Water Fountain (Each)	Ice Machine (Each)	Commercial Chiller Unit (Each)	Household Refrigerator / Freezer (Each)	Air Conditioning Unit (Each)	Light Bulbs / Tubes (Each)						Thermostat (Each)	Battery (Each)	Fire Extinguisher (Each)	Lead Vent Pipe (Each)	Underground Auto Lift (2-Post Lift)	Generator (Each)	Aboveground Storage Tank (Each)	Underground Storage Tank (Each)
																											4'	*8'*	*U - Shaped*	*HID*	*CFL*	*Halogen*									
84	Fire Door (Assumed)												1																												
85	Interior Door/Window Caulk (OM1)	50																			3							5			4				2					
85	Floor Tile, Tan w/White and Dark Tan Specs, 12X12 (FT5)						175																																	
85	Floor Tile Mastic, Black (Associated with FT5)							175																																
85	Fire Door (Assumed)												2																												
86	Fire Door (Assumed)												1								2							4													
87	Ceiling Plaster, Cream, Textured (S3)					25																										1								
87	Fire Door (Assumed)												1																												
88	Fire Door (Assumed)												1								3							6													
89	Interior Door/Window Caulk (OM1)	250																			47						4	102			2		1		1					
89	Floor Tile, Cream w/Carmel Streaks, 12X12 (FT7)						1800																																	
89	Floor Tile Mastic, Black (Associated with FT7)							1800																																
89	Joint Compound, Wall, White (DW/JC1)									350																															
89	Spray Applied Column Fireproofing (Presumed) Refer to: Appendix C - As-Built Drawings Conversion of Central Office to Work Release Housing Sheet A-3										200																														
89	Fire Door (Assumed)												2																												
90	Floor Tile, Cream w/Carmel Streaks, 12X12 (FT7)						175																					4			2		1		2	1				
90	Floor Tile Mastic, Black (Associated with FT7)							175																																
90	Fire Door (Assumed)												3																												
91A	Floor Tile, Cream w/Green and Gray Blotches, 12X12 (FT1)						35														7							17			4		2		4					
91A	Floor Tile Mastic, Black (Associated with FT1)							35																																
91A	Floor Tile Mastic, Black (Associated with FT2)							5																																
91A	Floor Tile, Tan w/White and Dark Tan Specs, 12X12 (FT5)						5																																	
91A	Floor Tile Mastic, Black (Associated with FT5)							5																																
91A	Floor Tile, Cream w/Carmel Streaks, 12X12 (FT7)						550																																	
91A	Floor Tile Mastic, Black (Associated with FT7)							550																																
91A	Floor Tile, Cream w/Brown and White Specs, 9X9 (FT8)						10																																	
91A	Floor Tile Mastic, Black (Associated with FT8)							10																																
91A	Spray Applied Column Fireproofing (Presumed) Refer to: Appendix C - As-Built Drawings Conversion of Central Office to Work Release Housing Sheet A-3										500																														
91B	Fire Door (Assumed)												2								6							12			6				3					
92	Interior Door/Window Caulk (OM1)	50																			3							24													
92	Floor Tile, Cream w/Carmel Streaks, 12X12 (FT7)						400																																	
92	Floor Tile Mastic, Black (Associated with FT7)							400																																

Limited Hazardous Materials Summary Table - DRAFT

Youth Detention Center Project

INTERIOR AREAS WITHIN THE OSTC-OCCUPIED PORTION OF THE SUI BUILDING THAT WILL BE AFFECTED BY THE INSTALLATION OF A NEW FIRE ALARM SYSTEM HAVE NOT BEEN SURVEYED

AREA	ASBESTOS																			PCBs		ODCs					UNIVERSAL WASTE									MISCELLANEOUS MATERIALS					
Location (Room No.)	Asbestos Description (Material, Color, Size)	Caulk (LF)	Sidewalk Expansion Joint (LF)	Transite Window Insert (SF)	Window Glaze (LF)	Plaster Ceiling (SF)	Floor Tile (SF)	Floor Tile Mastic (SF)	Fitting (Each)	Joint Compound (SF; based on square footage of drywall)	Spray Applied Column Fireproofing (SF)	Vibration Dampener (Each)	Fire Door (Each)	Valve Packing (Each)	Cement Asbestos Panel Board (SF)	Built-Up Roof (SF)	1" Plaster Fireproofing (SF)	8" Transite Piping (LF)	Caulk Between Masonry and Steel (LF)	Pipe Insulation (LF)	Ballast (Each)	Transformer (Each)	Water Fountain (Each)	Ice Machine (Each)	Commercial Chiller Unit (Each)	Household Refrigerator / Freezer (Each)	Air Conditioning Unit (Each)	Light Bulbs / Tubes (Each)						Thermostat (Each)	Battery (Each)	Fire Extinguisher (Each)	Lead Vent Pipe (Each)	Underground Auto Lift (2-Post Lift)	Generator (Each)	Aboveground Storage Tank (Each)	Underground Storage Tank (Each)
																											4'	*8'*	*U - Shaped*	*HID*	*CFL*	*Halogen*									
92	Joint Compound, Ceiling, White (DW/JC1)									400																														
93	Ceiling Plaster, Cream, Textured (S3)					25															7						28												
93	Floor Tile, Cream w/Carmel Streaks, 12X12 (FT7)						500																																
93	Floor Tile Mastic, Black (Associated with FT7)							500																																
93	Joint Compound, Ceiling, White (DW/JC1)									500																														
93	Joint Compound, Wall, White (DW/JC1)									250																														
93	Spray Applied Column Fireproofing (Presumed) Refer to: Appendix C - As-Built Drawings Conversion of Central Office to Work Release Housing Sheet A-3										100																													
93	Fire Door (Assumed)												2																											
94	Floor Tile, Cream w/Green and Gray Blotches, 12X12 (FT1)						100														1						2												
94	Floor Tile Mastic, Black (Associated with FT1)							100																																
94	Joint Compound, Ceiling, White (DW/JC1)									100																														
94	Fire Door (Assumed)												1																											
95	Floor Tile, Tan w/White and Dark Tan Specs, 12X12 (FT5)						175														3					1	12												
95	Floor Tile Mastic, Black (Associated with FT5)							175																																
95	Joint Compound, Ceiling, White (DW/JC1)									175																														
95	Fire Door (Assumed)												1																											
96	Floor Tile, Cream w/Green and Gray Blotches, 12X12 (FT1)						200														7						24			2		1		3					
96	Floor Tile Mastic, Black (Associated with FT1)							200																																
96	Floor Tile, Cream w/Carmel Streaks, 12X12 (FT7)						400																																
96	Floor Tile Mastic, Black (Associated with FT7)							400																																
96	Joint Compound, Ceiling, White (DW/JC1)									600																														
96	Joint Compound, Wall, White (DW/JC1)									100																														
96	Spray Applied Column Fireproofing (Presumed) Refer to: Appendix C - As-Built Drawings Conversion of Central Office to Work Release Housing Sheet A-3										200																													
96	Fire Door (Assumed)												1																											
97	Floor Tile, Cream w/Carmel Streaks, 12X12 (FT7)						120														2						8												
97	Floor Tile Mastic, Black (Associated with FT7)							120																																
97	Joint Compound, Ceiling, White (DW/JC1)									120																														
97	Fire Door (Assumed)												1																											
98	Floor Tile, Cream w/Carmel Streaks, 12X12 (FT7)						100														2						4												
98	Floor Tile Mastic, Black (Associated with FT7)							100																																
98	Joint Compound, Ceiling, White (DW/JC1)									100																														
98	Fire Door (Assumed)												1																											

Limited Hazardous Materials Summary Table - DRAFT

Youth Detention Center Project

INTERIOR AREAS WITHIN THE OSTC-OCCUPIED PORTION OF THE SUI BUILDING THAT WILL BE AFFECTED BY THE INSTALLATION OF A NEW FIRE ALARM SYSTEM HAVE NOT BEEN SURVEYED

AREA	ASBESTOS																			PCBs		ODCs					UNIVERSAL WASTE									MISCELLANEOUS MATERIALS					
Location (Room No.)	Asbestos Description (Material, Color, Size)	Caulk (LF)	Sidewalk Expansion Joint (LF)	Transite Window Insert (SF)	Window Glaze (LF)	Plaster Ceiling (SF)	Floor Tile (SF)	Floor Tile Mastic (SF)	Fitting (Each)	Joint Compound (SF; based on square footage of drywall)	Spray Applied Column Fireproofing (SF)	Vibration Dampener (Each)	Fire Door (Each)	Valve Packing (Each)	Cement Asbestos Panel Board (SF)	Built-Up Roof (SF)	1" Plaster Fireproofing (SF)	8" Transite Piping (LF)	Caulk Between Masonry and Steel (LF)	Pipe Insulation (LF)	Ballast (Each)	Transformer (Each)	Water Fountain (Each)	Ice Machine (Each)	Commercial Chiller Unit (Each)	Household Refrigerator / Freezer (Each)	Air Conditioning Unit (Each)	Light Bulbs / Tubes (Each)						Thermostat (Each)	Battery (Each)	Fire Extinguisher (Each)	Lead Vent Pipe (Each)	Underground Auto Lift (2-Post Lift)	Generator (Each)	Aboveground Storage Tank (Each)	Underground Storage Tank (Each)
																											4'	*8'*	*U - Shaped*	*HID*	*CFL*	*Halogen*									
99	Ceiling Plaster, Cream, Textured (S3)					25															2							8													
99	Floor Tile, Cream w/Carmel Streaks, 12X12 (FT7)						100																																	
99	Floor Tile Mastic, Black (Associated with FT7)							100																																
99	Joint Compound, Ceiling, White (DW/JC1)									100																														
99	Joint Compound, Wall, White (DW/JC1)									50																														
99	Fire Door (Assumed)												1																											
100	Floor Tile, Cream w/Carmel Streaks, 12X12 (FT7)						120														1							4													
100	Floor Tile Mastic, Black (Associated with FT7)							120																																
100	Joint Compound, Ceiling, White (DW/JC1)									120																														
101	3/4" Pipe Fitting, Elbow (TSI4)								4												2							8													
101	Joint Compound, Ceiling, White (DW/JC1)									180																														
101	Spray Applied Column Fireproofing (Presumed) Refer to: Appendix C - As-Built Drawings Conversion of Central Office to Work Release Housing Sheet A-3										100																													
101	Fire Door (Assumed)												2																											
102	Interior Door/Window Caulk (OM1)	100																			42							42			2		1		3	1				
102	Floor Tile Mastic, Black (Associated with FT2)							25																															
102	Floor Tile, Tan w/White and Dark Tan Specs, 12X12 (FT5)						10																																
102	Floor Tile Mastic, Black (Associated with FT5)							10																																
102	Floor Tile, Cream w/Carmel Streaks, 12X12 (FT7)						1600																																
102	Floor Tile Mastic, Black (Associated with FT7)							1600																																
102	Floor Tile Mastic, Black (Associated with FT13)							10																																
102	Fire Door (Assumed)												2																											
103	Floor Tile, Cream w/Brown and White Specs, 9X9 (FT8)						100														1								2												
103	Floor Tile Mastic, Black (Associated with FT8)							100																																
103	Joint Compound, Ceiling, White (DW/JC1)									100																														
103	Fire Door (Assumed)												1																											
104	Floor Tile, Cream w/Green and Gray Blotches, 12X12 (FT1)						65																																
104	Floor Tile Mastic, Black (Associated with FT1)							65																																
104	Fire Door (Assumed)												1																											
105	Floor Tile, Cream w/Carmel Streaks, 12X12 (FT7)						100																																
105	Floor Tile Mastic, Black (Associated with FT7)							100																																
105	Fire Door (Assumed)												1																											
106	Floor Tile, Cream w/Carmel Streaks, 12X12 (FT7)						100														1							2													
106	Floor Tile Mastic, Black (Associated with FT7)							100																																

Limited Hazardous Materials Summary Table - DRAFT

Youth Detention Center Project

INTERIOR AREAS WITHIN THE OSTC-OCCUPIED PORTION OF THE SUI BUILDING THAT WILL BE AFFECTED BY THE INSTALLATION OF A NEW FIRE ALARM SYSTEM HAVE NOT BEEN SURVEYED

AREA	ASBESTOS																			PCBs		ODCs					UNIVERSAL WASTE									MISCELLANEOUS MATERIALS						
Location (Room No.)	Asbestos Description (Material, Color, Size)	Caulk (LF)	Sidewalk Expansion Joint (LF)	Transite Window Insert (SF)	Window Glaze (LF)	Plaster Ceiling (SF)	Floor Tile (SF)	Floor Tile Mastic (SF)	Fitting (Each)	Joint Compound (SF; based on square footage of drywall)	Spray Applied Column Fireproofing (SF)	Vibration Dampener (Each)	Fire Door (Each)	Valve Packing (Each)	Cement Asbestos Panel Board (SF)	Built-Up Roof (SF)	1" Plaster Fireproofing (SF)	8" Transite Piping (LF)	Caulk Between Masonry and Steel (LF)	Pipe Insulation (LF)	Ballast (Each)	Transformer (Each)	Water Fountain (Each)	Ice Machine (Each)	Commercial Chiller Unit (Each)	Household Refrigerator / Freezer (Each)	Air Conditioning Unit (Each)	Light Bulbs / Tubes (Each)						Thermostat (Each)	Battery (Each)	Fire Extinguisher (Each)	Lead Vent Pipe (Each)	Underground Auto Lift (2-Post Lift)	Generator (Each)	Aboveground Storage Tank (Each)	Underground Storage Tank (Each)
																											4'	*8'*	*U - Shaped*	*HID*	*CFL*	*Halogen*									
106	Spray Applied Column Fireproofing (Presumed) Refer to: Appendix C - As-Built Drawings Conversion of Central Office to Work Release Housing Sheet A-3										100																														
106	Fire Door (Assumed)												2																												
107	Spray Applied Column Fireproofing (Presumed) Refer to: Appendix C - As-Built Drawings Conversion of Central Office to Work Release Housing Sheet A-3										100																														
108	Interior Door/Window Caulk (OM1)	125																			24			2		1	4			48			1		1	1						
108	Floor Tile Mastic, Black (Associated with FT2)							2000																																	
108	Floor Tile, Orange w/Cream and Dark Tan Specs, 12X12 (FT14)						2000																																		
108	Floor Tile Mastic, Black (Associated with FT14)							2000																																	
108	Joint Compound, Ceiling, White (DW/JC1)									2000																															
108	Fire Door (Assumed)												5																												
108	1" Plaster Fireproofing (Presumed) Refer to: Appendix C - As-Built Drawings Vocational Rehabilitation Center, Maryland Penitentiary Sheet A-8																1000																								
109																					14													28				4	1		2			
110	Fire Door (Assumed)												1								1						1	2													
111	Fire Door (Assumed)												1																								1					
112																									2												3					
113																					3						1	6													
114	Interior Door/Window Caulk (OM1)	100																			2						1	8													
114	Floor Tile, Orange w/Cream and Dark Tan Specs, 12X12 (FT14)						400																																		
114	Floor Tile Mastic, Black (Associated with FT14)							400																																	
115	Interior Door/Window Caulk (OM1)	100																			2					1	1	4													
115	Floor Tile, Unknown, 12X12 (FT15)						400																																		
115	Floor Tile Mastic, Black (Associated with FT15)							400																																	
116	Interior Door/Window Caulk (OM1)	25																			1						1	4													
116	1" Pipe Fitting, Elbow (TSI3)								4																																
116	Fire Door (Assumed)												1																												
117	Interior Door/Window Caulk (OM1)	25																			2						1	8													
117	1" Pipe Fitting, Elbow (TSI3)								4																																
117	Fire Door (Assumed)												1																												
118	Interior Door/Window Caulk (OM1)	25																			1						1	4													
118	1" Pipe Fitting, Elbow (TSI3)								4																																
118	Fire Door (Assumed)												1																												

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AREA	ASBESTOS																			PCBs		ODCs					UNIVERSAL WASTE									MISCELLANEOUS MATERIALS					
Location (Room No.)	Asbestos Description (Material, Color, Size)	Caulk (LF)	Sidewalk Expansion Joint (LF)	Transite Window Insert (SF)	Window Glaze (LF)	Plaster Ceiling (SF)	Floor Tile (SF)	Floor Tile Mastic (SF)	Fitting (Each)	Joint Compound (SF; based on square footage of drywall)	Spray Applied Column Fireproofing (SF)	Vibration Dampener (Each)	Fire Door (Each)	Valve Packing (Each)	Cement Asbestos Panel Board (SF)	Built-Up Roof (SF)	1" Plaster Fireproofing (SF)	8" Transite Piping (LF)	Caulk Between Masonry and Steel (LF)	Pipe Insulation (LF)	Ballast (Each)	Transformer (Each)	Water Fountain (Each)	Ice Machine (Each)	Commercial Chiller Unit (Each)	Household Refrigerator / Freezer (Each)	Air Conditioning Unit (Each)	Light Bulbs / Tubes (Each)						Thermostat (Each)	Battery (Each)	Fire Extinguisher (Each)	Lead Vent Pipe (Each)	Underground Auto Lift (2-Post Lift)	Generator (Each)	Aboveground Storage Tank (Each)	Underground Storage Tank (Each)
																											4'	*8'*	*U - Shaped*	*HID*	*CFL*	*Halogen*								
119	Interior Door/Window Caulk (OM1)	50																			2						1	8												
119	1" Pipe Fitting, Elbow (TSI3)								4																															
119	Fire Door (Assumed)												1																											
120	Interior Door/Window Caulk (OM1)	25																			2							4												
120	1" Pipe Fitting, Elbow (TSI3)								4																															
120	3/4" Pipe Fitting, Elbow (TSI4)								15																															
120	Fire Door (Assumed)												1																											
121	Interior Door/Window Caulk (OM1)	25																			1						1	2												
121	1" Pipe Fitting, Elbow (TSI3)								4																															
121	Fire Door (Assumed)												1																											
122	Interior Door/Window Caulk (OM1)	25																			1							2												
122	1" Pipe Fitting, Elbow (TSI3)								2																															
122	Fire Door (Assumed)												1																											
123	Interior Door/Window Caulk (OM1)	25																			1							2												
123	1" Pipe Fitting, Elbow (TSI3)								4																															
123	Fire Door (Assumed)												1																											
124	Interior Door/Window Caulk (OM1)	25																			2							4												
124	Fire Door (Assumed)												1																											
125	Interior Door/Window Caulk (OM1)	25																			2							8			2				1					
125	Joint Compound, Wall, White (DW/JC1)									400																														
126	Floor Tile Mastic, Black (Associated with FT3)							50													5							20			2		1		1	1				
126	Floor Tile Mastic, Black (Associated with FT13)							350																																
127	Interior Door/Window Caulk (OM1)	150																			4						1	16			2	1			1	3				
127	Floor Tile Mastic, Black (Associated with FT13)							500																																
128	Floor Tile Mastic, Black (Associated with FT13)							50																								1								
128	Fire Door (Assumed)												1																											
129	Floor Tile Mastic, Black (Associated with FT13)							50																								1								
129	Fire Door (Assumed)												1																											
130	Floor Tile, Orange w/Cream and Dark Tan Specs, 12X12 (FT14)						50														1							4												
130	Floor Tile Mastic, Black (Associated with FT14)							50																																
130	Fire Door (Assumed)												1																											
131	Fire Door (Assumed)												1								1							2												
132	1" Pipe Fitting, Elbow (TSI3)								5												1							2					1							
133	Interior Door/Window Caulk (OM1)	50																			5					1	1	12								1				
133	1" Pipe Fitting, Elbow (TSI3)								20																															
133	Fire Door (Assumed)												1																											

Limited Hazardous Materials Summary Table - DRAFT

Youth Detention Center Project

INTERIOR AREAS WITHIN THE OSTC-OCCUPIED PORTION OF THE SUI BUILDING THAT WILL BE AFFECTED BY THE INSTALLATION OF A NEW FIRE ALARM SYSTEM HAVE NOT BEEN SURVEYED

AREA	ASBESTOS																			PCBs		ODCs					UNIVERSAL WASTE									MISCELLANEOUS MATERIALS					
Location (Room No.)	Asbestos Description (Material, Color, Size)	Caulk (LF)	Sidewalk Expansion Joint (LF)	Transite Window Insert (SF)	Window Glaze (LF)	Plaster Ceiling (SF)	Floor Tile (SF)	Floor Tile Mastic (SF)	Fitting (Each)	Joint Compound (SF; based on square footage of drywall)	Spray Applied Column Fireproofing (SF)	Vibration Dampener (Each)	Fire Door (Each)	Valve Packing (Each)	Cement Asbestos Panel Board (SF)	Built-Up Roof (SF)	1" Plaster Fireproofing (SF)	8" Transite Piping (LF)	Caulk Between Masonry and Steel (LF)	Pipe Insulation (LF)	Ballast (Each)	Transformer (Each)	Water Fountain (Each)	Ice Machine (Each)	Commercial Chiller Unit (Each)	Household Refrigerator / Freezer (Each)	Air Conditioning Unit (Each)	Light Bulbs / Tubes (Each)						Thermostat (Each)	Battery (Each)	Fire Extinguisher (Each)	Lead Vent Pipe (Each)	Underground Auto Lift (2-Post Lift)	Generator (Each)	Aboveground Storage Tank (Each)	Underground Storage Tank (Each)
																											4'	*8'*	*U - Shaped*	*HID*	*CFL*	*Halogen*									
134	6" Pipe Fitting, Straight (TSI1)								4												6							24					1			1					
134	4" Pipe Fitting, Elbow (TSI5)								50																																
134	Vibration Dampeners (Assumed)											3																													
134	Fire Door (Assumed)												1																												
134	Valve Packing (Assumed)													10																											
135	3/4" Pipe Fitting, Elbow (TSI4)								2												3							8			2				4					
136	Fire Door (Assumed)												2								1							2												
137	Fire Door (Assumed)												3								2							4												
138	Fire Door (Assumed)												1								3							6												
139	Fire Door (Assumed)												2								9							18												
139	Valve Packing (Assumed)													10																											
140	Interior Door/Window Caulk (OM1)	75																			16		1					21	2				1			3					
140	Joint Compound, Ceiling, White (DW/JC1)									1050																														
140																																					1			
141	Interior Door/Window Caulk (OM1)	50																			4							4	5				1	1						
141	Joint Compound, Ceiling, White (DW/JC1)									650																														
141	Fire Door (Assumed)												1																											
142	3/4" Pipe Fitting, Elbow (TSI4)								1												1								2				1							
142	Fire Door (Assumed)												3																											
142	Valve Packing (Assumed)													1																											
143	Fire Door (Assumed)												2								3							3												
144	Interior Door/Window Caulk (OM1)	25																														1								
144	Floor Tile, Orange w/Cream and Dark Tan Specs, 12X12 (FT14)						150																																	
144	Floor Tile Mastic, Black (Associated with FT14)							150																																
144	1" Pipe Fitting, Elbow (TSI3)								2																																
144	Fire Door (Assumed)												1																											
145	Interior Door/Window Caulk (OM1)	25																			1						1	4				3								
145	Floor Tile, Orange w/Cream and Dark Tan Specs, 12X12 (FT14)						150																																	
145	Floor Tile Mastic, Black (Associated with FT14)							150																																
145	1" Pipe Fitting, Elbow (TSI3)								1																																
145	Fire Door (Assumed)												1																											
146	Interior Door/Window Caulk (OM1)	25																														1								
146	Floor Tile, Orange w/Cream and Dark Tan Specs, 12X12 (FT14)						150																																	
146	Floor Tile Mastic, Black (Associated with FT14)							150																																
146	1" Pipe Fitting, Elbow (TSI3)								2																																
146	Fire Door (Assumed)												1																											

Limited Hazardous Materials Summary Table - DRAFT

Youth Detention Center Project

INTERIOR AREAS WITHIN THE OSTC-OCCUPIED PORTION OF THE SUI BUILDING THAT WILL BE AFFECTED BY THE INSTALLATION OF A NEW FIRE ALARM SYSTEM HAVE NOT BEEN SURVEYED

AREA	ASBESTOS																			PCBs		ODCs					UNIVERSAL WASTE									MISCELLANEOUS MATERIALS					
Location (Room No.)	Asbestos Description (Material, Color, Size)	Caulk (LF)	Sidewalk Expansion Joint (LF)	Transite Window Insert (SF)	Window Glaze (LF)	Plaster Ceiling (SF)	Floor Tile (SF)	Floor Tile Mastic (SF)	Fitting (Each)	Joint Compound (SF; based on square footage of drywall)	Spray Applied Column Fireproofing (SF)	Vibration Dampener (Each)	Fire Door (Each)	Valve Packing (Each)	Cement Asbestos Panel Board (SF)	Built-Up Roof (SF)	1" Plaster Fireproofing (SF)	8" Transite Piping (LF)	Caulk Between Masonry and Steel (LF)	Pipe Insulation (LF)	Ballast (Each)	Transformer (Each)	Water Fountain (Each)	Ice Machine (Each)	Commercial Chiller Unit (Each)	Household Refrigerator / Freezer (Each)	Air Conditioning Unit (Each)	Light Bulbs / Tubes (Each)						Thermostat (Each)	Battery (Each)	Fire Extinguisher (Each)	Lead Vent Pipe (Each)	Underground Auto Lift (2-Post Lift)	Generator (Each)	Aboveground Storage Tank (Each)	Underground Storage Tank (Each)
																											4'	*8'*	*U - Shaped*	*HID*	*CFL*	*Halogen*									
147	Interior Door/Window Caulk (OM1)	25																													1									
147	Floor Tile, Orange w/Cream and Dark Tan Specs, 12X12 (FT14)						150																																	
147	Floor Tile Mastic, Black (Associated with FT14)							150																																
147	Fire Door (Assumed)												1																											
148	Interior Door/Window Caulk (OM1)	25																													1									
148	Floor Tile, Orange w/Cream and Dark Tan Specs, 12X12 (FT14)						150																																	
148	Floor Tile Mastic, Black (Associated with FT14)							150																																
148	1" Pipe Fitting, Elbow (TSI3)								2																																
148	Fire Door (Assumed)												1																											
149	Interior Door/Window Caulk (OM1)	25																			2							4												
149	1" Pipe Fitting, Elbow (TSI3)								2																																
149	3/4" Pipe Fitting, Elbow (TSI4)								15																																
149	Fire Door (Assumed)												1																											
150	Interior Door/Window Caulk (OM1)	75																			1					2	1	16												
150	Floor Tile, Orange w/Cream and Dark Tan Specs, 12X12 (FT14)						500																																	
150	Floor Tile Mastic, Black (Associated with FT14)							500																																
150	1" Pipe Fitting, Elbow (TSI3)								6																																
150	Fire Door (Assumed)												1																											
151	Interior Door/Window Caulk (OM1)	25																			2							8												
151	Floor Tile, Orange w/Cream and Dark Tan Specs, 12X12 (FT14)						150																																	
151	Floor Tile Mastic, Black (Associated with FT14)							150																																
151	1" Pipe Fitting, Elbow (TSI3)								2																																
151	Fire Door (Assumed)												1																											
152	Floor Tile, Cream w/Carmel Streaks, 12X12 (FT7)						15														5							20			2		1		1	1				
152	Floor Tile Mastic, Black (Associated with FT7)							15																																
152	Floor Tile Mastic, Black (Associated with FT13)							385																																
Crawl Space	Pipe Fitting, Elbow (Presumed)								125																																
Crawl Space	3/4" Pipe Insulation (Presumed)																			500																				
Crawl Space	1" Pipe Insulation (Presumed)																			600																				
Crawl Space	1-1/4" Pipe Insulation (Presumed)																			300																				
Crawl Space	2" Pipe Insulation (Presumed)																			200																				
Crawl Space	2-1/2" Pipe Insulation (Presumed)																			200																				

Limited Hazardous Materials Summary Table - DRAFT

Youth Detention Center Project

INTERIOR AREAS WITHIN THE OSTC-OCCUPIED PORTION OF THE SUI BUILDING THAT WILL BE AFFECTED BY THE INSTALLATION OF A NEW FIRE ALARM SYSTEM HAVE NOT BEEN SURVEYED

AREA	ASBESTOS																			PCBs		ODCs					UNIVERSAL WASTE									MISCELLANEOUS MATERIALS					
Location (Room No.)	Asbestos Description (Material, Color, Size)	Caulk (LF)	Sidewalk Expansion Joint (LF)	Transite Window Insert (SF)	Window Glaze (LF)	Plaster Ceiling (SF)	Floor Tile (SF)	Floor Tile Mastic (SF)	Fitting (Each)	Joint Compound (SF; based on square footage of drywall)	Spray Applied Column Fireproofing (SF)	Vibration Dampener (Each)	Fire Door (Each)	Valve Packing (Each)	Cement Asbestos Panel Board (SF)	Built-Up Roof (SF)	1" Plaster Fireproofing (SF)	8" Transite Piping (LF)	Caulk Between Masonry and Steel (LF)	Pipe Insulation (LF)	Ballast (Each)	Transformer (Each)	Water Fountain (Each)	Ice Machine (Each)	Commercial Chiller Unit (Each)	Household Refrigerator / Freezer (Each)	Air Conditioning Unit (Each)	Light Bulbs / Tubes (Each)						Thermostat (Each)	Battery (Each)	Fire Extinguisher (Each)	Lead Vent Pipe (Each)	Underground Auto Lift (2-Post Lift)	Generator (Each)	Aboveground Storage Tank (Each)	Underground Storage Tank (Each)
																											4'	*8'*	*U - Shaped*	*HID*	*CFL*	*Halogen*									
Crawl Space	3" Pipe Insulation (Presumed)																			300																				
Exterior SUI Building	Door/Vent Caulk, White (OM10)	75																			2	2						4			18							1	1	2
Exterior SUI Building	Window Caulk, White (OM11)	1500																																						
Exterior SUI Building	Sidewalk Expansion Joint, Black, SUI Building (OM14)		125																																					
Exterior SUI Building	Built-Up Roof, Black (Assumed), Over BPRU-Occupied Portion of Building															14,000																								
Exterior Dorm Building	Window Insert Caulk, Black (OM16)	3000																																						
Exterior Dorm Building	Window Caulk, White (OM21) (Roofing Building)	200																																						
Exterior Dorm Building	Window Glaze, White (OM19)				4750																																			
Exterior Dorm Building	Window Glaze, White (OM20) (Roofing Building)				350																																			
Exterior Dorm Building	Transite Window Insert , Gray (OM17)			3000																																				
Exterior Dorm Building	Cement Asbestos Panel Board (Assumed) Refer to: Appendix C-As-Built Drawings Vocational Rehabilitation Center, Maryland Penitentiary Sheet A-7														1100																									
Exterior Dorm Building	Built-Up Roof, Black (Assumed)															13000																							5		
Exterior Dorm Building	8" Transite Piping (Assumed) Refer to: Appendix C-As-Built Drawings Central Office and Storage Building for the State Use Industries at the Maryland Penitentiary Sheet ME-1																	50																						
Interior SUI Building	Caulk Between Masonry and Steel (Assumed) Refer to: Appendix C - As-Built Drawings Central Office and Storage Building for the State Use Industries at the Maryland Penitentiary Sheet A-7																		Unk																					

Limited Hazardous Materials Summary Table - DRAFT

Youth Detention Center Project

INTERIOR AREAS WITHIN THE OSTC-OCCUPIED PORTION OF THE SUI BUILDING THAT WILL BE AFFECTED BY THE INSTALLATION OF A NEW FIRE ALARM SYSTEM HAVE NOT BEEN SURVEYED

AREA	ASBESTOS																		PCBs		ODCs					UNIVERSAL WASTE								MISCELLANEOUS MATERIALS					
Location (Room No.)	Asbestos Description (Material, Color, Size)	Caulk (LF)	Sidewalk Expansion Joint (LF)	Transite Window Insert (SF)	Window Glaze (LF)	Plaster Ceiling (SF)	Floor Tile (SF)	Floor Tile Mastic (SF)	Fitting (Each)	Joint Compound (SF; based on square footage of drywall)	Spray Applied Column Fireproofing (SF)	Vibration Dampener (Each)	Fire Door (Each)	Valve Packing (Each)	Cement Asbestos Panel Board (SF)	Built-Up Roof (SF)	1" Plaster Fireproofing (SF)	8" Transite Piping (LF)	Caulk Between Masonry and Steel (LF)	Pipe Insulation (LF)	Ballast (Each)	Transformer (Each)	Water Fountain (Each)	Ice Machine (Each)	Commercial Chiller Unit (Each)	Household Refrigerator / Freezer (Each)	Air Conditioning Unit (Each)	Light Bulbs / Tubes (Each)						Thermostat (Each)	Battery (Each)	Fire Extinguisher (Each)	Lead Vent Pipe (Each)	Underground Auto Lift (2-Post Lift)	Generator (Each)	Aboveground Storage Tank (Each)	Underground Storage Tank (Each)
																											4'	*8'*	*U - Shaped*	*HID*	*CFL*	*Halogen*								
TOTALS*		**8,775**	**125**	**3,000**	**5,100**	**2,650**	**35,585**	**41,835**	**438**	**22,270**	**3,000**	**3**	**173**	**21**	**1,100**	**27,000**	**1,000**	**50**	**Unk**	**2,100**	**506**	**2**	**4**	**2**	**2**	**5**	**23**	**1,254**	**23**	**50**	**94**	**67**	**30**	**1**	**62**	**30**	**5**	**1**	**1**	**1**	**2**

***INTERIOR AREAS WITHIN THE OSTC-OCCUPIED PORTION OF THE SUI BUILDING THAT WILL BE AFFECTED BY THE INSTALLATION OF A NEW FIRE ALARM SYSTEM HAVE NOT BEEN SURVEYED**

Appendix A - Photographs

Photograph 1

Overview of Dorm Building 926 Greenmount Avenue, Baltimore, Maryland 21202 (north wall)

Photograph 2

Overview of Dorm Building 926 Greenmount Avenue, Baltimore, Maryland 21202 (east wall)

Photograph 3

Overview of Dorm Building 926 Greenmount Avenue, Baltimore, Maryland 21202 (south wall)

The south wall of the Dorm Building shares a wall with the SUI Building and is depicted within the red rectangle.

Photograph 4

Overview of Dorm Building 926 Greenmount Avenue, Baltimore, Maryland 21202 (west wall)

The west wall of the Dorm Building is depicted within the red rectangle.

Photograph 5

Overview of SUI Building 926 Greenmount Avenue, Baltimore, Maryland 21202 (north wall)

Photograph 6

Overview of SUI Building 926 Greenmount Avenue, Baltimore, Maryland 21202 (east wall)

Photograph 7

Overview of SUI Building 926 Greenmount Avenue, Baltimore, Maryland 21202 (west wall)

The west wall of the Dorm Building is depicted within the red rectangle.

Photograph 8

Window Caulk (OM1), Room 27, Positive 2% Chrysotile

Photograph 9

Door Caulk (OM10), Exterior of SUI Building, Positive 2% Chrysotile

Photograph 10

Window Caulk (OM11), Exterior of SUI Building, Positive 2% Chrysotile

Photograph 11

Window Insert Caulk (OM16), Exterior of Dorm Building, Positive 2% Chrysotile

Photograph 12

Window Caulk (OM21), Exterior of Dorm Building (Roofing Building), Positive 2% Chrysotile

Photograph 13

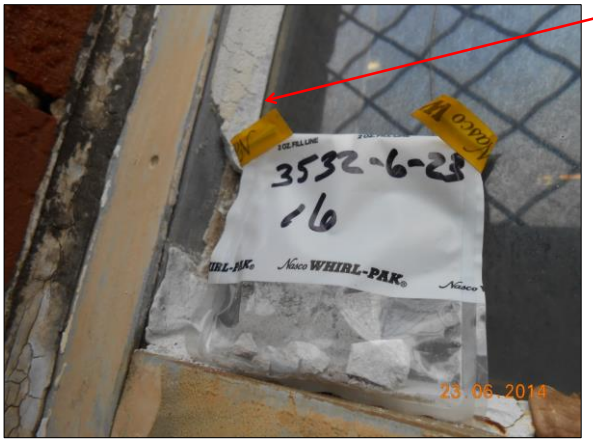
Expansion Joint (OM14), Exterior of SUI Building, Positive 2% Chrysotile

Photograph 14

Window Insert (OM17), Exterior of Dorm Building, Positive 15% Chrysotile

Photograph 15

Window Glaze (OM19), Exterior of Dorm Building, Positive 2% Chrysotile



Photograph 16

Window Glaze (OM20), Exterior of Dorm Building (Roofing Building), Positive 2% Chrysotile

Photograph 17

Plaster Ceiling (S3), Room 73, Positive 10% Chrysotile

Photograph 18

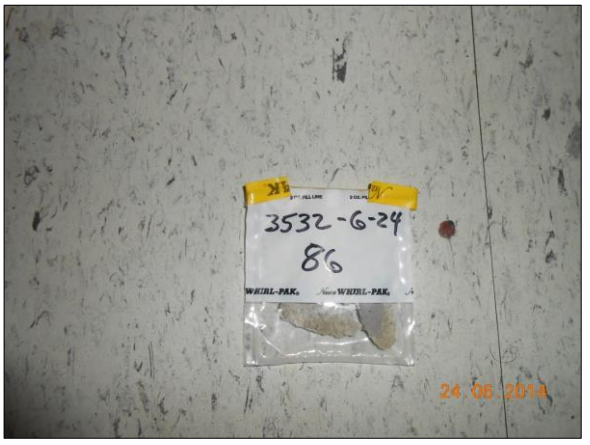
Floor Tile (FT1), Room 9, Positive 2% Chrysotile
Floor Tile Mastic (FT1), Room 9, Positive 2% Chrysotile

Photograph 19

Floor Tile Mastic (FT2), Room 13, Positive 5% Chrysotile

Photograph 20

Floor Tile Mastic (FT3), Room 23, Positive 5% Chrysotile



Photograph 21

Floor Tile Mastic (FT4), Room 23, Positive 4% Chrysotile

Photograph 22

Floor Tile (FT5), Room 47, Positive 2% Chrysotile
Floor Tile Mastic (FT5), Room 47, Positive 4% Chrysotile

Photograph 23

Floor Tile (FT7), Room 96, Positive 5% Chrysotile
Floor Tile Mastic (FT7), Room 96, Positive 2% Chrysotile

Photograph 24

Floor Tile (FT8), Room 68, Positive 5% Chrysotile
Floor Tile Mastic (FT8), Room 68, Positive 2% Chrysotile

Photograph 25

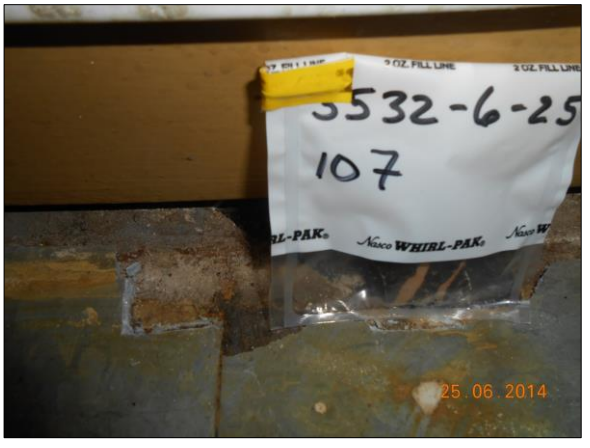
Floor Tile (FT9), Room 68, Positive 2% Chrysotile
Floor Tile Mastic (FT9), Room 68, Positive 2% Chrysotile

Photograph 26

Floor Tile Mastic (FT13), Room 127, Positive 2% Chrysotile

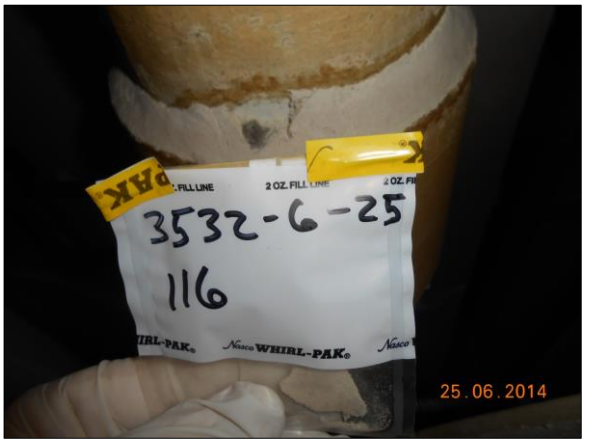
Photograph 27

Floor Tile (FT14), Room 146, Positive 2% Chrysotile
Floor Tile Mastic (FT14), Room 146, Positive 5% Chrysotile



Photograph 28

Floor Tile (FT15), Room 73, Positive 2% Chrysotile
Floor Tile Mastic (FT15), Room 73, Positive 5% Chrysotile



Photograph 29

6" Fitting (TSI1), Room 13, Positive 2% Amosite

Photograph 30

6" Fitting (TSI2), Room 13, Positive 2% Amosite

Photograph 31

1" Fitting (TSI3), Room 25, Positive 2% Amosite

Photograph 32

3/4" Fitting (TSI4), Room 53, Positive 2% Amosite

Photograph 33

4" Fitting (TSI5), Room 134, Positive 2% Amosite, Trace Chrysotile

Photograph 34

Joint Compound (DW/JC1), Room 48, Positive 2% Chrysotile

Photograph 35

Vibration Dampener, Room 134, Assumed

Photograph 36

Fire Door, Room 93, Assumed

Photograph 37

Valve Packing, Room 139, Assumed

Photograph 38

Cement Asbestos Panels , Exterior, Assumed

Photograph 39

Built-Up Roof, Exterior Roof, Assumed

Photograph 40

Railing Post, Room 23, Lead Paint

Photograph 41

2" Valve, Room 23, Lead Paint

Photograph 42

Wall Sink, Room 133, Lead Paint

Photograph 43

Window Frame, Room 59, Lead Paint

Photograph 44

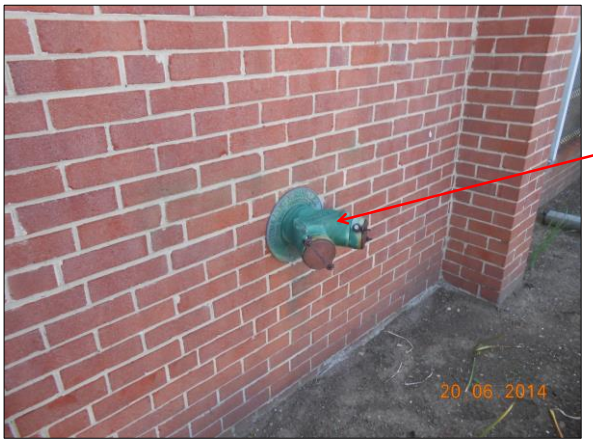
Wall, Room 48, Lead Paint

Photograph 45

Base Cove Molding, Room 89, Lead Paint

Photograph 46

Wall, Room 69, Lead Paint



Photograph 47

4" Piping (Fire Department Connection), Exterior, Lead Paint

Photograph 48

Typical Advance Ballast, No Polychlorinated Biphenyls (PCBs)

Photograph 49

Typical Universal Ballast, No Polychlorinated Biphenyls (PCBs)

Photograph 50

Typical Triad Ballast, No Polychlorinated Biphenyls (PCBs)

Photograph 51

Typical Ultra-Miser Ballast, No Polychlorinated Biphenyls (PCBs)

Photograph 52

General Electric (UltraMax), Suspect for Polychlorinated Biphenyls (PCBs)

Photograph 53

Transformers, Exterior, Suspect for Polychlorinated Biphenyls (PCBs)

Photograph 54

Water Fountain, Room 140, Ozone-Depleting Compounds (ODCs)

Photograph 55

Ice Machine, Room 108, Ozone-Depleting Compounds (ODCs)

Photograph 56

Commercial Chiller Unit, Room 112 and Exterior, Ozone-Depleting Compounds (ODCs)

Photograph 57

Household Refrigerator / Freezer, Room 115, Ozone-Depleting Compounds (ODCs)

Photograph 58

Air Conditioning Units, Rooms 113 and 114, Ozone-Depleting Compounds (ODCs)

Photograph 59

4' and 8' Fluorescent Light Tubes, Rooms 67 and 83, Universal Waste

Photograph 60

U-Shaped Fluorescent Tubes, Room 73, Universal Waste

Photograph 61

High-Intensity Discharge Bulbs (HID), Room 13 and Exterior, Universal Waste

Photograph 62

Compact Florescent Light Bulb (CFLs), Room 2, Universal Waste

Photograph 63

Halogen Bulb, Room 132, Universal Waste

Photograph 64

Thermostat, Room 141, Universal Waste

Photograph 65

Lead-Acid Batteries, Room 13, Universal Waste

Photograph 66

Lead-Acid Batteries, Room 135, Universal Waste

Photograph 67

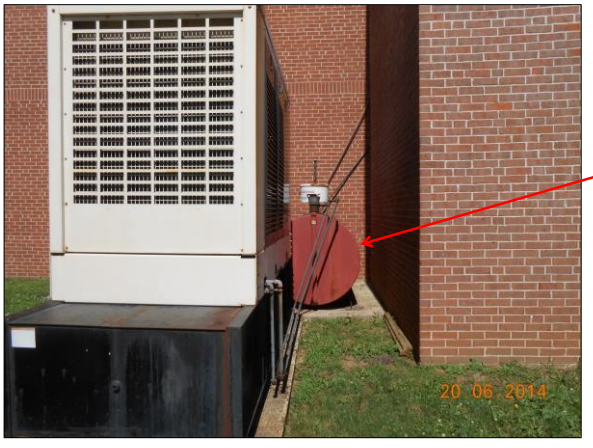
Fire Extinguisher, Room 108, Miscellaneous Material

Photograph 68

Lead Vent Pipe, Exterior Roof, Miscellaneous Material

Photograph 69

Generator, Exterior, Miscellaneous Material



Photograph 70

500-Gallon Aboveground Storage Tank, Exterior, Miscellaneous Material

Photograph 71

5,000-Gallon Underground Storage Tank, Exterior, Miscellaneous Material

Appendix B – Certificates of AHERA Inspectors

AEROSOL MONITORING & ANALYSIS, INC.

This is to certify that

SHERRI WALDRON

has met the attendance requirements and successfully completed the course entitled

4-Hour EPA AHERA Inspector Refresher

For Accreditation Under TSCA Title II

04/10/2014	04/10/2014	4/10/2015	STEVE SIERACKI
Course Date	***Exam Date***	***Expiration Date***	***Principal Instructor***

AIR04102014-12	VAAIR04102014-12	E. Rush Barnett
Certification No.	***Virginia Certification No.***	***Course Director***

1331 Ashton Road *P.O.Box 646* *Hanover, MD 21076* *P: 410-684-3327*

www.amatraining.com

Sherri Waldron
Name

Signature

HAS ATTENDED AND PASSED THE EXAM IN AN ASBESTOS TRAINING COURSE ENTITLED:

INSPECTOR REFRESHER
Course Name

FOR ACCREDITATION UNDER TSCA TITLE II.

(STATE SEAL IS BLUE)

~~04/10/2014~~ Course Date(s) ~~04/10/2015~~ Expiration Date ~~05/8/2014~~ Exam Date

NO. 127522 STATE OF MARYLAND

AEROSOL MONITORING & ANALYSIS, INC.

This is to certify that

JAMES SINES

has met the attendance requirements and successfully completed the course entitled

8-Hour EPA AHERA Insp/Mgmt Planner Refresher

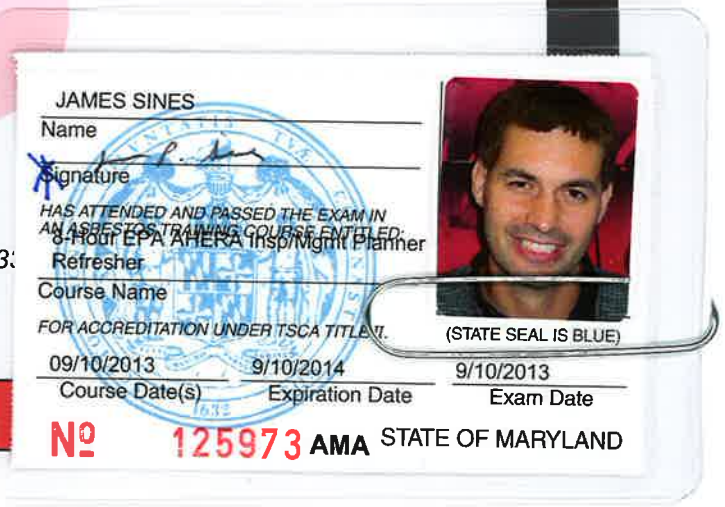
For Accreditation Under TSCA Title II

09/10/2013	09/10/2013	9/10/2014	DAVID TRUMAN
Course Date	***Exam Date***	***Expiration Date***	***Principal Instructor***

125973	VA125973	E. Rush Barnett
Certification No.	***Virginia Certification No.***	***Course Director***

1331 Ashton Road P.O.Box 646 Hanover, MD 21076 P: 410-684-3

www.amatraining.com



AEROSOL MONITORING & ANALYSIS, INC.

This is to certify that

SYLVAN BONSIGNORE BURCH

has met the attendance requirements and successfully completed the course entitled

4-Hour EPA AHERA Inspector Refresher

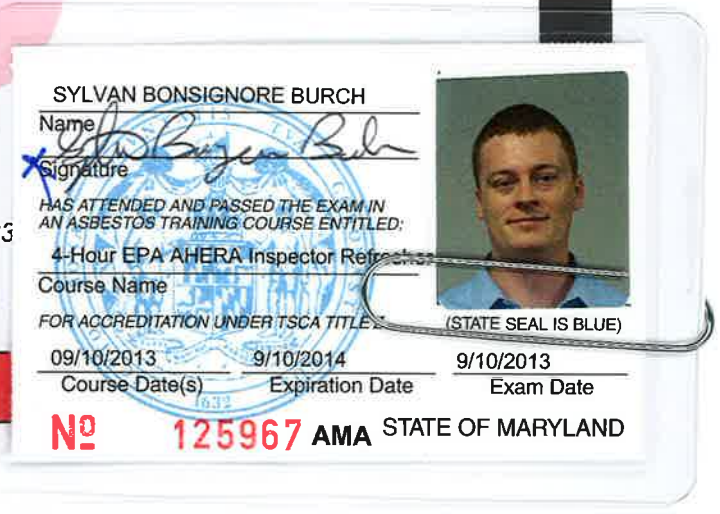
For Accreditation Under TSCA Title II

09/10/2013	09/10/2013	9/10/2014	DAVID TRUMAN
Course Date	***Exam Date***	***Expiration Date***	***Principal Instructor***

125967	VA125967	E. Rush Barnett
Certification No.	***Virginia Certification No.***	***Course Director***

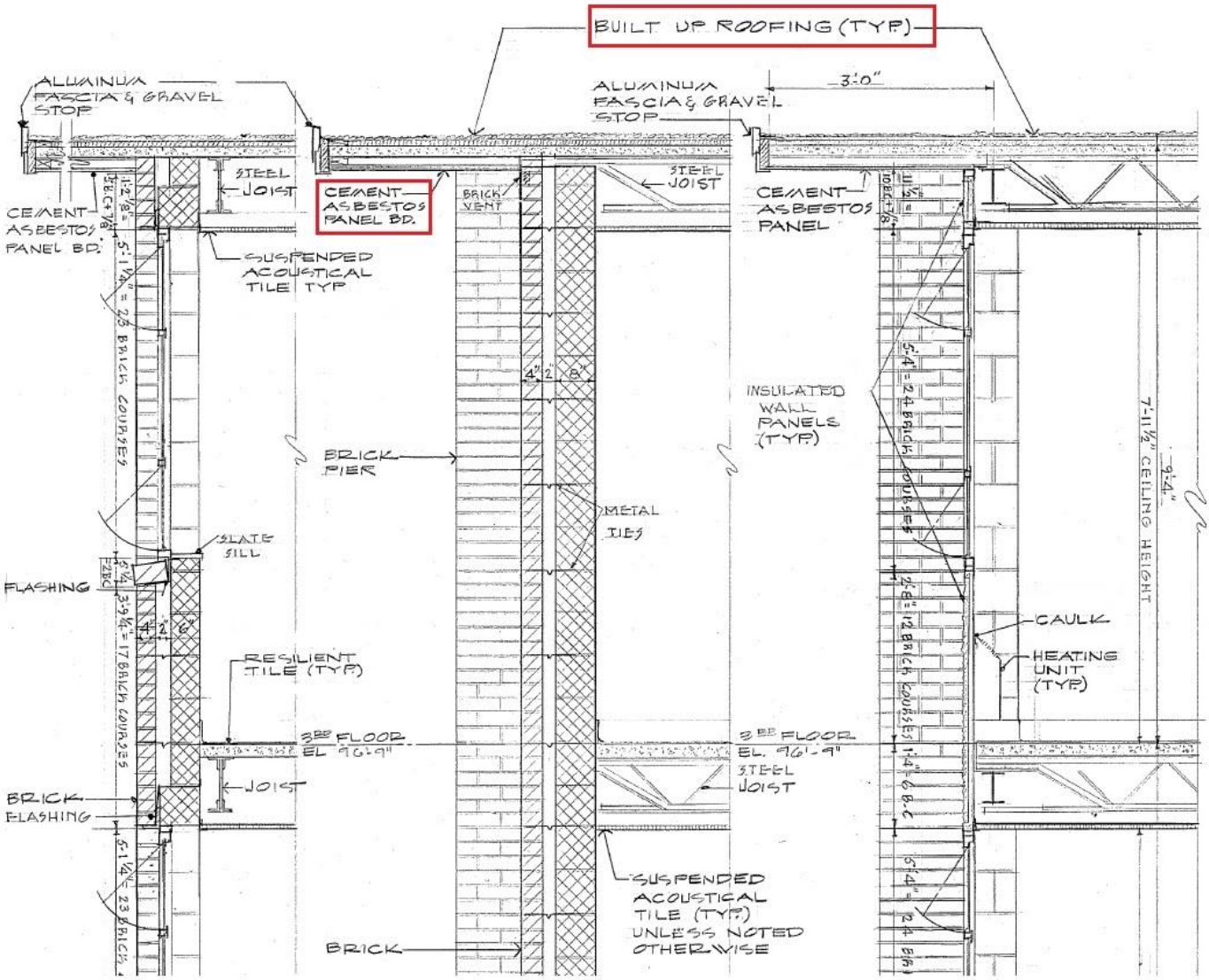
1331 Ashton Road P.O.Box 646 Hanover, MD 21076 P: 410-684-33

www.amatraining.com

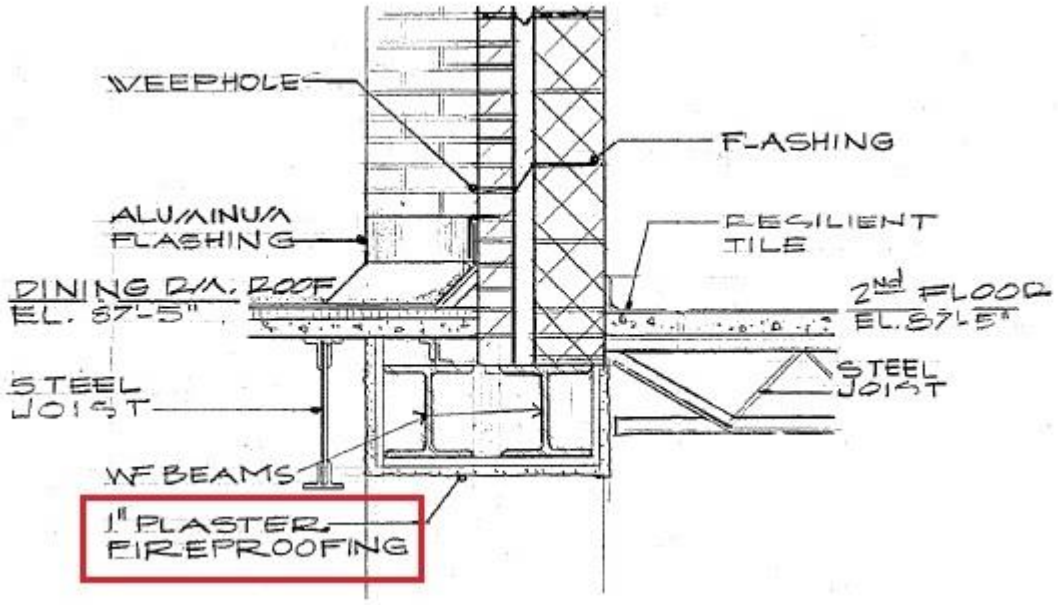

SYLVAN BONSIGNORE BURCH
Name
Signature
HAS ATTENDED AND PASSED THE EXAM IN AN ASBESTOS TRAINING COURSE ENTITLED:
4-Hour EPA AHERA Inspector Refresher
Course Name
FOR ACCREDITATION UNDER TSCA TITLE
(STATE SEAL IS BLUE)
09/10/2013 Course Date(s)
9/10/2014 Expiration Date
9/10/2013 Exam Date
№ 125967 AMA STATE OF MARYLAND

Appendix C – As-Built Drawings

Presumed and Assumed Asbestos-Containing Building Materials Identified on As-Built Drawings



EBA ENGINEERING	**Project Name:** **Limited Hazardous Materials Survey** **Youth Detention Center Project** **Dorm Building**	**Vocational Rehabilitation Center, Maryland Penitentiary, Prepared by: Wrenn, Lewis and Jencks Architects, June 1969 Sheet A-7** **EBA Project No.: 3532-01-000** **Subject Property Address: 926 Greenmount Avenue Baltimore, Maryland 21202**



EBA ENGINEERING

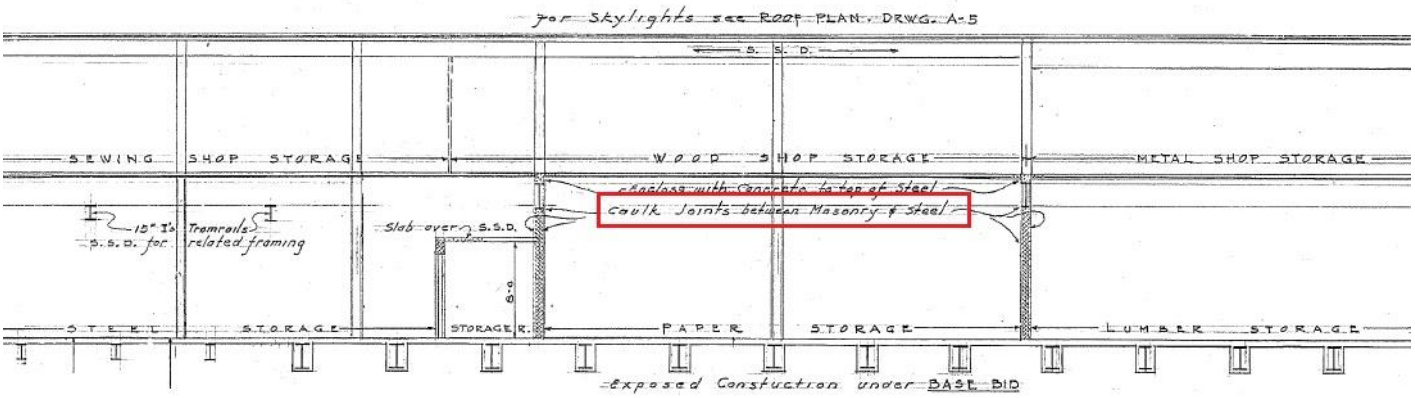
Project Name:

Limited Hazardous Materials Survey
Youth Detention Center Project
Dorm Building

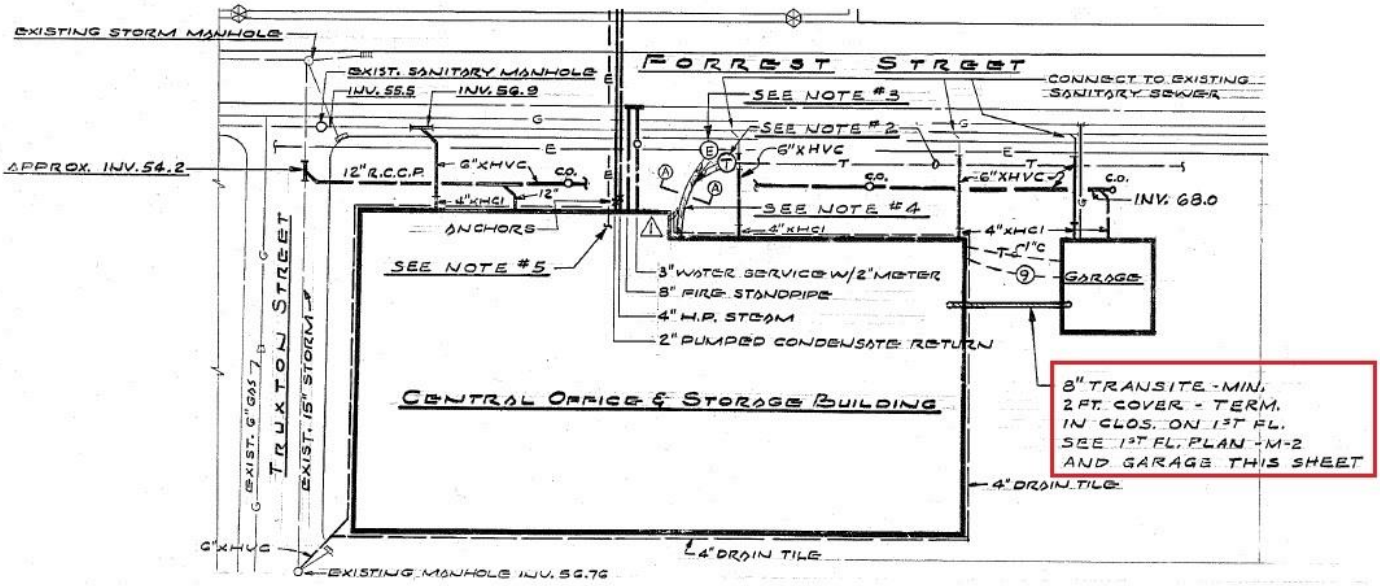
Vocational Rehabilitation Center, Maryland Penitentiary, Prepared by: Wrenn, Lewis and Jencks Architects, June 1969
Sheet A-8

EBA Project No.: 3532-01-000

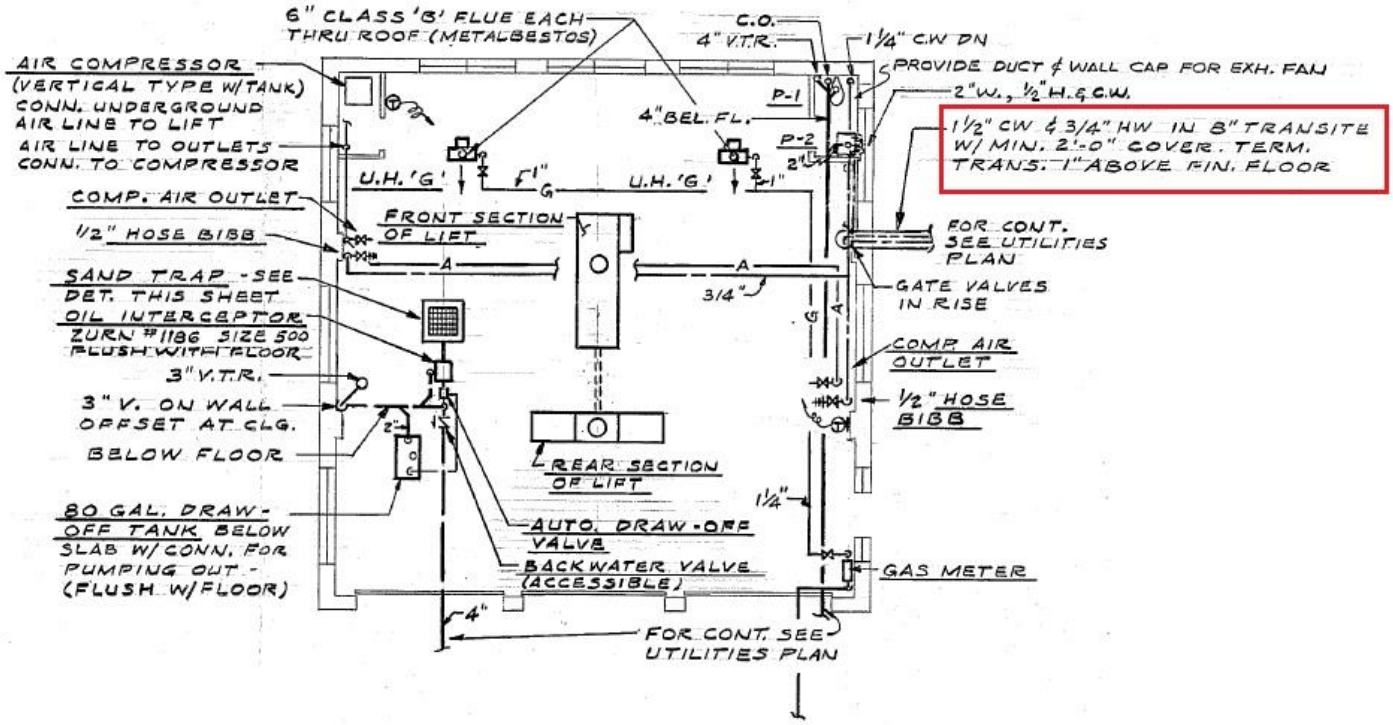
Subject Property Address:
926 Greenmount Avenue
Baltimore, Maryland 21202



EBA ENGINEERING	**Project Name:** **Limited Hazardous Materials Survey** **Youth Detention Center Project** **SUI Building**	**Central Office and Storage Building for the State use Industries at the Maryland Penitentiary, Prepared by: The Office of John A. Ahlers, January 1964** **Sheet A-7**
		EBA Project No.: 3532-01-000
		Subject Property Address: **926 Greenmount Avenue** **Baltimore, Maryland 21202**



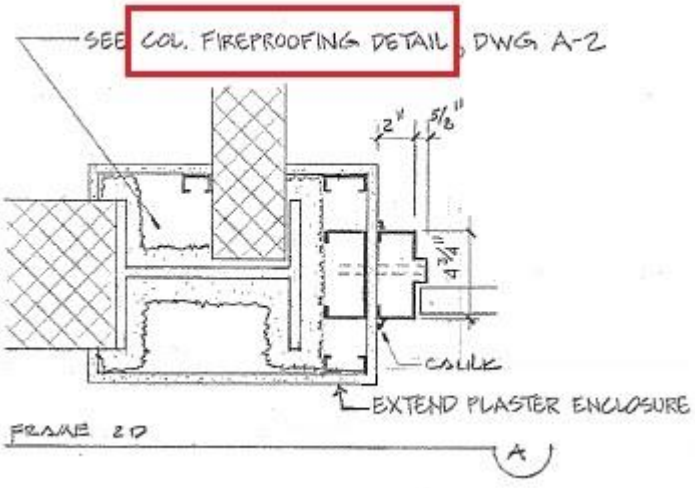
NOTE:
ALL PIPING TO BE RUN AT C'LG. UNLESS NOTED OTHERWISE



GARAGE

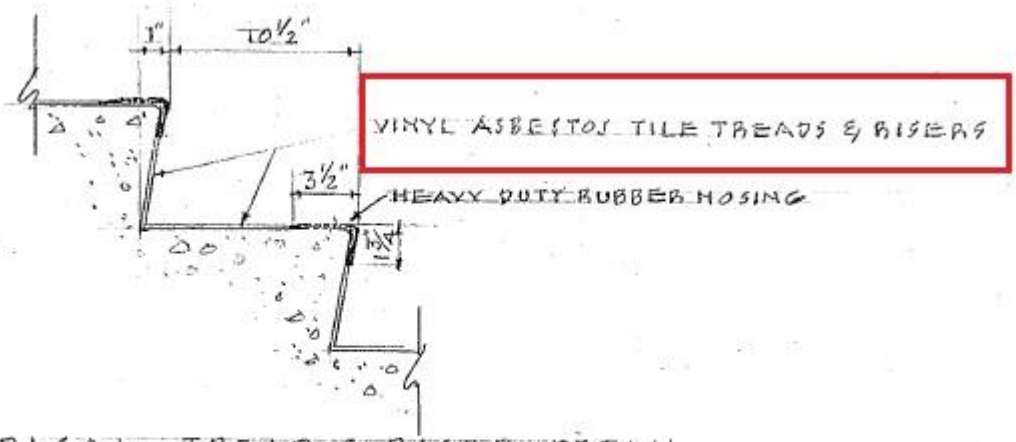
SCALE: 1/8"=1'-0"

EBA ENGINEERING	**Project Name:** **Limited Hazardous Materials Survey** **Youth Detention Center Project** **SUI Building**	**Central Office and Storage Building for the State use Industries at the Maryland Penitentiary, Prepared by: The Office of John A. Ahlers, January 1964** **Sheet ME-1** **EBA Project No.: 3532-01-000** **Subject Property Address:** **926 Greenmount Avenue** **Baltimore, Maryland 21202**



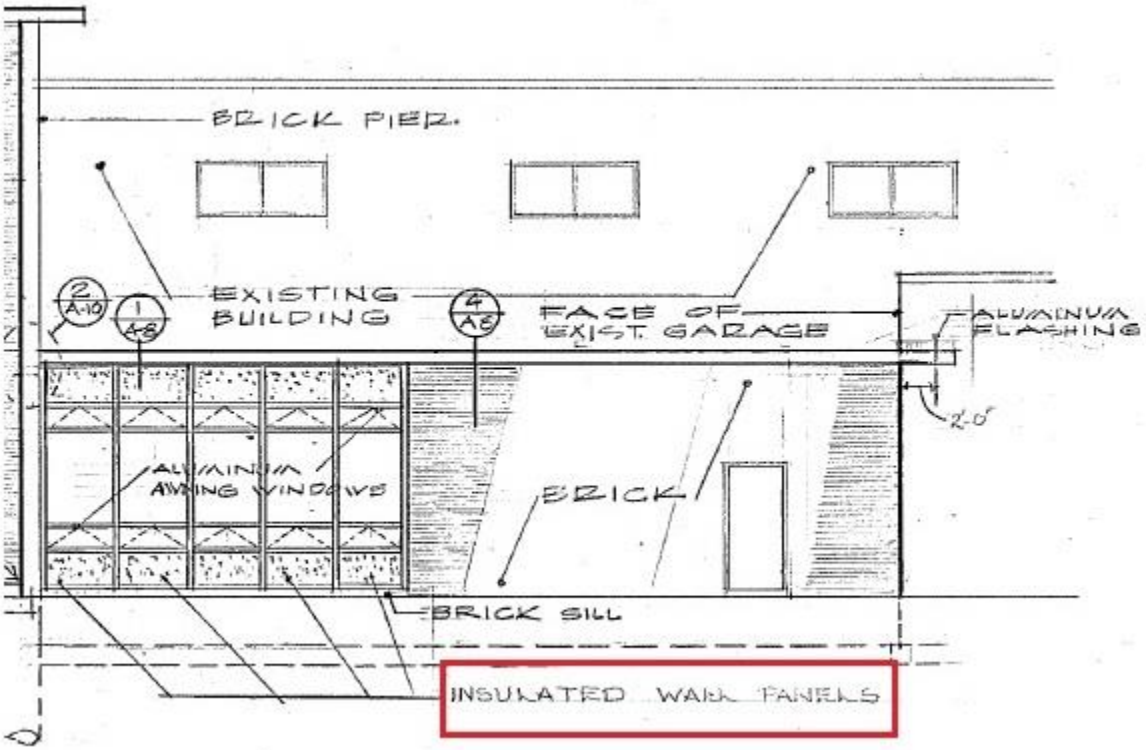
EBA ENGINEERING	**Project Name:** **Limited Hazardous Materials Survey** **Youth Detention Center Project** **SUI Building**	**Conversion of Central Office to Work Release Housing, Prepared by: Lapicki-Smith, May 1977 Sheet A-3** **EBA Project No.: 3532-01-000** **Subject Property Address: 926 Greenmount Avenue Baltimore, Maryland 21202**

Suspect Material Identified on As-Built Drawings which was Accessed and Sampled

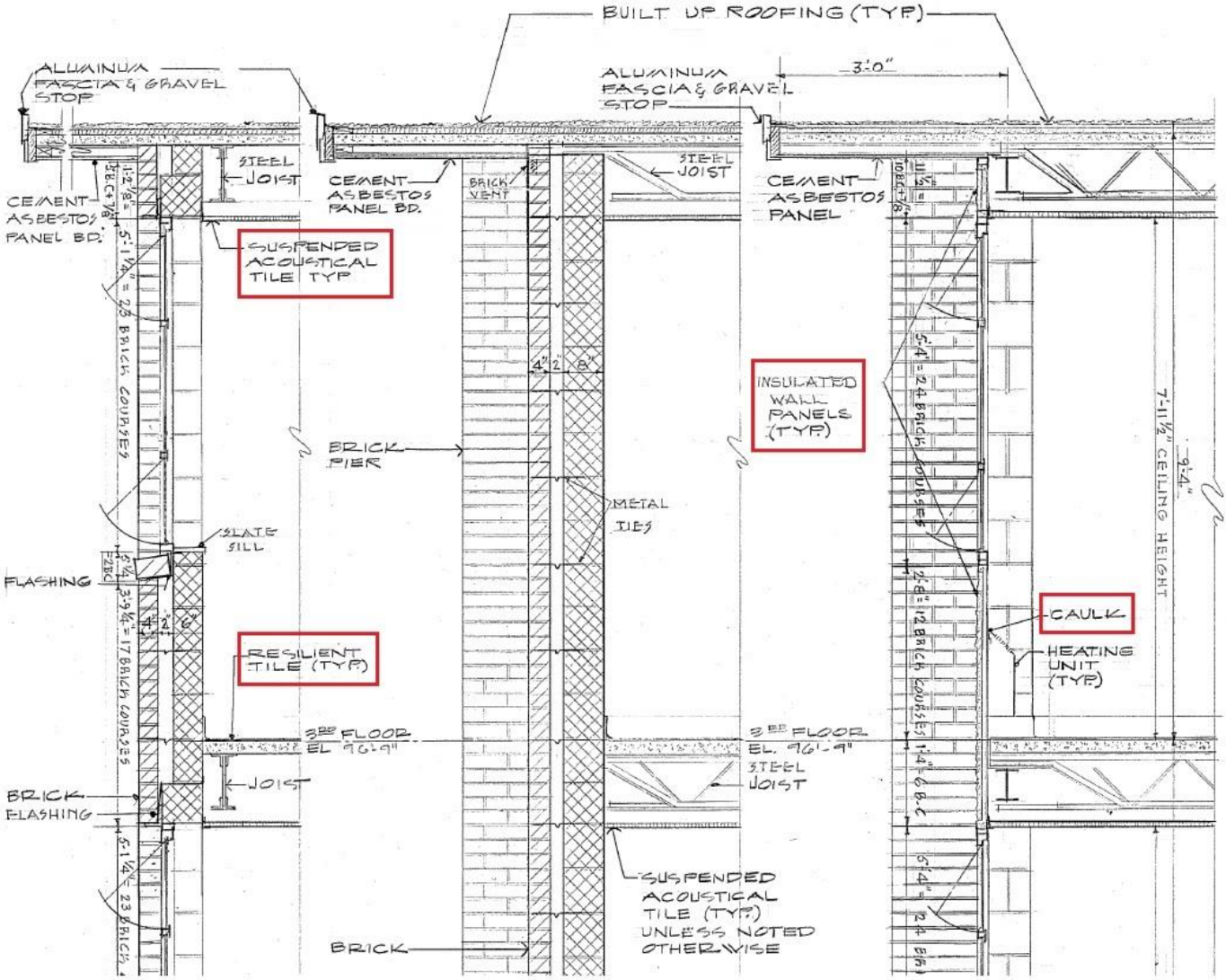


TYPICAL TREAD & RISER DETAIL
OF STAIRS IN CORRIDORS 100 & 120

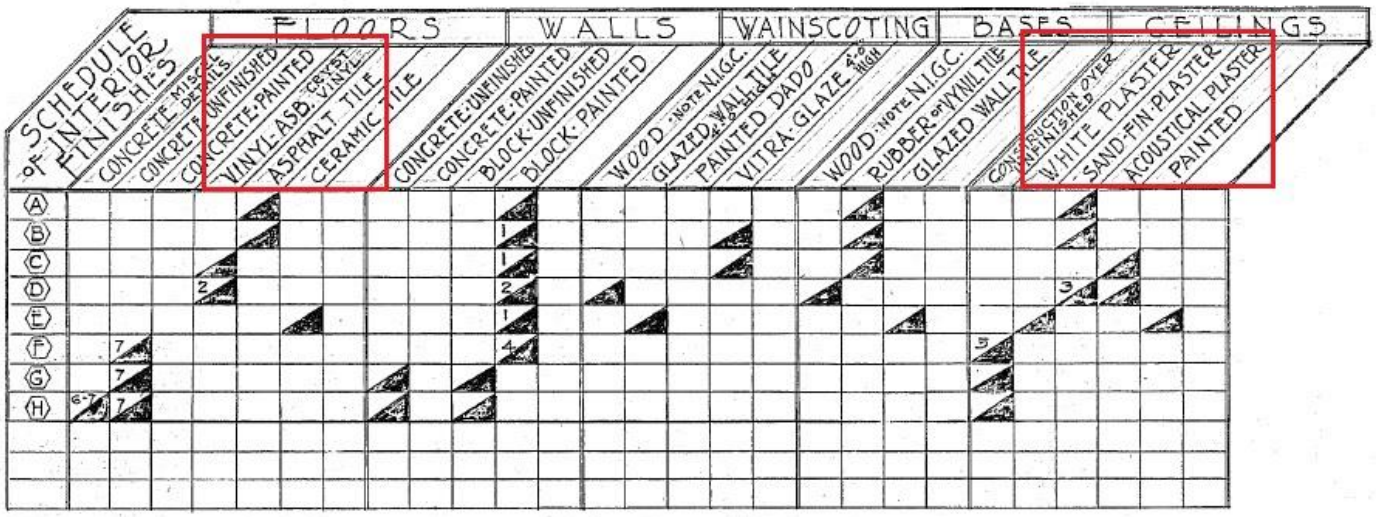
SCALE: 1½" = 1'-0"



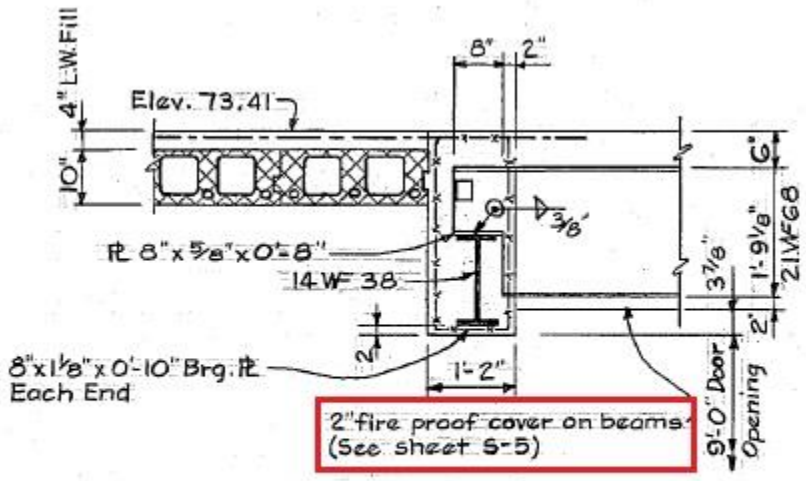
EBA ENGINEERING	**Project Name:** **Limited Hazardous Materials Survey** **Youth Detention Center Project** **Dorm Building**	**Vocational Rehabilitation Center, Maryland Penitentiary, Prepared by: Wrenn, Lewis and Jencks Architects, June 1969 Sheets A-2 and A-6** **EBA Project No.: 3532-01-000** **Subject Property Address: 926 Greenmount Avenue Baltimore, Maryland 21202**



EBA ENGINEERING	**Project Name:** **Limited Hazardous Materials Survey** **Youth Detention Center Project** **Dorm Building**	**Vocational Rehabilitation Center, Maryland Penitentiary, Prepared by: Wrenn, Lewis and Jencks Architects, June 1969 Sheet A-7** **EBA Project No.: 3532-01-000** **Subject Property Address: 926 Greenmount Avenue Baltimore, Maryland 21202**



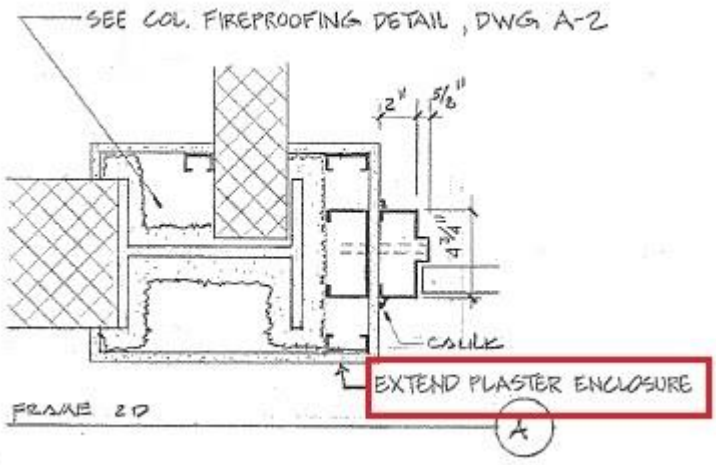
EBA ENGINEERING	**Project Name:** **Limited Hazardous Materials Survey** **Youth Detention Center Project** **SUI Building**	**Central Office and Storage Building for the State use Industries at the Maryland Penitentiary, Prepared by: The Office of John A. Ahlers, January 1964** **Sheet A-3** **EBA Project No.: 3532-01-000** **Subject Property Address:** **926 Greenmount Avenue** **Baltimore, Maryland 21202**



SECTION 1-1

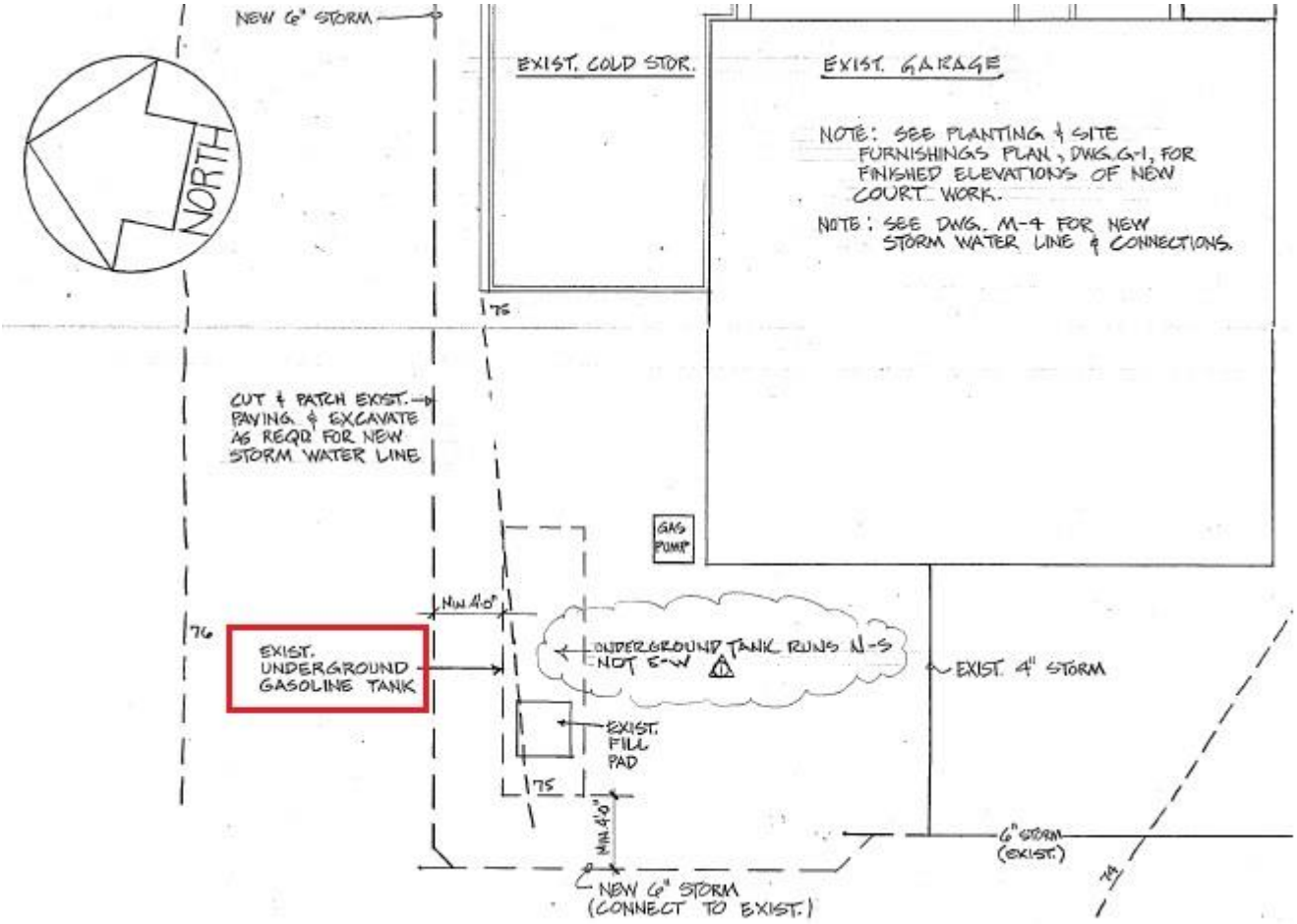
Scale: 1/2" = 1'-0"

EBA ENGINEERING	**Project Name:** **Limited Hazardous Materials Survey** **Youth Detention Center Project** **SUI Building**	**Central Office and Storage Building for the State use Industries at the Maryland Penitentiary, Prepared by: The Office of John A. Ahlers, January 1964** **Sheet S-7** **EBA Project No.: 3532-01-000** **Subject Property Address:** **926 Greenmount Avenue** **Baltimore, Maryland 21202**

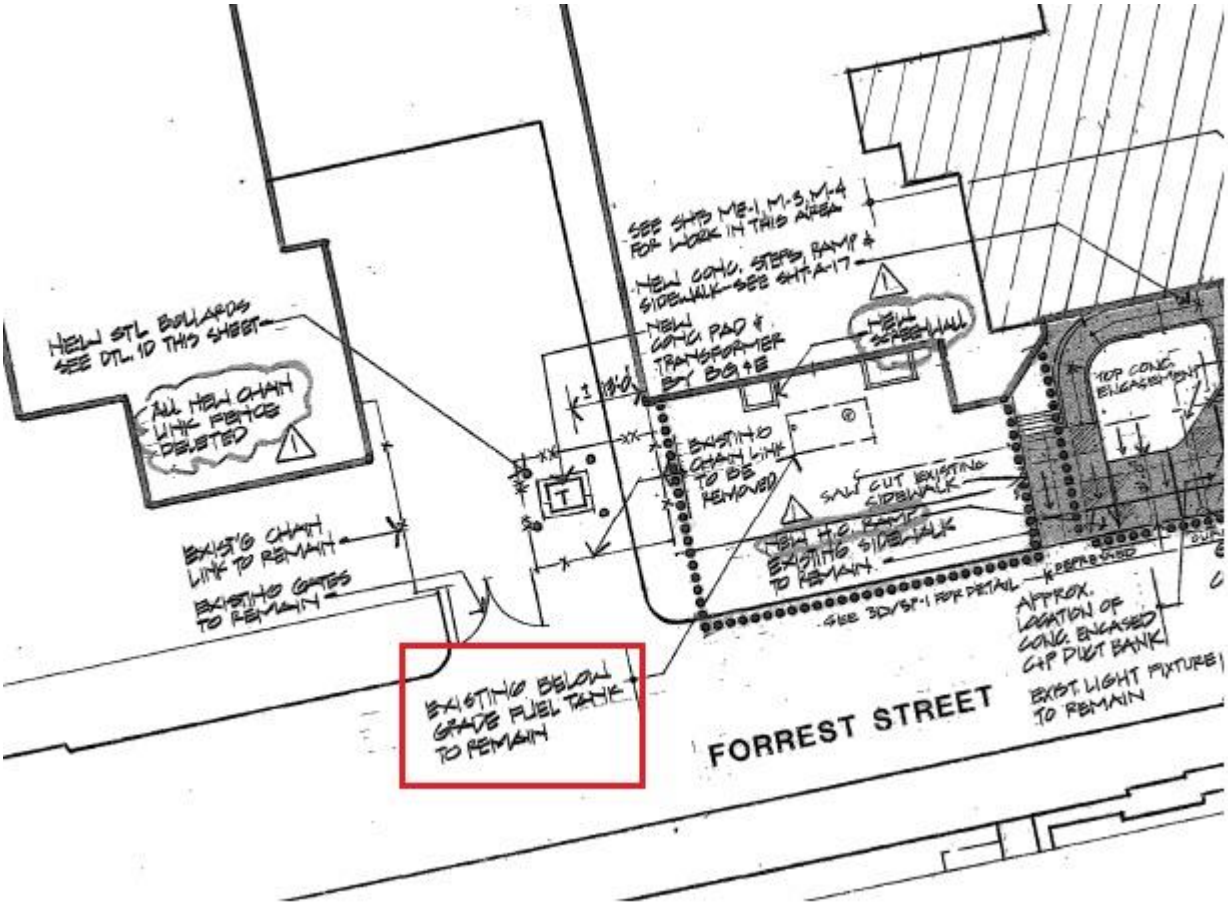


EBA ENGINEERING	**Project Name:** **Limited Hazardous Materials Survey** **Youth Detention Center Project** **SUI Building**	**Conversion of Central Office to Work Release Housing, Prepared by: Lapicki-Smith, May 1977 Sheet A-3** **EBA Project No.: 3532-01-000** **Subject Property Address: 926 Greenmount Avenue Baltimore, Maryland 21202**

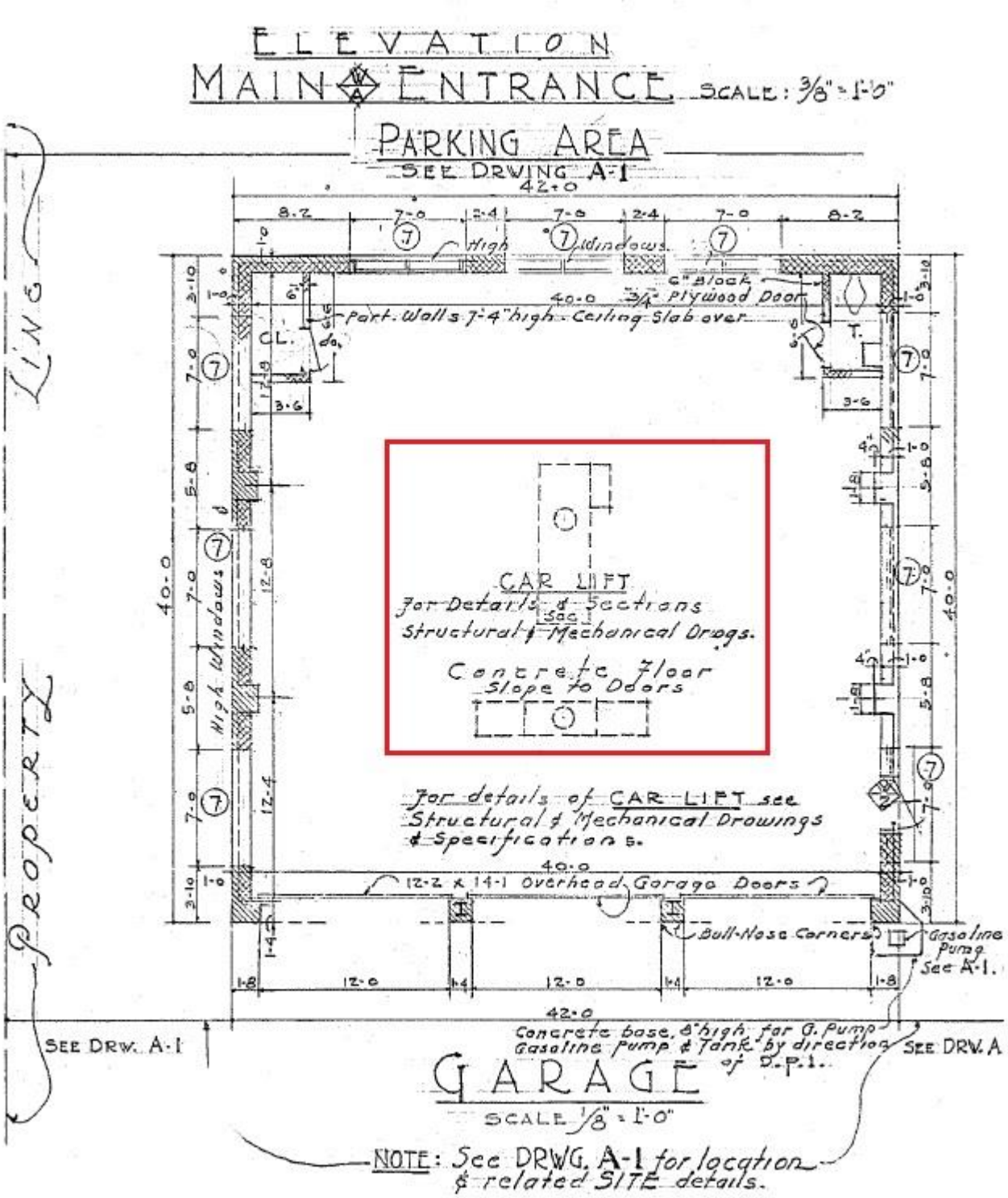
Suspect Miscellaneous Materials



EBA ENGINEERING	**Project Name:** **Limited Hazardous Materials Survey** **Youth Detention Center Project** **Dorm Building**	**Conversion of Central Office to Work Release Housing, Prepared by: Lapicki-Smith, May 1977 Sheet A-5** **EBA Project No.: 3532-01-000** **Subject Property Address: 926 Greenmount Avenue Baltimore, Maryland 21202**



EBA ENGINEERING	**Project Name:** **Limited Hazardous Materials Survey** **Youth Detention Center Project** **SUI Building**	**Occupational Skills Training Center, Prepared by: Gaudreau, Inc., February 1991** **Sheet SP-1** **EBA Project No.: 3532-01-000** **Subject Property Address:** **926 Greenmount Avenue** **Baltimore, Maryland 21202**



EBA ENGINEERING

Project Name:

Limited Hazardous Materials Survey

Youth Detention Center Project

Dorm Building

Central Office and Storage Building for the State use Industries at the Maryland Penitentiary, Prepared by: The Office of John A. Ahlers, January 1964
Sheet A-3

EBA Project No.: 3532-01-000

Subject Property Address:
926 Greenmount Avenue
Baltimore, Maryland 21202

Appendix D – Asbestos Laboratory Results

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

NVLAP 101143-0

Client:	EBA Engineering, Inc	**Job Name:**	Youth Detention Center Project	**Chain Of Custody:**	519634
Address:	4813 Seton Drive	**Job Location:**	926 Greenmount Avenue, Baltimore, MD 21202	**Date Analyzed:**	7/7/2014
	Baltimore, Maryland 21215	**Job Number:**	3532-01-000	**Person Submitting:**	Sylvan Burch
		P.O. Number:	Not Provided	**Revision Number:** 2	**Revised Date:** 7/15/2014

Attention: Sylvan Burch

Summary of Polarized Light Microscopy

AMA Sample Number	Client Sample #	Total Asbestos	Chrysotile Percent	Amosite Percent	Crocidolite Percent	Other Asbestos Percent	Mineral Wool Percent	Fiberglass Percent	Organic Percent	Synthetic Percent	Other Percent	Particulate Percent	Sample Type	Sample Color	Homogeneity	Analyst ID	Comments
14077407	3532-6-23-01	2	2	--	--	--	--	--	--	--	--	98	CK	Black	Homogeneous	PCSW	
14077408	3532-6-23-02	2	2	--	--	--	--	--	--	--	--	98	CK	Black	Homogeneous	PC	
14077409	3532-6-23-03	NAD	--	--	--	--	--	--	--	--	--	100	CK	Gray	Homogeneous	PC	
14077410	3532-6-23-04	NAD	--	--	--	--	--	--	--	--	--	100	CK	Gray	Homogeneous	PC	
14077411	3532-6-23-05	2	2	--	--	--	--	--	2	--	--	96	EJ	Black	Homogeneous	PC	
14077412	3532-6-23-06	2	2	--	--	--	--	--	5	--	--	93	EJ	Black	Homogeneous	PC	
14077413	3532-6-23-07	2	2	--	--	--	--	--	--	--	TR	98	CK	Gray	Homogeneous	PC	
14077414	3532-6-23-08	2	2	--	--	--	--	--	--	--	TR	98	CK	Gray	Homogeneous	PC	
14077415	3532-6-23-09	15	15	--	--	--	--	--	--	--	--	85	Transite	Gray	Homogeneous	PC	
14077416	3532-6-23-10	15	15	--	--	--	--	--	--	--	--	85	Transite	Gray	Homogeneous	PC	
14077417	3532-6-23-11	NAD	--	--	--	--	--	--	--	--	--	100	GZ	Gray	Homogeneous	PC	
14077418	3532-6-23-12	NAD	--	--	--	--	--	--	--	--	--	100	GZ	Gray	Homogeneous	PC	
14077419	3532-6-23-13	2	2	--	--	--	--	--	--	--	--	98	GZ	Off-White	Homogeneous	PC	
14077420	3532-6-23-14	2	2	--	--	--	--	--	--	--	--	98	GZ	Off-White	Homogeneous	PC	
14077421	3532-6-23-15	2	2	--	--	--	--	--	--	--	--	98	GZ	Off-White	Homogeneous	PC	

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

NVLAP 101143-0

Client:	EBA Engineering, Inc	**Job Name:**	Youth Detention Center Project	**Chain Of Custody:**	519634
Address:	4813 Seton Drive	**Job Location:**	926 Greenmount Avenue, Baltimore, MD 21202	**Date Analyzed:**	7/7/2014
	Baltimore, Maryland 21215	**Job Number:**	3532-01-000	**Person Submitting:**	Sylvan Burch
		P.O. Number:	Not Provided	**Revision Number:** 2	**Revised Date:** 7/15/2014

Attention: Sylvan Burch

Summary of Polarized Light Microscopy

AMA Sample Number	Client Sample #	Total Asbestos	Chrysotile Percent	Amosite Percent	Crocidolite Percent	Other Asbestos Percent	Mineral Wool Percent	Fiberglass Percent	Organic Percent	Synthetic Percent	Other Percent	Particulate Percent	Sample Type	Sample Color	Homogeneity	Analyst ID	Comments
14077422	3532-6-23-16	2	2	--	--	--	--	--	--	--	--	98	GZ	Off-White	Homogeneous	PC	
14077423	3532-6-23-17	2	2	--	--	--	--	--	--	--	--	98	CK	Off-White	Homogeneous	PC	
14077424	3532-6-23-18	2	2	--	--	--	--	--	--	--	--	98	CK	Off-White	Homogeneous	PC	
14077425	3532-6-23-19	NAD	--	--	--	--	--	--	--	--	--	100	CK	Off-White	Homogeneous	PC	
14077426	3532-6-23-20	NAD	--	--	--	--	--	--	--	--	--	100	CK	Off-White	Homogeneous	PC	
14077427	3532-6-23-21	2	2	--	--	--	--	--	--	--	--	98	CK	Off-White	Homogeneous	PC	
14077428	3532-6-23-22	2	2	--	--	--	--	--	--	--	--	98	CK	Off-White	Homogeneous	PC	
14077429	3532-6-23-23	NAD	--	--	--	--	--	--	--	--	--	100	GZ	Off-White	Homogeneous	PC	
14077430	3532-6-24-24	NAD	--	--	--	--	--	--	--	--	--	100	CK	Off-White	Homogeneous	PC	
14077431	3532-6-24-25	NAD	--	--	--	--	20	--	40	--	--	40	CT	Multi	Layered	PC	
14077432	3532-6-24-26	NAD	--	--	--	--	20	--	40	--	--	40	CT	Multi	Layered	PC	
14077433	3532-6-24-27	NAD	--	--	--	--	20	--	40	--	--	40	CT	Multi	Layered	PC	
14077434	3532-6-24-28	NAD	--	--	--	--	20	--	40	--	--	40	CT	Multi	Layered	PC	
14077435	3532-6-24-29	NAD	--	--	--	--	10	--	40	--	--	50	CT	Multi	Layered	PC	
14077436	3532-6-24-30	NAD	--	--	--	--	10	--	40	--	--	50	CT	Multi	Layered	PC	

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

NVLAP 101143-0

Client:	EBA Engineering, Inc	**Job Name:**	Youth Detention Center Project	**Chain Of Custody:**	519634
Address:	4813 Seton Drive	**Job Location:**	926 Greenmount Avenue, Baltimore, MD 21202	**Date Analyzed:**	7/7/2014
	Baltimore, Maryland 21215	**Job Number:**	3532-01-000	**Person Submitting:**	Sylvan Burch
		P.O. Number:	Not Provided	**Revision Number:** 2	**Revised Date:** 7/15/2014

Attention: Sylvan Burch

Summary of Polarized Light Microscopy

AMA Sample Number	Client Sample #	Total Asbestos	Chrysotile Percent	Amosite Percent	Crocidolite Percent	Other Asbestos Percent	Mineral Wool Percent	Fiberglass Percent	Organic Percent	Synthetic Percent	Other Percent	Particulate Percent	Sample Type	Sample Color	Homogeneity	Analyst ID	Comments
14077437	3532-6-24-31	NAD	--	--	--	--	20	--	40	--	--	40	CT	Multi	Layered	PC	
14077438	3532-6-24-32	NAD	--	--	--	--	20	--	40	--	--	40	CT	Multi	Layered	PC	
14077439	3532-6-24-33	NAD	--	--	--	--	30	--	30	--	--	40	CT	Multi	Layered	PC	
14077440	3532-6-24-34	NAD	--	--	--	--	30	--	30	--	--	40	CT	Multi	Layered	PC	
14077441	3532-6-24-35 CB	NAD	--	--	--	--	--	--	--	--	--	100	CB	Black	Homogeneous	PC	
14077442	3532-6-24-35 M	NAD	--	--	--	--	--	--	--	--	TR	100	MS	Multi	Homogeneous	PC	
14077443	3532-6-24-36 CB	NAD	--	--	--	--	--	--	--	--	--	100	CB	Beige	Homogeneous	PC	
14077444	3532-6-24-36 M	NAD	--	--	--	--	--	--	--	--	2	98	MS	Brown	Homogeneous	PC	
14077445	3532-6-24-37 CB	NAD	--	--	--	--	--	--	--	--	--	100	CB	Gray	Homogeneous	PC	
14077446	3532-6-24-37 M	NAD	--	--	--	--	--	--	--	--	--	100	MS	Cream	Homogeneous	PC	
14077447	3532-6-24-38 CB	NAD	--	--	--	--	--	--	--	--	--	100	CB	Gray	Homogeneous	PC	
14077448	3532-6-24-38 M	NAD	--	--	--	--	--	--	TR	--	--	100	MS	Cream	Homogeneous	PC	

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

NVLAP 101143-0

Client:	EBA Engineering, Inc	**Job Name:**	Youth Detention Center Project	**Chain Of Custody:**	519634
Address:	4813 Seton Drive	**Job Location:**	926 Greenmount Avenue, Baltimore, MD 21202	**Date Analyzed:**	7/7/2014
	Baltimore, Maryland 21215	**Job Number:**	3532-01-000	**Person Submitting:**	Sylvan Burch
		P.O. Number:	Not Provided	**Revision Number:** 1	**Revised Date:** 7/15/2014

Attention: Sylvan Burch

Summary of Polarized Light Microscopy

AMA Sample Number	Client Sample #	Total Asbestos	Chrysotile Percent	Amosite Percent	Crocidolite Percent	Other Asbestos Percent	Mineral Wool Percent	Fiberglass Percent	Organic Percent	Synthetic Percent	Other Percent	Particulate Percent	Sample Type	Sample Color	Homogeneity	Analyst ID	Comments
14077449	3532-6-24-39 CB	NAD	--	--	--	--	--	--	--	--	--	100	CB	Black	Homogeneous	PC	
14077450	3532-6-24-39 M	NAD	--	--	--	--	--	--	--	--	--	100	MS	Cream	Homogeneous	PC	
14077451	3532-6-24-40 CB	NAD	--	--	--	--	--	--	--	--	--	100	CB	Black	Homogeneous	PC	
14077452	3532-6-24-40 M	NAD	--	--	--	--	--	--	--	--	--	100	MS	Cream	Homogeneous	PC	
14077453	3532-6-24-41 CB	NAD	--	--	--	--	--	--	--	--	--	100	CB	Blue	Homogeneous	PC	
14077454	3532-6-24-41 M	NAD	--	--	--	--	--	--	--	--	TR	100	MS	Multi	Homogeneous	PC	
14077455	3532-6-24-42 CB	NAD	--	--	--	--	--	--	--	--	--	100	CB	Blue	Homogeneous	PC	
14077456	3532-6-24-42 M	NAD	--	--	--	--	--	--	TR	--	TR	100	MS	Multi	Homogeneous	PC	
14077457	3532-6-24-43 CB	NAD	--	--	--	--	--	--	--	--	--	100	CB	Brown	Homogeneous	PC	
14077458	3532-6-24-43 M	NAD	--	--	--	--	--	--	TR	--	--	100	MS	Brown	Homogeneous	PC	

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

NVLAP 101143-0

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		P.O. Number:	Not Provided	**Revision Number:** 1	**Revised Date:** 7/15/2014

Attention: Sylvan Burch

Summary of Polarized Light Microscopy

AMA Sample Number	Client Sample #	Total Asbestos	Chrysotile Percent	Amosite Percent	Crocidolite Percent	Other Asbestos Percent	Mineral Wool Percent	Fiberglass Percent	Organic Percent	Synthetic Percent	Other Percent	Particulate Percent	Sample Type	Sample Color	Homogeneity	Analyst ID	Comments
14077459	3532-6-24-44 CB	NAD	--	--	--	--	--	--	--	--	--	100	CB	Brown	Homogeneous	PC	
14077460	3532-6-24-44 M	NAD	--	--	--	--	--	--	TR	--	--	100	MS	Brown	Homogeneous	PC	
14077461	3532-6-24-45	NAD	--	--	--	--	--	--	TR	--	--	100	ST	Black	Homogeneous	PC	
14077463	3532-6-24-46	NAD	--	--	--	--	--	--	TR	--	--	100	ST	Black	Homogeneous	PC	
14077464	3532-6-24-47	NAD	--	--	--	--	--	--	--	--	--	100	CK	White	Homogeneous	PC	
14077465	3532-6-24-48	NAD	--	--	--	--	--	--	--	--	--	100	CK	White	Homogeneous	PC	
14077466	3532-6-24-49	NAD	--	--	--	--	--	--	--	--	--	100	CK	White	Homogeneous	PC	
14077467	3532-6-24-50	NAD	--	--	--	--	--	--	--	--	--	100	CK	White	Homogeneous	PC	
14077468	3532-6-24-51	2	2	--	--	--	--	--	--	--	--	98	CK	Off-White	Homogeneous	PC	
14077469	3532-6-24-52	2	2	--	--	--	--	--	--	--	--	98	CK	Off-White	Homogeneous	PC	
14077470	3532-6-24-53	NAD	--	--	--	--	--	--	--	--	--	100	Ads	Brown	Homogeneous	PC	
14077471	3532-6-24-54	NAD	--	--	--	--	--	--	--	--	--	100	Ads	Brown	Homogeneous	PC	
14077472	3532-6-24-55	NAD	--	--	--	--	--	--	--	--	--	100	Ads	Brown	Homogeneous	PC	
14077473	3532-6-24-56	NAD	--	--	--	--	--	--	--	--	--	100	Ads	Brown	Homogeneous	PC	

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

NVLAP 101143-0

Client:	EBA Engineering, Inc	**Job Name:**	Youth Detention Center Project	**Chain Of Custody:**	519634
Address:	4813 Seton Drive	**Job Location:**	926 Greenmount Avenue, Baltimore, MD 21202	**Date Analyzed:**	7/7/2014
	Baltimore, Maryland 21215	**Job Number:**	3532-01-000	**Person Submitting:**	Sylvan Burch
		P.O. Number:	Not Provided	**Revision Number:** 2	**Revised Date:** 7/15/2014

Attention: Sylvan Burch

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14077474	3532-6-24-57	NAD	--	--	--	--	--	--	--	--	--	100	PL	White	Homogeneous	PC	
14077475	3532-6-24-58	NAD	--	--	--	--	--	--	--	--	--	100	PL	White	Homogeneous	PC	
14077476	3532-6-24-59	NAD	--	--	--	--	--	--	--	--	--	100	PL	White	Homogeneous	PC	
14077477	3532-6-24-60	NAD	--	--	--	--	--	--	--	--	--	100	PL	White	Homogeneous	PC	
14077478	3532-6-24-61	NAD	--	--	--	--	--	--	--	--	--	100	PL	White	Homogeneous	PC	
14077479	3532-6-24-62	NAD	--	--	--	--	--	--	--	--	--	100	PL	White	Homogeneous	PC	
14077480	3532-6-24-63	NAD	--	--	--	--	--	--	--	--	--	100	PL	White	Homogeneous	PC	
14077481	3532-6-24-64	NAD	--	--	--	--	--	--	--	--	--	100	PL	White	Homogeneous	PC	
14077482	3532-6-24-65	NAD	--	--	--	--	--	--	--	--	--	100	PL	White	Homogeneous	PC	
14077483	3532-6-24-66 White	NAD	--	--	--	--	--	--	--	--	--	100	PL	White	Homogeneous	PC	
14077484	3532-6-24-66 Brown	NAD	--	--	--	--	--	--	TR	--	--	100	BC	Brown	Homogeneous	PC	
14077485	3532-6-24-67	NAD	--	--	--	--	--	--	--	--	--	100	PL	White	Homogeneous	PC	
14077486	3532-6-24-68 PL	NAD	--	--	--	--	--	--	--	--	--	100	PL	White	Homogeneous	PC	

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14077487	3532-6-24-68 BC	NAD	--	--	--	--	--	--	--	--	--	100	BC	Brown	Homogeneous	PC	
14077488	3532-6-24-69 PL	NAD	--	--	--	--	--	--	--	--	--	100	PL	White	Homogeneous	PC	
14077489	3532-6-24-69 BC	NAD	--	--	--	--	--	--	--	--	--	100	BC	Brown	Homogeneous	PC	
14077490	3532-6-24-70 PL	NAD	--	--	--	--	--	--	--	--	--	100	PL	White	Homogeneous	PC	
14077491	3532-6-24-70 BC	NAD	--	--	--	--	--	--	--	--	--	100	BC	Brown	Homogeneous	PC	
14077492	3532-6-24-71	10	10	--	--	--	--	--	--	--	--	90	PL	White	Homogeneous	PC	
14077493	3532-6-24-72 Texture	10	10	--	--	--	--	--	--	--	--	90	Texture	Off-White	Homogeneous	PC	
14077494	3532-6-24-72 BC	NAD	--	--	--	--	--	--	--	--	--	100	BC	Beige	Homogeneous	PC	
14077495	3532-6-24-73 Texture	10	10	--	--	--	--	--	--	--	--	90	Texture	Off-White	Homogeneous	PC	
14077496	3532-6-24-73 BC	NAD	--	--	--	--	--	--	--	--	--	100	BC	Beige	Homogeneous	PC	
14077497	3532-6-24-74	10	10	--	--	--	--	--	--	--	--	90	PL	Off-White	Homogeneous	PC	

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14077498	3532-6-24-75 Tan	NAD	--	--	--	--	--	--	--	--	--	100	PL	Tan	Homogeneous	PC	
14077499	3532-6-24-75 Lt. Brown	NAD	--	--	--	--	--	--	--	--	--	100	PL	Brown	Homogeneous	PC	
14077500	3532-6-24-76 Tan	NAD	--	--	--	--	--	--	--	--	--	100	PL	Tan	Homogeneous	PC	
14077501	3532-6-24-76 Lt. Brown	NAD	--	--	--	--	--	--	--	--	--	100	PL	Brown	Homogeneous	PC	
14077502	3532-6-24-77 Tan	NAD	--	--	--	--	--	--	--	--	--	100	PL	Tan	Homogeneous	PC	
14077503	3532-6-24-77 Lt. Brown	NAD	--	--	--	--	--	--	--	--	--	100	PL	Brown	Homogeneous	PC	
14077504	3532-6-24-78 DW	NAD	--	--	--	--	--	--	10	--	--	90	DW	Multi	Homogeneous	PC	
14077505	3532-6-24-78 JC	--	--	--	--	--	--	--	--	--	--	--				PC	Sample Not Analyzed - no JC sample present
14077506	3532-6-24-79 FT	2	2	--	--	--	--	--	--	--	--	98	FT	Cream	Homogeneous	PC	
14077507	3532-6-24-79 M	2	2	--	--	--	--	--	--	--	--	98	MS	Black	Homogeneous	PC	

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14077508	3532-6-24-80 FT	2	2	--	--	--	--	--	--	--	--	98	FT	Cream	Homogeneous	PC	
14077509	3532-6-24-80 M	3	3	--	--	--	--	--	TR	--	--	97	MS	Black	Homogeneous	PC	
14077510	3532-6-24-81 FT	NAD	--	--	--	--	--	--	--	--	--	100	FT	Multi	Homogeneous	PC	
14077511	3532-6-24-81 M	NAD	--	--	--	--	--	--	--	--	--	100	MS	Brown	Homogeneous	PC	
14077512	3532-6-24-82 FT	NAD	--	--	--	--	--	--	--	--	--	100	FT	Multi	Homogeneous	PC	
14077513	3532-6-24-82 M	5	5	--	--	--	--	--	--	--	--	95	MS	Black	Homogeneous	PC	
14077514	3532-6-24-83 FT	NAD	--	--	--	--	--	--	--	--	--	100	FT	Cream	Homogeneous	PC	
14077515	3532-6-24-83 M	5	5	--	--	--	--	--	--	--	--	95	MS	Black	Homogeneous	PC	
14077516	3532-6-24-84 FT	NAD	--	--	--	--	--	--	--	--	--	100	FT	Cream	Homogeneous	PC	
14077517	3532-6-24-84 M	5	5	--	--	--	--	--	--	--	--	95	MS	Black	Homogeneous	PC	

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14077518	3532-6-24-85 FT	NAD	--	--	--	--	--	--	--	--	--	100	FT	Multi	Homogeneous	PC	
14077519	3532-6-24-85 M	NAD	--	--	--	--	--	--	TR	--	--	100	MS	Brown	Homogeneous	PC	
14077520	3532-6-24-86 FT	NAD	--	--	--	--	--	--	--	--	--	100	FT	Multi	Homogeneous	PC	
14077521	3532-6-24-86 M	4	4	--	--	--	--	--	TR	--	--	96	MS	Black	Homogeneous	PC	
14077522	3532-6-24-87 FT	2	2	--	--	--	--	--	--	--	--	98	FT	Multi	Homogeneous	PC	
14077523	3532-6-24-87 M	4	4	--	--	--	--	--	TR	--	--	96	MS	Black	Homogeneous	PC	
14077524	3532-6-24-88 FT	2	2	--	--	--	--	--	--	--	--	98	FT	Multi	Homogeneous	PC	
14077525	3532-6-24-88 M	5	5	--	--	--	--	--	--	--	--	95	MS	Black	Homogeneous	PC	
14077526	3532-6-24-89 FT	NAD	--	--	--	--	--	--	--	--	--	100	FT	Multi	Homogeneous	PC	
14077527	3532-6-24-89 M	NAD	--	--	--	--	--	--	TR	--	--	100	MS	Yellow	Homogeneous	PC	

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14077528	3532-6-24-90 FT	NAD	--	--	--	--	--	--	--	--	--	100	FT	Multi	Homogeneous	PC	
14077529	3532-6-24-90 M	NAD	--	--	--	--	--	--	--	--	--	100	MS	Yellow	Homogeneous	PC	
14077530	3532-6-24-91 FT	5	5	--	--	--	--	--	--	--	--	95	FT	Cream	Homogeneous	PC	
14077531	3532-6-24-91 M	NAD	--	--	--	--	--	--	--	--	--	100	MS	Brown	Homogeneous	PC	
14077532	3532-6-24-92 FT	5	5	--	--	--	--	--	--	--	--	95	FT	Cream	Homogeneous	PC	
14077533	3532-6-24-92 M	2	2	--	--	--	--	--	--	--	--	98	MS	Black	Homogeneous	PC	
14077534	3532-6-25-93 FT	5	5	--	--	--	--	--	--	--	--	95	FT	Cream	Homogeneous	PC	
14077535	3532-6-25-93 M	2	2	--	--	--	--	--	TR	--	--	98	MS	Black	Homogeneous	PC	
14077536	3532-6-25-94 FT	2	2	--	--	--	--	--	--	--	--	98	FT	Cream	Homogeneous	SW	
14077537	3532-6-25-94 M	NAD	--	--	--	--	--	--	2	--	--	98	MS	Black	Homogeneous	SW	

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14077538	3532-6-25-95 FT	2	2	--	--	--	--	--	--	--	--	98	FT	Cream	Homogeneous	SW	
14077539	3532-6-25-95 M	2	2	--	--	--	--	--	--	--	--	98	MS	Black	Homogeneous	SW	
14077540	3532-6-25-96 FT	2	2	--	--	--	--	--	--	--	--	98	FT	Cream	Homogeneous	SW	
14077541	3532-6-25-96 M	2	2	--	--	--	--	--	TR	--	--	98	MS	Black	Homogeneous	SW	
14077542	3532-6-25-97 FT	NAD	--	--	--	--	--	--	--	--	--	100	FT	Multi	Homogeneous	SW	
14077543	3532-6-25-97 M	NAD	--	--	--	--	--	--	--	--	--	100	MS	Brown	Homogeneous	SW	
14077544	3532-6-25-98 FT	NAD	--	--	--	--	--	--	--	--	--	100	FT	Multi	Homogeneous	SW	
14077545	3532-6-25-98 M	NAD	--	--	--	--	--	--	--	--	--	100	MS	Brown	Homogeneous	SW	
14077546	3532-6-25-99 FT	NAD	--	--	--	--	--	--	--	--	--	100	FT	Gray	Homogeneous	SW	
14077547	3532-6-25-99 M	NAD	--	--	--	--	--	--	TR	--	--	100	MS	Yellow	Homogeneous	SW	

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14077548	3532-6-25-100 FT	NAD	--	--	--	--	--	--	--	--	--	100	FT	Multi	Homogeneous	SW	
14077549	3532-6-25-100 M	NAD	--	--	--	--	--	--	TR	--	--	100	MS	Yellow	Homogeneous	SW	
14077550	3532-6-25-101 FT	NAD	--	--	--	--	--	--	--	--	--	100	FT	Multi	Homogeneous	SW	
14077551	3532-6-25-101 M	NAD	--	--	--	--	--	TR	5	--	--	95	MS	Brown	Homogeneous	SW	
14077552	3532-6-25-102 FT	NAD	--	--	--	--	--	--	--	--	--	100	FT	Multi	Homogeneous	SW	
14077553	3532-6-25-102 M	NAD	--	--	--	--	--	--	TR	--	--	100	MS	Yellow	Homogeneous	SW	
14077554	3532-6-25-103 FT	NAD	--	--	--	--	--	--	--	--	--	100	FT	Cream	Homogeneous	SW	
14077555	3532-6-25-103 M	2	2	--	--	--	--	--	--	--	--	98	MS	Black	Homogeneous	SW	
14077556	3532-6-25-104 FT	NAD	--	--	--	--	--	--	--	--	--	100	FT	Gray	Homogeneous	SW	
14077557	3532-6-25-104 M	2	2	--	--	--	--	--	2	--	--	96	MS	Black	Homogeneous	SW	

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14077558	3532-6-25-105 FT	2	2	--	--	--	--	--	--	--	--	98	FT	Multi	Homogeneous	SW	
14077559	3532-6-25-105 M	5	5	--	--	--	--	--	--	--	--	95	MS	Black	Homogeneous	SW	
14077560	3532-6-25-106 FT	2	2	--	--	--	--	--	--	--	--	98	FT	Multi	Homogeneous	SW	
14077561	3532-6-25-106 M	5	5	--	--	--	--	--	--	--	--	95	MS	Black	Homogeneous	SW	
14077562	3532-6-25-107 FT	2	2	--	--	--	--	--	--	--	--	98	FT	Beige	Homogeneous	SW	
14077563	3532-6-25-107 M	5	5	--	--	--	--	--	--	--	--	95	MS	Black	Homogeneous	SW	
14077564	3532-6-25-108 FT	2	2	--	--	--	--	--	--	--	--	98	FT	Beige	Homogeneous	SW	
14077565	3532-6-25-108 M	NAD	--	--	--	--	--	--	TR	--	--	100	MS	Black	Homogeneous	SW	
14077566	3532-6-25-109 DW	NAD	--	--	--	--	--	TR	10	--	--	90	DW	Multi	Layered	SW	
14077567	3532-6-25-109 JC	NAD	--	--	--	--	--	--	--	--	--	100	JC	White	Homogeneous	SW	
14077568	3532-6-25-110	NAD	--	--	--	--	--	TR	10	--	--	90	DW	Multi	Homogeneous	SW	

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14077569	3532-6-25-111	NAD	--	--	--	--	--	TR	10	--	--	90	DW	Multi	Homogeneous	SW	
14077570	3532-6-25-112 DW	NAD	--	--	--	--	--	TR	TR	--	--	100	DW	Off-White	Homogeneous	SW	
14077571	3532-6-25-112 Black	NAD	--	--	--	--	--	--	TR	--	--	100	MS	Black	Homogeneous	SW	
14077572	3532-6-25-113	NAD	--	--	--	--	--	--	TR	--	--	100	Ceiling	Off-White	Homogeneous	SW	
14077573	3532-6-25-114	NAD	--	--	--	--	--	--	--	--	--	100	DS	Tan	Homogeneous	SW	
14077574	3532-6-25-115	NAD	--	--	--	--	--	TR	--	--	--	100	DS	Tan	Homogeneous	SW	
14077575	3532-6-25-116	2	--	2	--	--	38	--	--	--	--	60	Fitting	Gray	Homogeneous	SW	
14077576	3532-6-25-117	2	--	2	--	--	38	--	--	--	--	60	Fitting	Gray	Homogeneous	SW	
14077577	3532-6-25-118	2	--	2	--	--	38	--	--	--	--	60	Fitting	Gray	Homogeneous	SW	
14077578	3532-6-25-119	2	--	2	--	--	38	--	--	--	--	60	Fitting	Gray	Homogeneous	SW	
14077579	3532-6-25-120	2	--	2	--	--	38	--	--	--	--	60	Fitting	Gray	Homogeneous	SW	
14077580	3532-6-25-121	2	--	2	--	--	38	--	--	--	--	60	Fitting	Gray	Homogeneous	SW	
14077581	3532-6-25-122	2	--	2	--	--	38	--	--	--	--	60	Fitting	Gray	Homogeneous	SW	
14077582	3532-6-25-123	2	--	2	--	--	38	--	--	--	--	60	Fitting	Gray	Homogeneous	SW	

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

NVLAP
101143-0

Client:	EBA Engineering, Inc	**Job Name:**	Youth Detention Center Project	**Chain Of Custody:**	519634
Address:	4813 Seton Drive	**Job Location:**	926 Greenmount Avenue, Baltimore, MD 21202	**Date Analyzed:**	7/7/2014
	Baltimore, Maryland 21215	**Job Number:**	3532-01-000	**Person Submitting:**	Sylvan Burch
		P.O. Number:	Not Provided	**Revision Number:** 2	**Revised Date:** 7/15/2014

Attention: Sylvan Burch

Summary of Polarized Light Microscopy

AMA Sample Number	Client Sample #	Total Asbestos	Chrysotile Percent	Amosite Percent	Crocidolite Percent	Other Asbestos Percent	Mineral Wool Percent	Fiberglass Percent	Organic Percent	Synthetic Percent	Other Percent	Particulate Percent	Sample Type	Sample Color	Homogeneity	Analyst ID	Comments
14077583	3532-6-25-124	NAD	--	--	--	--	--	--	TR	--	--	100	DW	Gold	Homogeneous	SW	
14077584	3532-6-25-125	NAD	--	--	--	--	--	--	TR	--	--	100	DW	Gold	Homogeneous	SW	
14077585	3532-6-25-126	NAD	--	--	--	--	--	--	20	--	--	80	FP	Off-White	Homogeneous	SW	
14077586	3532-6-25-127	NAD	--	--	--	--	--	--	20	--	--	80	FP	Off-White	Homogeneous	SW	
14077587	3532-6-25-128	NAD	--	--	--	--	--	--	20	--	--	80	FP	Off-White	Homogeneous	SW	
14077588	3532-6-25-129	NAD	--	--	--	--	--	TR	--	20	--	80	PI	Blue	Homogeneous	SW	
14077589	3532-6-25-130	NAD	--	--	--	--	--	TR	--	20	--	80	PI	Blue	Homogeneous	SW	
14077590	3532-6-25-131	NAD	--	--	--	--	--	--	20	--	--	80	PI	Off-White	Homogeneous	SW	
14077591	3532-6-25-132	NAD	--	--	--	--	--	--	20	--	--	80	PI	Off-White	Homogeneous	SW	
14077592	3532-6-25-133	NAD	--	--	--	--	--	--	20	--	--	80	PI	Off-White	Homogeneous	SW	
14077593	3532-6-25-134	NAD	--	--	--	--	--	--	20	--	--	80	PI	Off-White	Homogeneous	SW	
14077594	3532-6-25-135	NAD	--	--	--	--	40	--	TR	--	--	60	Fitting	Gray	Homogeneous	SW	
14077595	3532-6-25-136	NAD	--	--	--	--	40	--	TR	--	--	60	Fitting	Gray	Homogeneous	SW	
14077596	3532-6-25-137	NAD	--	--	--	--	40	--	TR	--	--	60	Fitting	Gray	Homogeneous	SW	

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

NVLAP 101143-0

Client:	EBA Engineering, Inc	**Job Name:**	Youth Detention Center Project	**Chain Of Custody:**	519634
Address:	4813 Seton Drive	**Job Location:**	926 Greenmount Avenue, Baltimore, MD 21202	**Date Analyzed:**	7/7/2014
	Baltimore, Maryland 21215	**Job Number:**	3532-01-000	**Person Submitting:**	Sylvan Burch
		P.O. Number:	Not Provided	**Revision Number:** 2	**Revised Date:** 7/15/2014
Attention:	Sylvan Burch				

Summary of Polarized Light Microscopy

AMA Sample Number	Client Sample #	Total Asbestos	Chrysotile Percent	Amosite Percent	Crocidolite Percent	Other Asbestos Percent	Mineral Wool Percent	Fiberglass Percent	Organic Percent	Synthetic Percent	Other Percent	Particulate Percent	Sample Type	Sample Color	Homogeneity	Analyst ID	Comments

The following footnotes only apply to those samples which the total asbestos result is flagged with a note number.

1 TEM RECOMMENDATION - Please note, due to resolution limitations with optical microscopy and/or interference from matrix components of this sample, results which are reported via PLM as negative or trace (<1%) for asbestos may contain a significant quantity of asbestos. It is recommended that the additional analytical technique of TEM be used to check for asbestos fibers below the resolution limits of optical microscopy.

2 MATRIX REDUCTION RECOMMENDATION - Please note, due to interference from the matrix components of this sample, results which are reported via PLM as negative or trace (<1%) for asbestos may contain a significant quantity of asbestos which is obscured from view. It is recommended that the additional preparation technique of gravimetric reduction be performed on this sample to minimize the obscuring effects of matrix components, followed by reanalysis by PLM and/or TEM.

Analysis Method - EPA/600/R-93/116 dated July 1993

NAD = "No Asbestos Detected" TR = "Trace equals less than 1% of this component"

Uncertainty: For samples containing asbestos in range of 1-10% the CV is 0.43, 11-35% CV=0.55, >35 CV=0.23

All results are to be considered preliminary and subject to change unless signed by the Technical Director or Deputy.

Technical Director Peerawut Chaikeenee **Analyst(s)** P. Chaikeenee / S. Watson

EBA Engineering Asbestos Sample Data Sheet

Project Name:	Youth Detention Center Project	Inspector(s):	Sylvan Burch
Project Location:	926 Greenmount Avenue, Baltimore, Maryland 21202	Project Manager:	Sherri Waldron
Project Number:	3532-01-000	Date Sampled:	6/23/14 - 6/25/2014

PLEASE ANALYZE ALL LAYERS OF EACH SAMPLE

Sample Number or ID	Material Description (Use FT-Floor Tile, CT-Ceiling Tile, PF-Pipe Fitting)	Color	Sample Location (Floor, Room)	ACBM Type (TSI or S or M)	Condition (G, F, or P)	Multiple Layers
3532-6-23-01	Window Insert Caulk - OM16	Black	Exterior - BPRU Building	M	F	N
3532-6-23-02	Window Insert Caulk - OM16	Black	Exterior - BPRU Building	M	F	N
3532-6-23-03	Window Caulk - OM15	White/Gray	Exterior - BPRU Building	M	G	N
3532-6-23-04	Window Caulk - OM15	White/Gray	Exterior - BPRU Building	M	G	N
3532-6-23-05	Expansion Joint - OM14	Black	Exterior - OSTC Building	M	F	N
3532-6-23-06	Expansion Joint - OM14	Black	Exterior - OSTC Building	M	F	N
3532-6-23-07	Door Caulk - OM10	Gray	Exterior - OSTC Building	M	G	N
3532-6-23-08	Door Caulk - OM10	Gray	Exterior - OSTC Building	M	G	N
3532-6-23-09	Window Insert - OM17	Gray	Exterior - BPRU Building	M	G	N
3532-6-23-10	Window Insert - OM17	Gray	Exterior - BPRU Building	M	G	N
3532-6-23-11	Window Glaze - OM18	Black	Exterior - BPRU Building	M	F	N
3532-6-23-12	Window Glaze - OM18	Black	Exterior - BPRU Building	M	F	N
3532-6-23-13	Window Glaze - OM19	White	Exterior - BPRU Building	M	F	N
3532-6-23-14	Window Glaze - OM19	White	Exterior - BPRU Building	M	F	N
3532-6-23-15	Window Glaze - OM20	White	Exterior - Roofing Building	M	P	N
	PLEASE ANALYZE ALL LAYERS OF EACH SAMPLE					
	Homogeneous area = Suspect Materials of one type and color		**Samples required for the following:** **TSI:** 3 samples for each TSI material; 1 sample per area of patched insulation (<6 linear or squared feet); Sample in a manner sufficient per mechanical system not assumed to be ACBM where cement or plaster is used on fittings such as tees, elbows, or valves. **Surfacing:** 3 samples per area < 1,000 ft2; 5 samples per area > 1,000 ft2; 7 samples per area > 5,000 ft2. **Miscellaneous:** Sample in a manner sufficient to determine (Note EBA's Standard Operating Procedure is to collect at least 2 samples per homogenous area).	**TSI** = Thermal System Insulation **S** = Surface Material **M** = any other building material or structural component		

EBA Engineering Asbestos Sample Data Sheet

Project Name:	Youth Detention Center Project	Inspector(s):	Sylvan Burch
Project Location:	926 Greenmount Avenue, Baltimore, Maryland 21202	Project Manager:	Sherri Waldron
Project Number:	3532-01-000	Date Sampled:	6/23/14 - 6/25/2014

PLEASE ANALYZE ALL LAYERS OF EACH SAMPLE

Sample Number or ID	Material Description (Use FT-Floor Tile, CT-Ceiling Tile, PF-Pipe Fitting)	Color	Sample Location (Floor, Room)	ACBM Type (TSI or S or M)	Condition (G, F, or P)	Multiple Layers
3532-6-23-16	Window Glaze - OM20	White	Exterior - Roofing Building	M	P	N
3532-6-23-17	Window Caulk - OM21	White	Exterior - Roofing Building	M	F	N
3532-6-23-18	Window Caulk - OM21	White	Exterior - Roofing Building	M	F	N
3532-6-23-19	Joint Caulk - OM13	White	Exterior - OSTC Building	M	G	N
3532-6-23-20	Joint Caulk - OM13	White	Exterior - OSTC Building	M	G	N
3532-6-23-21	Window Caulk - OM11	White	Exterior - OSTC Building	M	F	N
3532-6-23-22	Window Caulk - OM11	White	Exterior - OSTC Building	M	F	N
3532-6-24-23	Window Glaze - 0M12	Off-White	Exterior - OSTC Building	M	G	N
3532-6-24-24	Window Glaze - OM12	Off-White	Exterior - OSTC Building	M	G	N
3532-6-24-25	Ceiling Tile - DCT4	White	Room 55	M	G	N
3532-6-24-26	Ceiling Tile - DCT4	White	Room 59	M	G	N
3532-6-24-27	Ceiling Tile - DCT1	White	Room 2	M	G	N
3532-6-24-28	Ceiling Tile - DCT1	White	Room 10	M	G	N
3532-6-24-29	Ceiling Tile - DCT2	White	Room 6	M	G	N
3532-6-24-30	Ceiling Tile - DCT2	White	Room 2	M	G	N

PLEASE ANALYZE ALL LAYERS OF EACH SAMPLE

Homogeneous area = Suspect Materials of one type and color

Samples required for the following:
TSI: 3 samples for each TSI material; 1 sample per area of patched insulation (<6 linear or squared feet); Sample in a manner sufficient per mechanical system not assumed to be ACBM where cement or plaster is used on fittings such as tees, elbows, or valves.
Surfacing: 3 samples per area < 1,000 ft2; 5 samples per area > 1,000 ft2; 7 samples per area > 5,000 ft2.
Miscellaneous: Sample in a manner sufficient to determine (Note EBA's Standard Operating Procedure is to collect at least 2 samples per homogenous area).

TSI = Thermal System Insulation
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EBA Engineering Asbestos Sample Data Sheet

Project Name:	Youth Detention Center Project	Inspector(s):	Sylvan Burch
Project Location:	926 Greenmount Avenue, Baltimore, Maryland 21202	Project Manager:	Sherri Waldron
Project Number:	3532-01-000	Date Sampled:	6/23/14 - 6/25/2014

PLEASE ANALYZE ALL LAYERS OF EACH SAMPLE

Sample Number or ID	Material Description (Use FT-Floor Tile, CT-Ceiling Tile, PF-Pipe Fitting)	Color	Sample Location (Floor, Room)	ACBM Type (TSI or S or M)	Condition (G, F, or P)	Multiple Layers
3532-6-24-31	Ceiling Tile - DCT3	White	Room 6	M	G	N
3532-6-24-32	Ceiling Tile - DCT3	White	Room 2	M	G	N
3532-6-24-33	Ceiling Tile - DCT5	White	Room 62	M	G	N
3532-6-24-34	Ceiling Tile - DCT5	White	Room 65	M	G	N
3532-6-24-35	Cove Base - CB1	Black	Room 47 CB|M	M	G	Y
3532-6-24-36	Cove Base - CB1	Black	Room 6 CB|M	M	G	Y
3532-6-24-37	Cove Base - CB2	Gray	Room 73 CB|M	M	G	Y
3532-6-24-38	Cove Base - CB2	Gray	Room 75 CB|M	M	G	Y
3532-6-24-39	Cove Base - CB3	Black	Room 76 CB|M	M	G	Y
3532-6-24-40	Cove Base - CB3	Black	Room 77 CB|M	M	G	Y
3532-6-24-41	Cove Base - CB4	Blue	Room 81 CB|M	M	G	Y
3532-6-24-42	Cove Base - CB4	Blue	Room 91B CB|M	M	G	Y
3532-6-24-43	Cove Base - CB5	Brown	Room 101 CB|M	M	G	Y
3532-6-24-44	Cove Base - CB5	Brown	Room 101 CB|M	M	G	Y
3532-6-24-45	Stair Tread - OM4	Black	Room 14	M	G	Y

PLEASE ANALYZE ALL LAYERS OF EACH SAMPLE

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Samples required for the following:
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Surfacing: 3 samples per area < 1,000 ft2; 5 samples per area > 1,000 ft2; 7 samples per area > 5,000 ft2.
Miscellaneous: Sample in a manner sufficient to determine (Note EBA's Standard Operating Procedure is to collect at least 2 samples per homogenous area).

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EBA Engineering Asbestos Sample Data Sheet

Project Name:	Youth Detention Center Project	Inspector(s):	Sylvan Burch
Project Location:	926 Greenmount Avenue, Baltimore, Maryland 21202	Project Manager:	Sherri Waldron
Project Number:	3532-01-000	Date Sampled:	6/23/14 - 6/25/2014

PLEASE ANALYZE ALL LAYERS OF EACH SAMPLE

Sample Number or ID	Material Description (Use FT-Floor Tile, CT-Ceiling Tile, PF-Pipe Fitting)	Color	Sample Location (Floor, Room)	ACBM Type (TSI or S or M)	Condition (G, F, or P)	Multiple Layers
3532-6-24-46	Stair Tread - OM4	Black	Room 22	M	G	Y
3532-6-24-47	Bathroom Caulk - OM2	White	Room 21	M	G	N
3532-6-24-48	Bathroom Caulk - OM2	White	Room 35	M	G	N
3532-6-24-49	Sink Caulk - OM5	White	Room 73	M	G	N
3532-6-24-50	Sink Caulk - OM5	White	Room 73	M	G	N
3532-6-24-51	Door/Window Caulk - OM1	Off-White	Room 27	M	G	N
3532-6-24-52	Door/Window Caulk - OM1	Off-White	Room 2	M	G	N
3532-6-24-53	Wall Adhesive - OM7	Brown	Room 46	M	G	N
3532-6-24-54	Wall Adhesive - OM7	Brown	Room 46	M	G	N
3532-6-24-55	Tile Adhesive - OM23	Brown	Room 46	M	G	N
3532-6-24-56	Tile Adhesive - OM23	Brown	Room 46	M	G	N
3532-6-24-57	Plaster Ceiling - S1	White	Room 5	S	G	N
3532-6-24-58	Plaster Ceiling - S1	White	Room 19	S	G	N
3532-6-24-59	Plaster Ceiling - S1	White	Room 18	S	G	N
3532-6-24-60	Plaster Ceiling - S1	White	Room 17	S	G	N

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Samples required for the following:
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Surfacing: 3 samples per area < 1,000 ft2; 5 samples per area > 1,000 ft2; 7 samples per area > 5,000 ft2.
Miscellaneous: Sample in a manner sufficient to determine (Note EBA's Standard Operating Procedure is to collect at least 2 samples per homogenous area).

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EBA Engineering Asbestos Sample Data Sheet

Project Name:	Youth Detention Center Project	Inspector(s):	Sylvan Burch
Project Location:	926 Greenmount Avenue, Baltimore, Maryland 21202	Project Manager:	Sherri Waldron
Project Number:	3532-01-000	Date Sampled:	6/23/14 - 6/25/2014

PLEASE ANALYZE ALL LAYERS OF EACH SAMPLE

Sample Number or ID	Material Description (Use FT-Floor Tile, CT-Ceiling Tile, PF-Pipe Fitting)	Color	Sample Location (Floor, Room)	ACBM Type (TSI or S or M)	Condition (G, F, or P)	Multiple Layers
3532-6-24-61	Plaster Ceiling - S1	White	Room 9	S	G	N
3532-6-24-62	Plaster Ceiling - S1	White	Room 10	S	G	N
3532-6-24-63	Plaster Ceiling - S1	White	Room 108	S	G	N
3532-6-24-64	Plaster Ceiling/Wall - S2	White	Room 67	S	G	N
3532-6-24-65	Plaster Ceiling/Wall - S2	White	Room 81	S	G	N
3532-6-24-66	Plaster Ceiling/Wall - S2	White	Room 82 White/Brown	S	G	N
3532-6-24-67	Plaster Ceiling/Wall - S2	White	Room 70	S	G	N
3532-6-24-68	Plaster Ceiling/Wall - S2	White	Room 85 PL/BC	S	G	N
3532-6-24-69	Plaster Ceiling/Wall - S2	White	Room 108 PL/BC	S	G	N
3532-6-24-70	Plaster Ceiling/Wall - S2	White	Room 91A PL/BC	S	G	N
3532-6-24-71	Plaster Ceiling - S3	White	Room 73	S	G	N
3532-6-24-72	Plaster Ceiling - S3	White	Room 73 Texture/BC	S	G	N
3532-6-24-73	Plaster Ceiling - S3	White	Room 74 Texture/BC	S	G	N
3532-6-24-74	Plaster Ceiling - S3	White	Room 75	S	G	N
3532-6-24-75	Plaster Ceiling - S3	White	Room 77 Tan/Lt. Brown	S	G	N
	PLEASE ANALYZE ALL LAYERS OF EACH SAMPLE					

Homogeneous area = Suspect Materials of one type and color

Samples required for the following:
TSI: 3 samples for each TSI material; 1 sample per area of patched insulation (<6 linear or squared feet); Sample in a manner sufficient per mechanical system not assumed to be ACBM where cement or plaster is used on fittings such as tees, elbows, or valves.
Surfacing: 3 samples per area < 1,000 ft2; 5 samples per area > 1,000 ft2; 7 samples per area > 5,000 ft2.
Miscellaneous: Sample in a manner sufficient to determine (Note EBA's Standard Operating Procedure is to collect at least 2 samples per homogenous area).

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EBA Engineering Asbestos Sample Data Sheet

Project Name:	Youth Detention Center Project	Inspector(s):	Sylvan Burch
Project Location:	926 Greenmount Avenue, Baltimore, Maryland 21202	Project Manager:	Sherri Waldron
Project Number:	3532-01-000	Date Sampled:	6/23/14 - 6/25/2014

PLEASE ANALYZE ALL LAYERS OF EACH SAMPLE

Sample Number or ID	Material Description (Use FT-Floor Tile, CT-Ceiling Tile, PF-Pipe Fitting)	Color	Sample Location (Floor, Room)	ACBM Type (TSI or S or M)	Condition (G, F, or P)	Multiple Layers
3532-6-24-76	Plaster Ceiling - S3	White	Room 76 Tan/Lt. Brown	S	G	N
3532-6-24-77	Plaster Ceiling - S3	White	Room 83 Tan/Lt. Brown	S	G	N
3532-6-24-78	Drywall - DW/JC1	White	Room 96 DW/JC	M	G	Y
3532-6-24-79	Floor Tile - FT1	Cream	Room 9 FT/M	M	G	Y
3532-6-24-80	Floor Tile - FT1	Cream	Room 15 FT/M	M	G	Y
3532-6-24-81	Floor Tile - FT2	Cream	Room 48 FT/M	M	G	Y
3532-6-24-82	Floor Tile - FT2	Cream	Room 13 FT/M	M	G	Y
3532-6-24-83	Floor Tile - FT3	Cream	Room 23 FT/M	M	G	Y
3532-6-24-84	Floor Tile - FT3	Cream	Room 22 FT/M	M	G	Y
3532-6-24-85	Floor Tile - FT4	Cream	Room 23 FT/M	M	G	Y
3532-6-24-86	Floor Tile - FT4	Cream	Room 23 FT/M	M	G	Y
3532-6-24-87	Floor Tile - FT5	Tan	Room 47 FT/M	M	G	Y
3532-6-24-88	Floor Tile - FT5	Tan	Room 36 FT/M	M	G	Y
3532-6-24-89	Floor Tile - FT6	White/Cream	Room 54 FT/M	M	G	Y
3532-6-24-90	Floor Tile - FT6	White/Cream	Room 59 FT/M	M	G	Y

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Homogeneous area = Suspect Materials of one type and color

Samples required for the following:
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Surfacing: 3 samples per area < 1,000 ft2; 5 samples per area > 1,000 ft2; 7 samples per area > 5,000 ft2.
Miscellaneous: Sample in a manner sufficient to determine (Note EBA's Standard Operating Procedure is to collect at least 2 samples per homogenous area).

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EBA Engineering Asbestos Sample Data Sheet

Project Name:	Youth Detention Center Project	Inspector(s):	Sylvan Burch
Project Location:	926 Greenmount Avenue, Baltimore, Maryland 21202	Project Manager:	Sherri Waldron
Project Number:	3532-01-000	Date Sampled:	6/23/14 - 6/25/2014

PLEASE ANALYZE ALL LAYERS OF EACH SAMPLE

Sample Number or ID	Material Description (Use FT-Floor Tile, CT-Ceiling Tile, PF-Pipe Fitting)	Color	Sample Location (Floor, Room)	ACBM Type (TSI or S or M)	Condition (G, F, or P)	Multiple Layers
3532-6-24-91	Floor Tile - FT7	Cream	Room 63 FT | M	M	G	Y
3532-6-24-92	Floor Tile - FT7	Cream	Room 96	M	G	Y
3532-6-25-93	Floor Tile - FT8	Cream (9x9)	Room 68	M	G	Y
3532-6-25-94	Floor Tile - FT8	Cream (9x9)	Room 83	M	G	Y
3532-6-25-95	Floor Tile - FT9	Cream (9x9)	Room 68	M	G	Y
3532-6-25-96	Floor Tile - FT9	Cream (9x9)	Room 68	M	G	Y
3532-6-25-97	Floor Tile - FT10	Black/White	Room 91A	M	G	Y
3532-6-25-98	Floor Tile - FT10	Black/White	Room 70	M	G	Y
3532-6-25-99	Floor Tile - FT11	Gray	Room 73	M	G	Y
3532-6-25-100	Floor Tile - FT11	Gray	Room 74	M	G	Y
3532-6-25-101	Floor Tile - FT12	Slate Blue	Room 73	M	G	Y
3532-6-25-102	Floor Tile - FT12	Slate Blue	Room 81	M	G	Y
3532-6-25-103	Floor Tile - FT13	Light Gray	Room 127	M	G	Y
3532-6-25-104	Floor Tile - FT13	Light Gray	Room 126	M	G	Y
3532-6-25-105	Floor Tile - FT14	Orange	Room 144	M	G	Y

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Surfacing: 3 samples per area < 1,000 ft2; 5 samples per area > 1,000 ft2; 7 samples per area > 5,000 ft2.
Miscellaneous: Sample in a manner sufficient to determine (Note EBA's Standard Operating Procedure is to collect at least 2 samples per homogenous area).

TSI = Thermal System Insulation
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EBA Engineering Asbestos Sample Data Sheet

Project Name:	Youth Detention Center Project	Inspector(s):	Sylvan Burch
Project Location:	926 Greenmount Avenue, Baltimore, Maryland 21202	Project Manager:	Sherri Waldron
Project Number:	3532-01-000	Date Sampled:	6/23/14 - 6/25/2014

PLEASE ANALYZE ALL LAYERS OF EACH SAMPLE

Sample Number or ID	Material Description (Use FT-Floor Tile, CT-Ceiling Tile, PF-Pipe Fitting)	Color	Sample Location (Floor, Room)	ACBM Type (TSI or S or M)	Condition (G, F, or P)	Multiple Layers
3532-6-25-106	Floor Tile - FT14	Orange	Room 146 FT/M	M	G	Y
3532-6-25-107	Floor Tile - FT15	Unknown	Room 73	M	G	Y
3532-6-25-108	Floor Tile - FT15	Unknown	Room 73	M	G	Y
3532-6-25-109	Drywall - DW/JC1	White	Room 73 DW/JC	M	G	Y
3532-6-25-110	Drywall - DW/JC1	White	Room 48 DW only	M	G	Y
3532-6-25-111	Drywall - DW/JC1	White	Room 66	M	G	Y
3532-6-25-112	Gypsum Ceiling - S6	White	Room 66 DW/Black	M	G	N
3532-6-25-113	Gypsum Ceiling - S6	White	Room 65	M	G	N
3532-6-25-114	Ductwork Mastic - OM22	Off-White	Room 84	M	G	N
3532-6-25-115	Ductwork Mastic - OM22	Off-White	Room 84	M	G	N
3532-6-25-116	Fitting - TSI1	White	Room 13	TSI	G	N
3532-6-25-117	Fitting - TSI1	White	Room 13	TSI	G	N
3532-6-25-118	Fitting - TSI2	White	Room 13	TSI	G	N
3532-6-25-119	Fitting - TSI2	White	Room 13	TSI	G	N
3532-6-25-120	Fitting - TSI3	White	Room 25	TSI	G	N

PLEASE ANALYZE ALL LAYERS OF EACH SAMPLE

Homogeneous area = Suspect Materials of one type and color

Samples required for the following:
TSI: 3 samples for each TSI material; 1 sample per area of patched insulation (<6 linear or squared feet); Sample in a manner sufficient per mechanical system not assumed to be ACBM where cement or plaster is used on fittings such as tees, elbows, or valves.
Surfacing: 3 samples per area < 1,000 ft2; 5 samples per area > 1,000 ft2; 7 samples per area > 5,000 ft2.
Miscellaneous: Sample in a manner sufficient to determine (Note EBA's Standard Operating Procedure is to collect at least 2 samples per homogenous area).

TSI = Thermal System Insulation
S = Surface Material
M = any other building material or structural component

EBA Engineering Asbestos Sample Data Sheet

Project Name:	Youth Detention Center Project	Inspector(s):	Sylvan Burch
Project Location:	926 Greenmount Avenue, Baltimore, Maryland 21202	Project Manager:	Sherri Waldron
Project Number:	3532-01-000	Date Sampled:	6/23/14 - 6/25/2014

PLEASE ANALYZE ALL LAYERS OF EACH SAMPLE

Sample Number or ID	Material Description (Use FT-Floor Tile, CT-Ceiling Tile, PF-Pipe Fitting)	Color	Sample Location (Floor, Room)	ACBM Type (TSI or S or M)	Condition (G, F, or P)	Multiple Layers
3532-6-25-121	Fitting - TSI3	White	Room 30	TSI	G	N
3532-6-25-122	Fitting - TSI4	White	Room 53	TSI	G	N
3532-6-25-123	Fitting - TSI4	White	Room 101	TSI	G	N
3532-6-25-124	Ductwork Mastic - OM9	Gold	Room 139	M	G	N
3532-6-25-125	Ductwork Mastic - OM9	Gold	Room 139	M	G	N
3532-6-25-126	Fireproofing - S5	White	Room 139	S	G	N
3532-6-25-127	Fireproofing - S5	White	Room 139	S	G	N
3532-6-25-128	Fireproofing - S5	White	Room 139	S	G	N
3532-6-25-129	Pipe Run - TSI6	White	Room 139	TSI	G	N
3532-6-25-130	Pipe Run - TSI6	White	Room 139	TSI	G	N
3532-6-25-131	Pipe Run - TSI7	White	Room 139	TSI	G	N
3532-6-25-132	Pipe Run - TSI7	White	Room 139	TSI	G	N
3532-6-25-133	Pipe Run - TSI7	White	Room 139	TSI	G	N
3532-6-25-134	Pipe Run - TSI6	White	Room 139	TSI	G	N
3532-6-25-135	Fitting - TSI8	White	Room 139	TSI	G	N
	PLEASE ANALYZE ALL LAYERS OF EACH SAMPLE					
	Homogeneous area = Suspect Materials of one type and color		**Samples required for the following:** **TSI:** 3 samples for each TSI material; 1 sample per area of patched insulation (<6 linear or squared feet); Sample in a manner sufficient per mechanical system not assumed to be ACBM where cement or plaster is used on fittings such as tees, elbows, or valves. **Surfacing:** 3 samples per area < 1,000 ft2; 5 samples per area > 1,000 ft2; 7 samples per area > 5,000 ft2. **Miscellaneous:** Sample in a manner sufficient to determine (Note EBA's Standard Operating Procedure is to collect at least 2 samples per homogenous area).	**TSI** = Thermal System Insulation **S** = Surface Material **M** = any other building material or structural component		

EBA Engineering Asbestos Sample Data Sheet

Project Name:	Youth Detention Center Project	Inspector(s):	Sylvan Burch
Project Location:	926 Greenmount Avenue, Baltimore, Maryland 21202	Project Manager:	Sherri Waldron
Project Number:	3532-01-000	Date Sampled:	6/23/14 - 6/25/2014

PLEASE ANALYZE ALL LAYERS OF EACH SAMPLE

Sample Number or ID	Material Description (Use FT-Floor Tile, CT-Ceiling Tile, PF-Pipe Fitting)	Color	Sample Location (Floor, Room)	ACBM Type (TSI or S or M)	Condition (G, F, or P)	Multiple Layers
3532-6-25-136	Fitting - TSI8	White	Room 139	TSI	G	N
3532-6-25-137	Fitting - TSI8	White	Room 139	TSI	G	N

PLEASE ANALYZE ALL LAYERS OF EACH SAMPLE

	Homogeneous area = Suspect Materials of one type and color		**Samples required for the following:** **TSI:** 3 samples for each TSI material; 1 sample per area of patched insulation (<6 linear or squared feet); Sample in a manner sufficient per mechanical system not assumed to be ACBM where cement or plaster is used on fittings such as tees, elbows, or valves. **Surfacing:** 3 samples per area < 1,000 ft2; 5 samples per area > 1,000 ft2; 7 samples per area > 5,000 ft2. **Miscellaneous:** Sample in a manner sufficient to determine (Note EBA's Standard Operating Procedure is to collect at least 2 samples per homogenous area).	**TSI** = Thermal System Insulation **S** = Surface Material **M** = any other building material or structural component		

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4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) **519634**

Mailing/Billing Information:
1. Client Name: EBA Engineering, Inc.
2. Address 1: 4813 Seton Dr.
3. Address 2: Baltimore, MD 21215
4. Address 3:
5. Phone #: (410) 358-7171 Fax #: (410) 358-7213

Submittal Information:
1. Job Name: Youth Detention Center Project
2. Job Location: 926 Greenmount Avenue, Baltimore, Maryland 21202
3. Job #: 3532-01-000 P.O. #:
4. Contact Person: Sylvan Burch @ phone # (410) 504-6113
5. Submitted by: Sylvan Burch Signature: Sylvan Burch

Reporting Information (Results will be provided as soon as technically feasible):

AFTER HOURS (must be pre-scheduled)	NORMAL BUSINESS HOURS	REPORT TO:
❑ Immediate Date Due:	❑ Immediate ❑ 3 Day	❑ Include COC/Field Data Sheets with Report
❑ 24 Hours Time Due:	☒ Next Day ☒ 5 Day +	☒ Email: Sylvan.Burch@ebaengineering.com
Comments:	❑ 2 Day Date Due: 07-07-14	❑ Fax:
	❑ Results Required By Noon (EveryAttempt Will Be Made to Accomodate)	❑ Verbals:

Asbestos Analysis

PCM Air – Please Indicate Filter Type:
- ❑ NIOSH 7400 (QTY)
- ❑ Fiberglass (QTY)

TEM Air – Please Indicate Filter Type:
- ❑ AHERA (QTY)
- ❑ NIOSH 7402 (QTY)
- ❑ Other (specify) (QTY)

PLM Bulk
- ☒ EPA 600 – Visual Estimate 137 (QTY)
- ❑ EPA Point Count (QTY)
- ❑ NY State Friable 198.1 (QTY)
- ❑ Grav. Reduction ELAP 198.6 (QTY)
- ❑ Other (specify) (QTY)

MISC
- ❑ Vermiculite
- ❑ Asbestos Soil PLM (Qual) PLM (Quan) PLM/TEM (Qual) PLM/TEM (Quan)

TEM Bulk
- ❑ ELAP 198.4/Chatfield (QTY)
- ❑ NY State PLM/TEM (QTY)
- ❑ Residual Ash (QTY)

TEM Dust
- ❑ Qual. (pres/abs) Vacuum/Dust (QTY)
- ❑ Quan. (s/area) Vacuum D5755-95 (QTY)
- ❑ Quan. (s/area)Dust D6480-99 (QTY)

TEM Water
- ❑ Qual. (pres/abs) (QTY)
- ❑ ELAP 198.2/EPA 100.2 (QTY)
- ❑ EPA 100.1 (QTY)

☑ All samples received in good condition unless otherwise noted. (TEM Water samples °C)

Metals Analysis
- ❑ Pb Paint Chip (QTY)
- ❑ Pb Dust Wipe (wipe type) (QTY)
- ❑ Pb Air (QTY)
- ❑ Pb Soil/Solid (QTY)
- ❑ Pb TCLP (QTY)
- ❑ Drinking Water ❑ Pb (QTY) ❑ Cu (QTY) ❑ As (QTY)
- ❑ Waste Water ❑ Pb (QTY) ❑ Cu (QTY) ❑ As (QTY)
- ❑ Pb Furnace (Media) (QTY)

Fungal Analysis

Collection Apparatus for Spore Traps/Air Samples:
Collection Media
- ❑ Spore-Trap (QTY) ❑ Surface Vacuum Dust (QTY)
- ❑ Surface Swab (QTY) ❑ Culturable ID Genus (Media) (QTY)
- ❑ Surface Tape (QTY) ❑ Culturable ID Species (Media) (QTY)
- ❑ Other (Specify) (QTY)

SAMPLE INFORMATION: CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	ANALYSIS: TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	MATRIX: DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB	CLIENT CONTACT (LABORATORY STAFF ONLY)
Please see attached field form							X				X						Date/Time: Contact: By:
Please analyze ALL layers of each sample																	
																	Date/Time: Contact: By:
																	Date/Time: Contact: By:

LABORATORY STAFF ONLY: (CUSTODY)

1. Date/Time RCVD: 6/27/14 @ 930 Via: FedEx By (Print): MRM Sign:
2. Date/Time Analyzed: 7/7/14 @ By (Print): P.ChaiKeenee / S. Watson Sign: P. Chai
3. Results Reported To: Via: Date: 7/7/14 Time: Initials: PCSW
4. Comments: 8029 9228 5645

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

NVLAP 101143-0

Client:	EBA Engineering, Inc	**Job Name:**	Youth Detention Center Project	**Chain Of Custody:**	520020
Address:	4813 Seton Drive	**Job Location:**	926 Greenmount Avenue, Baltimore, MD 21202	**Date Analyzed:**	7/28/2014
	Baltimore, Maryland 21215	**Job Number:**	3532-01-000	**Person Submitting:**	Sylvan Burch
		P.O. Number:	Not Provided		
Attention:	Sylvan Burch				

Summary of Polarized Light Microscopy

AMA Sample Number	Client Sample #	Total Asbestos	Chrysotile Percent	Amosite Percent	Crocidolite Percent	Other Asbestos Percent	Mineral Wool Percent	Fiberglass Percent	Organic Percent	Synthetic Percent	Other Percent	Particulate Percent	Sample Type	Sample Color	Homogeneity	Analyst ID	Comments
14088207	3532-7-25-138	2	TR	2	--	--	20	--	--	--	--	78	Fitting	Off-White	Homogeneous	PC	
14088208	3532-7-25-139	2	TR	2	--	--	20	--	--	--	--	78	Fitting	Off-White	Homogeneous	PC	
14088209	3532-7-25-140	2	2	--	--	--	--	--	--	--	--	98	JC	Off-White	Homogeneous	PC	
14088210	3532-7-25-141	NAD	--	--	--	--	--	--	--	--	--	100	JC	White	Homogeneous	PC	
14088211	3532-7-25-142	NAD	--	--	--	--	--	--	--	--	--	100	Gypsum C.	Off-White	Homogeneous	PC	

NVLAP (101143-0) Accredited Laboratory

4475 Forbes Blvd. · Lanham, MD, 20706 · (301) 459-2640 · Toll Free (800) 346-0961 · Fax (301) 459-2643

AMA Analytical Services, Inc.

A Specialized Environmental Laboratory

CERTIFICATE OF ANALYSIS

NVLAP 101143-0

Client:	EBA Engineering, Inc	**Job Name:**	Youth Detention Center Project	**Chain Of Custody:**	520020
Address:	4813 Seton Drive	**Job Location:**	926 Greenmount Avenue, Baltimore, MD 21202	**Date Analyzed:**	7/28/2014
	Baltimore, Maryland 21215	**Job Number:**	3532-01-000	**Person Submitting:**	Sylvan Burch
		P.O. Number:	Not Provided		

Attention: Sylvan Burch

Summary of Polarized Light Microscopy

AMA Sample Number	Client Sample #	Total Asbestos	Chrysotile Percent	Amosite Percent	Crocidolite Percent	Other Asbestos Percent	Mineral Wool Percent	Fiberglass Percent	Organic Percent	Synthetic Percent	Other Percent	Particulate Percent	Sample Type	Sample Color	Homogeneity	Analyst ID	Comments

The following footnotes only apply to those samples which the total asbestos result is flagged with a note number.

1 TEM RECOMMENDATION - Please note, due to resolution limitations with optical microscopy and/or interference from matrix components of this sample, results which are reported via PLM as negative or trace (<1%) for asbestos may contain a significant quantity of asbestos. It is recommended that the additional analytical technique of TEM be used to check for asbestos fibers below the resolution limits of optical microscopy.

2 MATRIX REDUCTION RECOMMENDATION - Please note, due to interference from the matrix components of this sample, results which are reported via PLM as negative or trace (<1%) for asbestos may contain a significant quantity of asbestos which is obscured from view. It is recommended that the additional preparation technique of gravimetric reduction be performed on this sample to minimize the obscuring effects of matrix components, followed by reanalysis by PLM and/or TEM.

Analysis Method - EPA/600/R-93/116 dated July 1993

NAD = "No Asbestos Detected" TR = "Trace equals less than 1% of this component"

Uncertainty: For samples containing asbestos in range of 1-10% the CV is 0.43, 11-35% CV=0.55, >35 CV=0.23

All results are to be considered preliminary and subject to change unless signed by the Technical Director or Deputy.

Technical Director Peerawut Chaikeenee **Analyst(s)** Peerawut Chaikeenee

EBA Engineering Asbestos Sample Data Sheet

Project Name:	Youth Detention Center Project	Inspector(s):	Sylvan Burch
Project Location:	926 Greenmount Avenue, Baltimore, Maryland 21202	Project Manager:	Sherri Waldron
Project Number:	3532-01-000	Date Sampled:	7/25/2014

PLEASE ANALYZE ALL LAYERS OF EACH SAMPLE

Sample Number or ID	Material Description (Use FT-Floor Tile, CT-Ceiling Tile, PF-Pipe Fitting)	Color	Sample Location (Floor, Room)	ACBM Type (TSI or S or M)	Condition (G, F, or P)	Multiple Layers
3532-7-25-138	Fitting - TSI5	White	Room 134	M	G	N
3532-7-25-139	Fitting - TSI5	White	Room 134	M	G	N
3532-7-25-140	Joint Compund -JC1	White	Room 48	M	G	N
3532-7-25-141	Joint Compund -JC1	White	Room 96	M	G	N
3532-7-25-142	Gypsum Ceiling - S6	White	Room 66	M	G	N
3532-7-25-143						
3532-7-25-144						
3532-7-25-145						
3532-7-25-146						
3532-7-25-147						
3532-7-25-148						
3532-7-25-149						
3532-7-25-150						
3532-7-25-151						
3532-7-25-152						

PLEASE ANALYZE ALL LAYERS OF EACH SAMPLE

Homogeneous area = Suspect Materials of one type and color

Samples required for the following:
TSI: 3 samples for each TSI material; 1 sample per area of patched insulation (<6 linear or squared feet); Sample in a manner sufficient per mechanical system not assumed to be ACBM where cement or plaster is used on fittings such as tees, elbows, or valves.
Surfacing: 3 samples per area < 1,000 ft2; 5 samples per area > 1,000 ft2; 7 samples per area > 5,000 ft2.
Miscellaneous: Sample in a manner sufficient to determine (Note EBA's Standard Operating Procedure is to collect at least 2 samples per homogenous area).

TSI = Thermal System Insulation
S = Surface Material
M = any other building material or structural component

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4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) **520020**

Mailing/Billing Information:
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2. Address 1: 4813 Seton Dr.
3. Address 2: Baltimore, MD 21215
4. Address 3:
5. Phone #: (410) 358-7171 Fax #: (410) 358-7213

Submittal Information:
1. Job Name: Youth Detention Center Project
2. Job Location: 926 Greenmount Avenue, Baltimore, Maryland 21202
3. Job #: 3532-01-000 P.O. #:
4. Contact Person: Sylvan Burch @ phone # (410) 504-6113
5. Submitted by: Sylvan Burch Signature: Sylvan Burch

Reporting Information (Results will be provided as soon as technically feasible):

AFTER HOURS (must be pre-scheduled)	NORMAL BUSINESS HOURS	REPORT TO:
❑ Immediate Date Due:	☒ Immediate ❑ 3 Day	❑ Include COC/Field Data Sheets with Report
❑ 24 Hours Time Due:	❑ Next Day ❑ 5 Day +	☒ Email: Sylvan.Burch@ebaengineering.com
Comments:	❑ 2 Day Date Due: 7-28-2014	❑ Fax:
	❑ Results Required By Noon (EveryAttempt Will Be Made to Accomodate)	❑ Verbals:

Asbestos Analysis
PCM Air – Please Indicate Filter Type:
- ❑ NIOSH 7400 (QTY)
- ❑ Fiberglass (QTY)

TEM Air – Please Indicate Filter Type:
- ❑ AHERA (QTY)
- ❑ NIOSH 7402 (QTY)
- ❑ Other (specify) (QTY)

PLM Bulk
- ☒ EPA 600 – Visual Estimate 5 (QTY)
- ❑ EPA Point Count (QTY)
- ❑ NY State Friable 198.1 (QTY)
- ❑ Grav. Reduction ELAP 198.6 (QTY)
- ❑ Other (specify) (QTY)

MISC
- ❑ Vermiculite
- ❑ Asbestos Soil PLM (Qual) PLM (Quan) PLM/TEM (Qual) PLM/TEM (Quan)

TEM Bulk
- ❑ ELAP 198.4/Chatfield (QTY)
- ❑ NY State PLM/TEM (QTY)
- ❑ Residual Ash (QTY)

TEM Dust
- ❑ Qual. (pres/abs) Vacuum/Dust (QTY)
- ❑ Quan. (s/area) Vacuum D5755-95 (QTY)
- ❑ Quan. (s/area)Dust D6480-99 (QTY)

TEM Water
- ❑ Qual. (pres/abs) (QTY)
- ❑ ELAP 198.2/EPA 100.2 (QTY)
- ❑ EPA 100.1 (QTY)

☒ All samples received in good condition unless otherwise noted. (TEM Water samples °C)

Metals Analysis
- ❑ Pb Paint Chip (QTY)
- ❑ Pb Dust Wipe (wipe type) (QTY)
- ❑ Pb Air (QTY)
- ❑ Pb Soil/Solid (QTY)
- ❑ Pb TCLP (QTY)
- ❑ Drinking Water ❑ Pb (QTY) ❑ Cu (QTY) ❑ As (QTY)
- ❑ Waste Water ❑ Pb (QTY) ❑ Cu (QTY) ❑ As (QTY)
- ❑ Pb Furnace (Media) (QTY)

Fungal Analysis
Collection Apparatus for Spore Traps/Air Samples:
Collection Media
- ❑ Spore-Trap (QTY)
- ❑ Surface Swab (QTY)
- ❑ Surface Tape (QTY)
- ❑ Other (Specify) (QTY)
- ❑ Surface Vacuum Dust (QTY)
- ❑ Culturable ID Genus (Media) (QTY)
- ❑ Culturable ID Species (Media) (QTY)

SAMPLE INFORMATION					ANALYSIS						MATRIX							CLIENT CONTACT
CLIENT ID NUMBER	SAMPLE LOCATION/ IDENTIFICATION	DATE	VOLUME (LITERS)	WIPE AREA	TEM	PCM	PLM	LEAD	MOLD	AIR	BULK	DUST	WATER AND OTHER	SPORE TRAP	TAPE	SWAB	(LABORATORY STAFF ONLY)
Please see attached field form							X				X						Date/Time: Contact: By:
Please analyze ALL layers of each sample																	
																	Date/Time: Contact: By:
																	Date/Time: Contact: By:

LABORATORY STAFF ONLY: (CUSTODY)
1. Date/Time RCVD: 7/28/14 @ 800 Via: Fedex Sat By (Print): Sign:
2. Date/Time Analyzed: 7/28/14 @ By (Print): Peerawit Chaikeeree Sign: P. Chai
3. Results Reported To: Via: Email Date: 7/28/14 Time: Initials: PC
4. Comments: 8004 9228 5634

Appendix E – Certificate of LBP Inspector

THIS IS TO CERTIFY THAT

Sylvan Bonsignore Burch

HAS MET THE LEAD PAINT SERVICES ACCREDITATION REQUIREMENTS FOR

Risk Assessor

EXPIRATION DATE 04 / 04 / 2016

TRAINING PROVIDER Aerosol Monitoring & Analysis, Inc.

ADMINISTRATOR, LEAD PAINT ACCREDITATION
MARYLAND DEPARTMENT OF THE ENVIRONMENT

DATE 4/4/14

COURSE DATE 12 / 12 / 2013

STATE OF MARYLAND

Certificate # 14463

Application for reaccreditation shall be submitted to MDE 60 days prior to accreditation expiration indicated on this certificate.

Appendix F – XRF Performance Characteristic Sheet

Performance Characteristic Sheet

EFFECTIVE DATE: **September 24, 2004** **EDITION NO.: 1**

MANUFACTURER AND MODEL:

Make: *Niton LLC*
Tested Model: *XLp 300*
Source: ^{109}Cd
Note: This PCS is also applicable to the equivalent model variations indicated below, for the Lead-in-Paint K+L variable reading time mode, in the XLi and XLp series:

XLi 300A, XLi 301A, XLi 302A and XLi 303A.
XLp 300A, XLp 301A, XLp 302A and XLp 303A.
XLi 700A, XLi 701A, XLi 702A and XLi 703A.
XLp 700A, XLp 701A, XLp 702A, and XLp 703A.

Note: The XLi and XLp versions refer to the shape of the handle part of the instrument. The differences in the model numbers reflect other modes available, in addition to Lead-in-Paint modes. The manufacturer states that specifications for these instruments are identical for the source, detector, and detector electronics relative to the Lead-in-Paint mode.

FIELD OPERATION GUIDANCE

OPERATING PARAMETERS:

Lead-in-Paint K+L variable reading time mode.

XRF CALIBRATION CHECK LIMITS:

0.8 to 1.2 mg/cm^2 (inclusive)

The calibration of the XRF instrument should be checked using the paint film nearest 1.0 mg/cm^2 in the NIST Standard Reference Material (SRM) used (e.g., for NIST SRM 2579, use the 1.02 mg/cm^2 film).

If readings are outside the acceptable calibration check range, follow the manufacturer's instructions to bring the instruments into control before XRF testing proceeds.

SUBSTRATE CORRECTION:

For XRF results using Lead-in-Paint K+L variable reading time mode, substrate correction is <u>not</u> needed for:

Brick, Concrete, Drywall, Metal, Plaster, and Wood

INCONCLUSIVE RANGE OR THRESHOLD:

K+L MODE READING DESCRIPTION	SUBSTRATE	THRESHOLD (mg/cm^2)
Results not corrected for substrate bias on any substrate	Brick	1.0
	Concrete	1.0
	Drywall	1.0
	Metal	1.0
	Plaster	1.0
	Wood	1.0

BACKGROUND INFORMATION

EVALUATION DATA SOURCE AND DATE:

This sheet is supplemental information to be used in conjunction with Chapter 7 of the HUD *Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing* ("HUD Guidelines"). Performance parameters shown on this sheet are calculated from the EPA/HUD evaluation using archived building components. Testing was conducted in August 2004 on 133 testing combinations. The instruments that were used to perform the testing had new sources; one instrument's was installed in November 2003 with 40 mCi initial strength, and the other's was installed June 2004 with 40 mCi initial strength.

OPERATING PARAMETERS:

Performance parameters shown in this sheet are applicable only when properly operating the instrument using the manufacturer's instructions and procedures described in Chapter 7 of the HUD Guidelines.

SUBSTRATE CORRECTION VALUE COMPUTATION:

Substrate correction is not needed for brick, concrete, drywall, metal, plaster or wood when using Lead-in-Paint K+L variable reading time mode, the normal operating mode for these instruments. If substrate correction is desired, refer to Chapter 7 of the HUD Guidelines for guidance on correcting XRF results for substrate bias.

EVALUATING THE QUALITY OF XRF TESTING:

Randomly select ten testing combinations for retesting from each house or from two randomly selected units in multifamily housing. Use the K+L variable time mode readings.

Conduct XRF retesting at the ten testing combinations selected for retesting.

Determine if the XRF testing in the units or house passed or failed the test by applying the steps below.

Compute the Retest Tolerance Limit by the following steps:

Determine XRF results for the original and retest XRF readings. Do not correct the original or retest results for substrate bias. In single-family housing a result is defined as the average of three readings. In multifamily housing, a result is a single reading. Therefore, there will be ten original and ten retest XRF results for each house or for the two selected units.

Calculate the average of the original XRF result and retest XRF result for each testing combination.

Square the average for each testing combination.

Add the ten squared averages together. Call this quantity C.

Multiply the number C by 0.0072. Call this quantity D.

Add the number 0.032 to D. Call this quantity E.

Take the square root of E. Call this quantity F.

Multiply F by 1.645. The result is the Retest Tolerance Limit.

Compute the average of all ten original XRF results.

Compute the average of all ten re-test XRF results.

Find the absolute difference of the two averages.

If the difference is less than the Retest Tolerance Limit, the inspection has passed the retest. If the difference of the overall averages equals or exceeds the Retest Tolerance Limit, this procedure should be repeated with ten new testing combinations. If the difference of the overall averages is equal to or greater than the Retest Tolerance Limit a second time, then the inspection should be considered deficient.

Use of this procedure is estimated to produce a spurious result approximately 1% of the time. That is, results of this procedure will call for further examination when no examination is warranted in approximately 1 out of 100 dwelling units tested.

TESTING TIMES:

For the Lead-in-Paint K+L variable reading time mode, the instrument continues to read until it is moved away from the testing surface, terminated by the user, or the instrument software indicates the reading is complete. The following table provides testing time information for this testing mode. The times have been adjusted for source decay, normalized to the initial source strengths as noted above. Source strength and type of substrate will affect actual testing times. At the time of testing, the instruments had source strengths of 26.6 and 36.6 mCi.

Testing Times Using K+L Reading Mode (Seconds)

	All Data			Median for laboratory-measured lead levels (mg/cm^2)		
Substrate	25^{th} Percentile	Median	75^{th} Percentile	Pb < 0.25	0.25 ≤ Pb<1.0	1.0 ≤ Pb
Wood Drywall	4	11	19	11	15	11
Metal	4	12	18	9	12	14
Brick Concrete Plaster	8	16	22	15	18	16

CLASSIFICATION RESULTS:

XRF results are classified as positive if they are greater than or equal to the threshold, and negative if they are less than the threshold.

DOCUMENTATION:

A document titled *Methodology for XRF Performance Characteristic Sheets* provides an explanation of the statistical methodology used to construct the data in the sheets, and provides empirical results from using the recommended inconclusive ranges or thresholds for specific XRF instruments. For a copy of this document call the National Lead Information Center Clearinghouse at 1-800-424-LEAD.

This XRF Performance Characteristic Sheet was developed by the Midwest Research Institute (MRI) and QuanTech, Inc., under a contract between MRI and the XRF manufacturer. HUD has determined that the information provided here is acceptable when used as guidance in conjunction with Chapter 7, Lead-Based Paint Inspection, of HUD's *Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing*.

Appendix G – XRF Lead-Based Paint Data Sheets

Limited Hazardous Materials Survey
Youth Detention Center Project

Reading No.	COMPONENT	MEMBER	SUBSTRATE	SIDE	COLOR	ROOM	LEVEL	CONDITION	SITE	INSPECTOR	RESULT	RESULT (mg/cm²)
1	SHUTTER CAL											
2	CAL STANDARD								YDC	SYLVAN BURCH	Positive	1.1
3	CAL STANDARD								YDC	SYLVAN BURCH	Positive	1.1
4	CAL STANDARD								YDC	SYLVAN BURCH	Positive	1.2
5	WALL	NA	CONCRETE	A	WHITE	2	THIRD	INTACT	BPRU	SYLVAN BURCH	Negative	0
6	WALL	NA	CONCRETE	C	WHITE	2	THIRD	INTACT	BPRU	SYLVAN BURCH	Negative	0
7	WALL	HEATER	METAL	C	BLACK	2	THIRD	INTACT	BPRU	SYLVAN BURCH	Negative	0
8	WINDOW	SECURITY BARS	METAL	C	BLACK	2	THIRD	INTACT	BPRU	SYLVAN BURCH	Negative	0
9	WINDOW	SILL	METAL	B	BLACK	2	THIRD	INTACT	BPRU	SYLVAN BURCH	Negative	0
10	BASEBOARD	NA	PLASTIC	D	BLACK	2	THIRD	INTACT	BPRU	SYLVAN BURCH	Negative	0.05
11	CEILING	TILE	TILE	CTR	WHITE	2	THIRD	INTACT	BPRU	SYLVAN BURCH	Negative	0
12	DOOR	NA	METAL	A	BLACK	2	THIRD	NON-INTACT	BPRU	SYLVAN BURCH	Negative	0.06
13	DOOR	JAMB	METAL	A	GREY	2	THIRD	NON-INTACT	BPRU	SYLVAN BURCH	Negative	0.15
14	WALL	NA	CONCRETE	A	GREY	13	THIRD	INTACT	BPRU	SYLVAN BURCH	Negative	0
15	WALL	NA	CONCRETE	A	WHITE	13	THIRD	INTACT	BPRU	SYLVAN BURCH	Negative	0
16	DOOR	NA	METAL	A	GREY	13	THIRD	INTACT	BPRU	SYLVAN BURCH	Negative	0.01
17	DOOR	JAMB	METAL	A	GREY	13	THIRD	INTACT	BPRU	SYLVAN BURCH	Negative	-0.01
18	BASEBOARD	NA	VINYL	C	BLACK	13	THIRD	INTACT	BPRU	SYLVAN BURCH	Negative	0.01
19	WALL	FIRE ALARM	METAL	C	RED	13	THIRD	INTACT	BPRU	SYLVAN BURCH	Negative	0
20	WALL	FIRE ALARM	METAL	C	WHITE	13	THIRD	INTACT	BPRU	SYLVAN BURCH	Negative	0
21	WALL	HEATER	METAL	C	GREY	13	THIRD	INTACT	BPRU	SYLVAN BURCH	Negative	0.01
22	WINDOW	FRAME	METAL	C	GREY	13	THIRD	INTACT	BPRU	SYLVAN BURCH	Negative	0
23	WINDOW	SECURITY BARS	METAL	C	GREY	13	THIRD	INTACT	BPRU	SYLVAN BURCH	Negative	0
24	WALL	HEATER	METAL	C	BLACK	13	THIRD	INTACT	BPRU	SYLVAN BURCH	Negative	0.01
25	WALL	FIRE BOX	METAL	A	RED	13	THIRD	INTACT	BPRU	SYLVAN BURCH	Negative	0.01
26	WALL	ELECTRICAL BOX COVER	METAL	A	WHITE	13	THIRD	INTACT	BPRU	SYLVAN BURCH	Negative	-0.03
27	WALL	PHONE SUPPORT	METAL	A	BLACK	13	THIRD	INTACT	BPRU	SYLVAN BURCH	Negative	0
28	WALL	BENCH SUPPORT	METAL	A	GREY	13	THIRD	INTACT	BPRU	SYLVAN BURCH	Negative	0
29	WALL	BENCH	WOOD	A	CLEAR	13	THIRD	INTACT	BPRU	SYLVAN BURCH	Negative	0
30	WALL	FIRE BOX	METAL	A	WHITE	13	THIRD	INTACT	BPRU	SYLVAN BURCH	Negative	0
31	CEILING	BEAM	METAL	CTR	RED	13	THIRD	INTACT	BPRU	SYLVAN BURCH	Negative	0.09
32	CEILING	NA	PLASTER	CTR	WHITE	13	THIRD	INTACT	BPRU	SYLVAN BURCH	Negative	0

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Reading No.	COMPONENT	MEMBER	SUBSTRATE	SIDE	COLOR	ROOM	LEVEL	CONDITION	SITE	INSPECTOR	RESULT	RESULT (mg/cm²)
33	CEILING	NA	METAL	CTR	WHITE	14	THIRD	INTACT	BPRU	SYLVAN BURCH	Negative	0
34	WALL	NA	CONCRETE	D	WHITE	14	THIRD	INTACT	BPRU	SYLVAN BURCH	Negative	0
35	WALL	NA	WOOD	A	WHITE	14	THIRD	INTACT	BPRU	SYLVAN BURCH	Negative	0
36	DOOR	NA	METAL	A	GREY	14	THIRD	INTACT	BPRU	SYLVAN BURCH	Negative	0
37	DOOR	JAMB	METAL	A	GREY	14	THIRD	INTACT	BPRU	SYLVAN BURCH	Negative	0.04
38	SHOWER	NA	METAL	B	BLACK	14	THIRD	INTACT	BPRU	SYLVAN BURCH	Negative	0
39	CEILING	HATCH	METAL	CTR	GREY	14	THIRD	INTACT	BPRU	SYLVAN BURCH	Negative	0.02
40	WINDOW	SECURITY BARS	METAL	C	GREY	14	THIRD	INTACT	BPRU	SYLVAN BURCH	Negative	0
41	WALL	HEATER	METAL	C	GREY	14	THIRD	NON-INTACT	BPRU	SYLVAN BURCH	Negative	0
42	WALL	NA	METAL	C	WHITE	14	THIRD	NON-INTACT	BPRU	SYLVAN BURCH	Negative	0
43	BASEBOARD	NA	CONCRETE	D	BLACK	14	THIRD	INTACT	BPRU	SYLVAN BURCH	Negative	0
44	FLOOR	NA	CONCRETE	CTR	GREEN	14	THIRD	INTACT	BPRU	SYLVAN BURCH	Negative	0
45	WALL	NA	CONCRETE	C	WHITE	11	THIRD	INTACT	BPRU	SYLVAN BURCH	Negative	0
46	BASEBOARD	NA	VINYL	C	BLACK	11	THIRD	INTACT	BPRU	SYLVAN BURCH	Negative	0.05
47	WINDOW	SECURITY BARS	METAL	C	BLACK	11	THIRD	INTACT	BPRU	SYLVAN BURCH	Null	0.6
48	WINDOW	SECURITY BARS	METAL	C	BLACK	11	THIRD	INTACT	BPRU	SYLVAN BURCH	Negative	0
49	WALL	HEATER	METAL	C	BLACK	11	THIRD	INTACT	BPRU	SYLVAN BURCH	Negative	0.01
50	CEILING	TILE	TILE	CTR	WHITE	11	THIRD	INTACT	BPRU	SYLVAN BURCH	Negative	0
51	DOOR	NA	METAL	A	BLACK	11	THIRD	INTACT	BPRU	SYLVAN BURCH	Negative	0.01
52	DOOR	JAMB	METAL	A	GREY	11	THIRD	INTACT	BPRU	SYLVAN BURCH	Negative	0.02
53	WALL	NA	CONCRETE	A	WHITE	22	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0
54	WALL	NA	CONCRETE	A	GREY	22	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0
55	BASEBOARD	NA	CONCRETE	A	GREY	22	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0.04
56	STAIRS	STRINGER	METAL	A	GREY	22	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	-0.05
57	STAIRS	NA	METAL	CTR	GREY	22	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0
58	STAIRS	TREAD	METAL	CTR	GREY	22	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0.01
59	WALL	HEATER	METAL	B	GREY	22	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0.01
60	WALL	HEATER	METAL	B	GREY	22	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0.01
61	STAIRS	STRINGER	METAL	CTR	BLACK	22	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0.04
62	RAILING	POST	METAL	CTR	BLACK	22	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0
63	RAILING	NA	METAL	CTR	BLACK	22	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0.01
64	STAIRS	NA	METAL	CTR	WHITE	22	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0.03

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Reading No.	COMPONENT	MEMBER	SUBSTRATE	SIDE	COLOR	ROOM	LEVEL	CONDITION	SITE	INSPECTOR	RESULT	RESULT (mg/cm²)
65	STAIRS	STRINGER	METAL	CTR	WHITE	22	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0.03
66	DOOR	NA	METAL	B	GREY	22	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0
67	DOOR	NA	METAL	B	RED	22	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	-0.25
68	WALL	NA	CONCRETE	C	WHITE	26	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0
69	BASEBOARD	NA	VINYL	C	BLACK	26	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0.06
70	WINDOW	SECURITY BARS	METAL	C	BLACK	26	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0
71	DOOR	NA	METAL	A	BLACK	26	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0.03
72	DOOR	JAMB	METAL	A	GREY	26	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	-0.24
73	WALL	HEATER	METAL	C	BLACK	26	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0.02
74	WALL	HEATER	METAL	C	BLACK	26	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0.01
75	WALL	NA	CONCRETE	C	WHITE	47	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0
76	WALL	NA	CONCRETE	C	GREY	47	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0.01
77	BASEBOARD	NA	VINYL	C	BLACK	47	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0.02
78	DOOR	NA	METAL	A	GREY	47	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	-0.03
79	DOOR	JAMB	METAL	A	GREY	47	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	-0.04
80	WINDOW	SECURITY BARS	METAL	B	GREY	47	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0
81	WINDOW	INSERT	WOOD	B	GREY	47	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0.01
82	WALL	HEATER	METAL	B	GREY	47	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	-0.11
83	WALL	PIPE	METAL	B	WHITE	47	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0
84	WALL	ELECTRICAL BOX COVER	METAL	A	GREY	47	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0
85	WALL	FIRE BOX	METAL	A	RED	47	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0.03
86	BASEBOARD	NA	VINYL	A	BLACK	47	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0
87	DOOR	NA	METAL	A	GREY	35	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0
88	DOOR	JAMB	METAL	A	GREY	35	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0.01
89	SINK	PIPE	METAL	B	BLACK	35	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0.12
90	WALL	NA	CONCRETE	A	WHITE	35	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0
91	CEILING	NA	METAL	CTR	WHITE	35	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0
92	WALL	NA	WOOD	C	WHITE	35	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0
93	WALL	NA	WOOD	B	WHITE	35	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0
94	FLOOR	NA	CONCRETE	CTR	GREEN	35	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0
95	BASEBOARD	NA	CONCRETE	D	BLACK	35	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0
96	WALL	SHOWER	CONCRETE	B	BLACK	35	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0

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Reading No.	COMPONENT	MEMBER	SUBSTRATE	SIDE	COLOR	ROOM	LEVEL	CONDITION	SITE	INSPECTOR	RESULT	RESULT (mg/cm²)
97	CEILING	BEAM	METAL	CTR	RED	47	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0.02
98	WALL	NA	CONCRETE	A	WHITE	23	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
99	WALL	NA	CONCRETE	A	GREY	23	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
100	BASEBOARD	NA	CONCRETE	A	BLACK	23	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
101	STAIRS	NA	METAL	CTR	BLACK	23	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
102	STAIRS	TREAD	METAL	CTR	BLACK	23	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.01
103	STAIRS	STRINGER	METAL	CTR	BLACK	23	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
104	STAIRS	STRINGER	METAL	CTR	GREY	23	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.01
105	RAILING	NA	METAL	CTR	BLACK	23	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
106	RAILING	POST	METAL	CTR	GREY	23	FIRST	INTACT	BPRU	SYLVAN BURCH	Positive	4.4
107	RAILING	POST	METAL	CTR	GREY	23	FIRST	INTACT	BPRU	SYLVAN BURCH	Positive	2.4
108	CEILING	NA	METAL	CTR	WHITE	23	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.02
109	CEILING	BEAM	METAL	CTR	WHITE	23	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
110	CEILING	BEAM	METAL	CTR	GREY	23	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
111	PIPING	2"	METAL	C	RED	23	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.09
112	VALVE	2"	METAL	C	RED	23	FIRST	INTACT	BPRU	SYLVAN BURCH	Positive	18.6
113	VALVE	2"	METAL	C	RED	23	FIRST	INTACT	BPRU	SYLVAN BURCH	Positive	20
114	VALVE	2"	METAL	C	RED	23	THIRD	INTACT	BPRU	SYLVAN BURCH	Positive	16
115	PIPING	2"	METAL	C	RED	23	THIRD	INTACT	BPRU	SYLVAN BURCH	Negative	0.08
116	WALL	HEATER	METAL	D	GREY	23	THIRD	INTACT	BPRU	SYLVAN BURCH	Negative	0
117	DOOR	NA	METAL	D	GREY	23	THIRD	INTACT	BPRU	SYLVAN BURCH	Negative	0.05
118	DOOR	JAMB	METAL	D	GREY	23	THIRD	INTACT	BPRU	SYLVAN BURCH	Negative	0
119	STAIRS	NA	METAL	CTR	WHITE	23	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.08
120	STAIRS	STRINGER	METAL	CTR	WHITE	23	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.01
121	WALL	NA	CONCRETE	D	WHITE	132	BASEMENT	INTACT	BPRU	SYLVAN BURCH	Negative	0.01
122	RAILING	NA	METAL	D	GREY	132	BASEMENT	INTACT	BPRU	SYLVAN BURCH	Negative	0.02
123	STAIRS	NA	CONCRETE	CTR	GREY	132	BASEMENT	INTACT	BPRU	SYLVAN BURCH	Negative	0
124	STAIRS	NA	METAL	CTR	GREY	132	BASEMENT	INTACT	BPRU	SYLVAN BURCH	Negative	0.02
125	DOOR	NA	METAL	C	GREY	132	BASEMENT	INTACT	BPRU	SYLVAN BURCH	Negative	-0.38
126	DOOR	JAMB	METAL	C	GREY	132	BASEMENT	INTACT	BPRU	SYLVAN BURCH	Negative	0.04
127	PIPING	1"	METAL	D	WHITE	132	BASEMENT	INTACT	BPRU	SYLVAN BURCH	Negative	0
128	PIPING	2"	METAL	D	WHITE	132	BASEMENT	INTACT	BPRU	SYLVAN BURCH	Negative	0.03

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Reading No.	COMPONENT	MEMBER	SUBSTRATE	SIDE	COLOR	ROOM	LEVEL	CONDITION	SITE	INSPECTOR	RESULT	RESULT (mg/cm²)
129	CEILING	NA	CONCRETE	CTR	WHITE	132	BASEMENT	INTACT	BPRU	SYLVAN BURCH	Negative	0.01
130	PIPING	4"	METAL	CTR	BLACK	132	BASEMENT	INTACT	BPRU	SYLVAN BURCH	Null	0.02
131	PIPING	4"	METAL	CTR	BLACK	132	BASEMENT	INTACT	BPRU	SYLVAN BURCH	Negative	0.02
132	WALL	NA	CONCRETE	A	WHITE	150	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.02
133	BASEBOARD	NA	VINYL	A	BLACK	150	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.05
134	DOOR	NA	METAL	A	GREY	150	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.02
135	DOOR	JAMB	METAL	A	GREY	150	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.02
136	WINDOW	FRAME	METAL	C	WHITE	150	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
137	WALL	HEATER	METAL	C	BLACK	150	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.02
138	WINDOW	INSERT	WOOD	C	BLACK	150	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.01
139	WALL	NA	CONCRETE	C	WHITE	152	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
140	WALL	NA	CONCRETE	C	GREY	152	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
141	BASEBOARD	NA	VINYL	C	BLACK	152	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
142	DOOR	NA	METAL	B	GREY	152	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.03
143	DOOR	JAMB	METAL	B	GREY	152	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.01
144	RAILING		WOOD	A	CLEAR	152	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
145	WALL	NA	CONCRETE	D	WHITE	114	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.01
146	WALL	NA	CONCRETE	D	GREY	114	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.02
147	BASEBOARD	NA	VINYL	D	BLACK	114	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.02
148	WINDOW	SILL	WOOD	A	BLACK	114	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.03
149	WINDOW	SECURITY BARS	METAL	A	BLACK	114	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.5
150	WINDOW	FRAME	METAL	A	WHITE	114	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.4
151	DOOR	NA	WOOD	A	CLEAR	114	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.02
152	DOOR	JAMB	METAL	A	GREY	114	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.3
153	STAIRS	NA	CONCRETE	CTR	BLACK	152	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
154	RAILING	NA	WOOD	A	CLEAR	152	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
155	WALL	VENT	METAL	D	WHITE	125	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
156	DOOR	NA	WOOD	A	GREY	125	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
157	WALL	NA	DRYWALL	D	WHITE	125	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
158	WALL	NA	DRYWALL	B	WHITE	125	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
159	WALL	NA	CONCRETE	A	WHITE	133	BASEMENT	INTACT	BPRU	SYLVAN BURCH	Negative	0.02
160	WALL	NA	WOOD	B	WHITE	133	BASEMENT	INTACT	BPRU	SYLVAN BURCH	Negative	0

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Reading No.	COMPONENT	MEMBER	SUBSTRATE	SIDE	COLOR	ROOM	LEVEL	CONDITION	SITE	INSPECTOR	RESULT	RESULT (mg/cm²)
161	DOOR	NA	WOOD	B	WHITE	133	BASEMENT	INTACT	BPRU	SYLVAN BURCH	Negative	0
162	DOOR	JAMB	WOOD	B	WHITE	133	BASEMENT	INTACT	BPRU	SYLVAN BURCH	Negative	0
163	DOOR	JAMB	WOOD	B	GREY	133	BASEMENT	INTACT	BPRU	SYLVAN BURCH	Negative	0
164	DOOR	NA	WOOD	B	GREY	133	BASEMENT	INTACT	BPRU	SYLVAN BURCH	Negative	0
165	WALL	SECURITY BARS	METAL	B	BLACK	133	BASEMENT	INTACT	BPRU	SYLVAN BURCH	Negative	0.3
166	WALL	1"	METAL	A	BLACK	133	BASEMENT	INTACT	BPRU	SYLVAN BURCH	Negative	0.01
167	WALL	2"	METAL	A	WHITE	133	BASEMENT	INTACT	BPRU	SYLVAN BURCH	Negative	0
168	WALL	SINK	METAL	A	WHITE	133	BASEMENT	INTACT	BPRU	SYLVAN BURCH	Positive	24.2
169	WALL	SINK	METAL	A	BLACK	133	BASEMENT	INTACT	BPRU	SYLVAN BURCH	Negative	0.23
170	WALL	SHELF SUPPORT	WOOD	A	BLACK	133	BASEMENT	INTACT	BPRU	SYLVAN BURCH	Negative	0
171	WALL	SHELF	WOOD	A	BLACK	133	BASEMENT	INTACT	BPRU	SYLVAN BURCH	Negative	0
172	CEILING	DUCT	METAL	A	WHITE	133	BASEMENT	INTACT	BPRU	SYLVAN BURCH	Negative	0.01
173	PIPING	4"	METAL	A	BLACK	133	BASEMENT	INTACT	BPRU	SYLVAN BURCH	Negative	0.03
174	FLOOR	NA	CONCRETE	CTR	GREY	133	BASEMENT	NON-INTACT	BPRU	SYLVAN BURCH	Negative	0
175	VALVE	4"	METAL	C	BLACK	133	BASEMENT	INTACT	BPRU	SYLVAN BURCH	Negative	0.06
176	VALVE	4"	METAL	C	GREY	133	BASEMENT	INTACT	BPRU	SYLVAN BURCH	Negative	0.01
177	PIPING	4"	METAL	CTR	WHITE	134	BASEMENT	INTACT	BPRU	SYLVAN BURCH	Negative	0.01
178	PIPING	4"	METAL	CTR	BLACK	134	BASEMENT	INTACT	BPRU	SYLVAN BURCH	Negative	0.04
179	VALVE	4"	METAL	CTR	BLACK	134	BASEMENT	INTACT	BPRU	SYLVAN BURCH	Negative	0.01
180	VALVE	4"	METAL	CTR	BLACK	134	BASEMENT	INTACT	BPRU	SYLVAN BURCH	Negative	0.02
181	VALVE	8"	METAL	CTR	BLACK	134	BASEMENT	INTACT	BPRU	SYLVAN BURCH	Negative	0.2
182	VALVE	6"	METAL	CTR	RED	134	BASEMENT	INTACT	BPRU	SYLVAN BURCH	Negative	0
183	PIPING	6"	METAL	CTR	RED	134	BASEMENT	INTACT	BPRU	SYLVAN BURCH	Negative	0.09
184	PIPING	1"	METAL	CTR	RED	134	BASEMENT	INTACT	BPRU	SYLVAN BURCH	Negative	0.02
185	PUMP	NA	METAL	CTR	BLUE	134	BASEMENT	INTACT	BPRU	SYLVAN BURCH	Negative	0.01
186	DUCTWORK	NA	METAL	CTR	SILVER	134	BASEMENT	INTACT	BPRU	SYLVAN BURCH	Negative	0.01
187	DUCTWORK	NA	METAL	CTR	SILVER	134	BASEMENT	INTACT	BPRU	SYLVAN BURCH	Negative	0
188	WALL	ELECTRICAL BOX COVER	METAL	D	GREY	134	BASEMENT	INTACT	BPRU	SYLVAN BURCH	Negative	0.06
189	WALL	ELECTRICAL BOX COVER	METAL	D	GREY	134	BASEMENT	INTACT	BPRU	SYLVAN BURCH	Negative	0.01
190	WALL	ELECTRICAL BOX COVER	METAL	D	GREY	134	BASEMENT	INTACT	BPRU	SYLVAN BURCH	Negative	0.05
191	TRANSFORMER	NA	METAL	D	GREY	134	BASEMENT	INTACT	BPRU	SYLVAN BURCH	Negative	0.06
192	TRANSFORMER	NA	METAL	D	GREY	134	BASEMENT	INTACT	BPRU	SYLVAN BURCH	Negative	0

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Reading No.	COMPONENT	MEMBER	SUBSTRATE	SIDE	COLOR	ROOM	LEVEL	CONDITION	SITE	INSPECTOR	RESULT	RESULT (mg/cm²)
193	FURNASE	NA	METAL	CTR	GREY	134	BASEMENT	INTACT	BPRU	SYLVAN BURCH	Negative	0
194	FURNASE	NA	METAL	CTR	BLACK	134	BASEMENT	INTACT	BPRU	SYLVAN BURCH	Negative	0
195	TANK	NA	METAL	CTR	GREY	134	BASEMENT	INTACT	BPRU	SYLVAN BURCH	Negative	0.02
196	TANK	NA	METAL	CTR	RED	134	BASEMENT	INTACT	BPRU	SYLVAN BURCH	Negative	0
197	CEILING	BEAM	CONCRETE	CTR	WHITE	134	BASEMENT	INTACT	BPRU	SYLVAN BURCH	Negative	0
198	FLOOR	NA	CONCRETE	CTR	GREY	134	BASEMENT	NON-INTACT	BPRU	SYLVAN BURCH	Negative	0.01
199	FLOOR	SHELF	METAL	CTR	YELLOW	134	BASEMENT	INTACT	BPRU	SYLVAN BURCH	Negative	0.05
200	DOOR	NA	METAL	C	BLUE	152	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.08
201	DOOR	JAMB	METAL	C	BLUE	152	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	-0.15
202	WALL	NA	CONCRETE	CTR	WHITE	113	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
203	POST	NA	METAL	D	WHITE	113	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.01
204	CEILING	BEAM	METAL	CTR	WHITE	113	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.01
205	WALL	NA	METAL	A	RED	113	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
206	WALL	ELECTRICAL BOX COVER	METAL	D	BLUE	109	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
207	WALL	ELECTRICAL BOX COVER	METAL	D	BLUE	109	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
208	WALL	ELECTRICAL BOX COVER	METAL	D	BLUE	109	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
209	WALL	NA	CONCRETE	D	WHITE	109	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
210	CAL STANDARD								YDC	SYLVAN BURCH	Positive	1
211	CAL STANDARD								YDC	SYLVAN BURCH	Positive	1
212	CAL STANDARD								YDC	SYLVAN BURCH	Positive	1
213	WALL	NA	CONCRETE	C	WHITE	108	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
214	WALL	NA	CONCRETE	C	GREEN	108	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
215	WALL	NA	CONCRETE	C	BROWN	108	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.09
216	WALL	NA	CONCRETE	C	RED	108	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
217	WALL	NA	CONCRETE	C	BLUE	108	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
218	WALL	HEATER	METAL	D	GREY	108	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	-0.01
219	WINDOW	INSERT	METAL	D	GREY	108	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
220	WALL	VENT	METAL	C	GREY	108	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.01
221	WALL	NA	CONCRETE	A	GREY	108	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
222	DOOR	NA	METAL	A	GREY	108	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.1
223	DOOR	JAMB	METAL	A	GREY	108	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.13
224	WALL	NA	CONCRETE	B	YELLOW	49	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0.03

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225	WALL	NA	CONCRETE	C	WHITE	49	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0.09
226	WALL	NA	PLASTER	A	WHITE	49	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0
227	DOOR	NA	METAL	A	GREY	49	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0.07
228	DOOR	JAMB	METAL	A	GREY	49	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0.22
229	WALL	NA	PLASTER	C	GREY	59	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0
230	WALL	NA	PLASTER	C	WHITE	59	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0.01
231	PIPING	6"	METAL	C	WHITE	59	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0.03
232	WINDOW	FRAME	WOOD	D	GREY	59	SECOND	INTACT	BPRU	SYLVAN BURCH	Null	0.7
233	WINDOW	FRAME	WOOD	D	GREY	59	SECOND	INTACT	BPRU	SYLVAN BURCH	Positive	1.3
234	WINDOW	NA	WOOD	D	GREY	59	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0
235	WINDOW	NA	WOOD	D	WHITE	59	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0
236	WALL	SECURITY BARS	WOOD	C	WHITE	59	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0
237	WALL	FIRE BOX	METAL	A	RED	59	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0.02
238	WALL	NA	CONCRETE	C	WHITE	54	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0.03
239	WALL	HEATER	METAL	C	WHITE	54	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0.1
240	PIPING	1"	METAL	C	WHITE	54	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0
241	WALL	NA	WOOD	C	WHITE	54	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0.11
242	DOOR	NA	METAL	A	GREY	54	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0.11
243	DOOR	JAMB	METAL	A	GREY	54	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0.02
244	DOOR	FRAME	METAL	A	BLACK	54	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0.03
245	WALL	NA	TILE	D	GREEN	50	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0.01
246	FLOOR	NA	TILE	CTR	GREEN	50	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0
247	CEILING	NA	DRYWALL	CTR	WHITE	50	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0
248	CEILING	NA	DRYWALL	CTR	WHITE	51	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0
249	WALL	NA	TILE	D	PINK	51	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0.04
250	WALL	NA	CONCRETE	C	WHITE	63	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0
251	CEILING	NA	TILE	CTR	WHITE	63	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0
252	BASEBOARD	NA	VINYL	B	BLUE	63	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0.06
253	WINDOW	NA	CONCRETE	D	GREEN	63	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0
254	DOOR	NA	METAL	A	GREY	63	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0.01
255	DOOR	JAMB	METAL	A	GREY	63	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0.1
256	PIPING	6"	METAL	CTR	GREY	93	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0.14

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257	WALL	NA	PLASTER	C	WHITE	93	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0
258	WINDOW	FRAME	METAL	C	RED	92	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0.4
259	WINDOW	FRAME	METAL	C	RED	92	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0.4
260	CEILING	NA	TILE	CTR	WHITE	93	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0
261	DOOR	NA	METAL	A	BLUE	73	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.04
262	DOOR	JAMB	METAL	A	BLUE	73	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.09
263	DOOR	FRAME	METAL	A	BLUE	73	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.03
264	WALL	NA	METAL	D	WHITE	73	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
265	WINDOW	FRAME	WOOD	D	WHITE	73	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
266	WALL	HEATER	METAL	C	WHITE	73	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
267	WALL	HEATER	METAL	C	WHITE	73	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.01
268	WALL	CABNET	WOOD	A	WHITE	73	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.01
269	WALL	CABNET	WOOD	A	WHITE	73	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.01
270	WINDOW	FRAME	METAL	D	WHITE	73	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.02
271	WINDOW	FRAME	METAL	D	WHITE	73	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
272	WINDOW	SILL	CONCRETE	D	BLACK	73	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
273	DOOR	NA	METAL	A	GREEN	73	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.03
274	DOOR	VENT	METAL	A	WHITE	73	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
275	DOOR	FRAME	METAL	A	WHITE	73	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.07
276	WINDOW	FRAME	METAL	C	WHITE	74	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
277	WINDOW	FRAME	METAL	C	WHITE	74	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.01
278	WINDOW	SILL	CONCRETE	C	BLACK	74	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.01
279	WINDOW	SILL	WOOD	B	GREEN	76	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
280	WINDOW	FRAME	METAL	B	GREEN	76	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.01
281	WALL	NA	DRYWALL	B	GREEN	76	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
282	WALL	NA	METAL	D	GREEN	76	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.01
283	WALL	NA	METAL	D	BLUE	77	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.02
284	WALL	NA	DRYWALL	B	BLUE	77	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
285	DOOR	NA	WOOD	A	CLEAR	77	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
286	DOOR	JAMB	WOOD	A	WHITE	77	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
287	FLOOR	NA	TILE	CTR	OFFWHITE	77	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.01
288	WALL	ELECTRICAL BOX COVER	METAL	A	WHITE	73	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.01

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289	WALL	ELECTRICAL BOX COVER	METAL	A	WHITE	73	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.02
290	DOOR	NA	METAL	A	WHITE	81	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.02
291	BASEBOARD	NA	VINYL	C	BLUE	81	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
292	WALL	ELECTRICAL BOX COVER	METAL	C	GREY	81	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
293	WALL	NA	CONCRETE	B	ORANGE	81	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
294	CAL STANDARD								YDC	SYLVAN BURCH	Positive	1
295	CAL STANDARD								YDC	SYLVAN BURCH	Positive	1
296	CAL STANDARD								YDC	SYLVAN BURCH	Positive	1.1
297	WALL	NA	CONCRETE	A	WHITE	48	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0
298	WALL	NA	CONCRETE	A	GREY	48	SECOND	INTACT	BPRU	SYLVAN BURCH	Positive	1.3
299	WALL	NA	CONCRETE	A	GREY	48	SECOND	INTACT	BPRU	SYLVAN BURCH	Positive	1.5
300	WALL	NA	CONCRETE	A	GREY	48	SECOND	INTACT	BPRU	SYLVAN BURCH	Positive	1.4
301	WALL	NA	CONCRETE	D	GREY	48	SECOND	INTACT	BPRU	SYLVAN BURCH	Null	0.5
302	WALL	NA	CONCRETE	D	GREY	48	SECOND	INTACT	BPRU	SYLVAN BURCH	Null	0.5
303	WALL	NA	CONCRETE	D	GREY	48	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0
304	DOOR	NA	METAL	D	GREY	48	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0.05
305	DOOR	FRAME	METAL	D	GREY	48	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0.02
306	WINDOW	FRAME	METAL	B	BLACK	48	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0
307	WINDOW	SECURITY BARS	METAL	B	GREY	48	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0
308	WINDOW	SILL	CONCRETE	B	BLACK	48	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0
309	WALL	NA	CONCRETE	D	WHITE	102	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0
310	PIPING	1"	METAL	D	WHITE	102	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0
311	WINDOW	SECURITY BARS	METAL	D	BLACK	102	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0.02
312	DOOR	NA	METAL	A	GREY	102	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0
313	DOOR	FRAME	METAL	A	GREY	102	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0.02
314	CEILING	NA	PLASTER	CTR	WHITE	102	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0
315	WALL	NA	CONCRETE	C	WHITE	91A	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0
316	WALL	NA	CONCRETE	C	GREY	91A	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0
317	DOOR	NA	CONCRETE	A	GREY	91A	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0
318	DOOR	JAMB	CONCRETE	A	GREY	91A	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0.03
319	WALL	HATCH	WOOD	A	WHITE	91A	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0
320	WALL	HATCH	METAL	A	WHITE	91A	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0

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321	WALL	NA	TILE	D	WHITE	86	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0.01
322	WALL	NA	WOOD	D	BLACK	86	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0.01
323	WALL	NA	WOOD	C	WHITE	86	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0
324	WALL	NA	CONCRETE	B	WHITE	86	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0
325	FLOOR	NA	TILE	CTR	BROWN	86	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0.01
326	WALL	NA	TILE	C	ORANGE	88	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0.04
327	WALL	NA	TILE	A	ORANGE	88	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0.05
328	WALL	BENCH	TILE	D	GREY	88	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0
329	CEILING	NA	METAL	CTR	WHITE	88	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0.12
330	CEILING	HATCH	METAL	CTR	GREY	88	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0
331	WALL	NA	CONCRETE	D	LIGHT BLUE	89	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0
332	BASEBOARD	NA	VINYL	D	WHITE	89	SECOND	INTACT	BPRU	SYLVAN BURCH	Positive	2.7
333	BASEBOARD	NA	VINYL	D	WHITE	89	SECOND	INTACT	BPRU	SYLVAN BURCH	Positive	3.2
334	DOOR	NA	METAL	A	LIGHT BLUE	89	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0.05
335	DOOR	JAMB	METAL	A	LIGHT BLUE	89	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0.08
336	WALL	NA	CONCRETE	D	WHITE	89	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0
337	BASEBOARD	NA	VINYL	A	WHITE	89	SECOND	INTACT	BPRU	SYLVAN BURCH	Positive	1.4
338	PIPING	4"	METAL	CTR	WHITE	89	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0.03
339	WALL	PILLER	PLASTER	CTR	WHITE	89	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0
340	WALL	NA	DRYWALL	C	LIGHT BLUE	89	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0
341	DOOR	NA	WOOD	C	LIGHT BLUE	89	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0
342	DOOR	JAMB	WOOD	C	LIGHT BLUE	89	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0
343	WINDOW	FRAME	METAL	C	WHITE	89	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0
344	WINDOW	FRAME	METAL	C	WHITE	89	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0.01
345	WINDOW	SILL	WOOD	C	WHITE	89	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0
346	STAIRS	STRINGER	METAL	B	BLUE	91B	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0
347	RAILING	NA	METAL	B	BLUE	91B	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0
348	CEILING	NA	METAL	CTR	WHITE	91B	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0
349	CEILING	BEAM	METAL	CTR	WHITE	91B	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0
350	WALL	NA	CONCRETE	B	WHITE	91B	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0
351	BASEBOARD	NA	VINYL	D	BLUE	91B	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0.01
352	DOOR	NA	METAL	C	WHITE	91B	SECOND	INTACT	BPRU	SYLVAN BURCH	Negative	0.02

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Reading No.	COMPONENT	MEMBER	SUBSTRATE	SIDE	COLOR	ROOM	LEVEL	CONDITION	SITE	INSPECTOR	RESULT	RESULT (mg/cm²)
353	WALL	NA	CONCRETE	D	WHITE	67	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.01
354	WALL	NA	CONCRETE	D	GREY	67	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.01
355	WALL	BENCH	WOOD	D	CLEAR	67	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
356	BASEBOARD	NA	VINYL	D	BLACK	67	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
357	WALL	NA	CONCRETE	C	GREY	69	FIRST	INTACT	BPRU	SYLVAN BURCH	Positive	2.1
358	WALL	NA	CONCRETE	B	GREY	69	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
359	WALL	NA	CONCRETE	D	GREY	69	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
360	WALL	NA	CONCRETE	C	GREY	69	FIRST	INTACT	BPRU	SYLVAN BURCH	Positive	2.3
361	BASEBOARD	NA	VINYL	A	WHITE	69	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
362	WALL	NA	TILE	A	ORANGE	70	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.01
363	CEILING	NA	METAL	CTR	WHITE	70	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
364	WALL	NA	TILE	A	WHITE	70	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.01
365	WALL	NA	WOOD	D	WHITE	68	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
366	WALL	NA	CONCRETE	A	WHITE	68	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
367	DOOR	NA	WOOD	D	BLACK	68	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
368	WINDOW	SILL	CONCRETE	B	BLACK	68	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.02
369	WALL	HEATER	METAL	B	GREY	68	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.11
370	DOOR	NA	METAL	D	BLACK	68	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.09
371	DOOR	FRAME	METAL	D	BLACK	68	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.08
372	WALL	NA	CONCRETE	C	GREY	83	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.05
373	WALL	NA	CONCRETE	B	GREY	83	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
374	WALL	FIRE BOX	METAL	B	RED	83	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
375	PIPING	4"	METAL	C	WHITE	83	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.03
376	CEILING	NA	PLASTER	CTR	WHITE	83	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
377	WALL	NA	CONCRETE	C	LIGHT GREEN	84	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.11
378	DOOR	NA	METAL	A	BROWN	84	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.04
379	DOOR	JAMB	METAL	A	BROWN	84	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.07
380	DOOR	NA	METAL	B	BLUE	EXTERIOR	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.02
381	DOOR	FRAME	METAL	B	BLUE	EXTERIOR	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.1
382	WINDOW	INSERT	WOOD	B	BLUE	EXTERIOR	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.26
383	WINDOW	INSERT	WOOD	B	BLUE	EXTERIOR	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.29
384	PIPING	4"	METAL	B	GREEN	EXTERIOR	FIRST	INTACT	BPRU	SYLVAN BURCH	Positive	12.6

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Reading No.	COMPONENT	MEMBER	SUBSTRATE	SIDE	COLOR	ROOM	LEVEL	CONDITION	SITE	INSPECTOR	RESULT	RESULT (mg/cm²)
385	WINDOW	INSERT	WOOD	B	BLUE	EXTERIOR	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
386	DOOR	NA	METAL	A	BLUE	EXTERIOR	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.03
387	DOOR	FRAME	METAL	A	BLUE	EXTERIOR	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.06
388	WINDOW	INSERT	WOOD	D	BLUE	EXTERIOR	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
389	WALL	NA	METAL	A	BLUE	EXTERIOR	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
390	WALL	NA	METAL	A	WHITE	EXTERIOR	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
391	PIPING	1"	METAL	A	WHITE	EXTERIOR	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
392	GUARD RAIL	6"	METAL	A	RED	EXTERIOR	FIRST	NON-INTACT	BPRU	SYLVAN BURCH	Negative	0
393	DOOR	NA	METAL	D	BLUE	EXTERIOR	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.03
394	DOOR	FRAME	WOOD	D	BLUE	EXTERIOR	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
395	DOOR	FRAME	METAL	D	BLUE	EXTERIOR	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
396	GUARD BOOTH	NA	WOOD	D	BLUE	EXTERIOR	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
397	GUARD BOOTH	NA	WOOD	D	WHITE	EXTERIOR	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
398	GUARD BOOTH	NA	WOOD	D	WHITE	EXTERIOR	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.12
399	GUARD BOOTH	NA	WOOD	D	GREY	EXTERIOR	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
400	WINDOW	FRAME	METAL	A	BLUE	EXTERIOR	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
401	WINDOW	SECURITY BARS	METAL	A	BLUE	EXTERIOR	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.02
402	GUARD RAIL	4"	METAL	D	YELLOW	EXTERIOR	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
403	GUARD RAIL	4"	METAL	D	YELLOW	EXTERIOR	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
404	POST	NA	METAL	D	YELLOW	EXTERIOR	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
405	POST	NA	METAL	D	YELLOW	EXTERIOR	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.02
406	POST	NA	METAL	D	YELLOW	EXTERIOR	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
407	ROOF	NA	METAL	D	BLUE	EXTERIOR	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
408	ROOF	NA	METAL	D	BLUE	EXTERIOR	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
409	ROOF	NA	METAL	D	WHITE	EXTERIOR	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
410	POST	NA	METAL	D	YELLOW	EXTERIOR	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
411	WINDOW	INSERT	WOOD	D	BLUE	EXTERIOR	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.4
412	WALL	NA	WOOD	D	BLUE	EXTERIOR	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
413	WALL	NA	WOOD	D	BLUE	EXTERIOR	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
414	WALL	NA	WOOD	D	BLUE	EXTERIOR	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
415	DOOR	NA	METAL	A	GREY	EXTERIOR	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
416	DOOR	NA	METAL	A	GREY	EXTERIOR	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0

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Reading No.	COMPONENT	MEMBER	SUBSTRATE	SIDE	COLOR	ROOM	LEVEL	CONDITION	SITE	INSPECTOR	RESULT	RESULT (mg/cm²)
417	PILLER	NA	CONCRETE	D	YELLOW	EXTERIOR	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
418	PILLER	NA	CONCRETE	D	YELLOW	EXTERIOR	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0.14
419	TRANSFORMER	NA	METAL	D	GREEN	EXTERIOR	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
420	TRANSFORMER	NA	METAL	D	GREEN	EXTERIOR	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
421	GENERATOR	NA	METAL	D	BLACK	EXTERIOR	FIRST	NON-INTACT	BPRU	SYLVAN BURCH	Negative	0.07
422	GENERATOR	NA	METAL	D	WHITE	EXTERIOR	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
423	TANK	NA	METAL	D	RED	EXTERIOR	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
424	TANK	NA	METAL	D	WHITE	EXTERIOR	FIRST	INTACT	BPRU	SYLVAN BURCH	Negative	0
425	CAL STANDARD								YDC	SYLVAN BURCH	Positive	0.9
426	CAL STANDARD								YDC	SYLVAN BURCH	Positive	1
427	CAL STANDARD								YDC	SYLVAN BURCH	Positive	1.1