PROJECT MANUAL

Robert Poole Building #056 Additions and Renovations

March 31, 2016

VOLUME 1 – DIVISIONS 1-14

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SECTION 012100 - ALLOWANCES

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 governing allowances.
 - 1. Certain items are specified in the Contract Documents by allowances. 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. Quantity allowances.
- C. Related Requirements:
 - 1. Section 012200 "Unit Prices" for procedures for using unit prices.

1.3 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 an allowance must be completed to avoid delaying the Work.
- B. At Architect's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.
- C. Purchase products and systems selected by Architect from the designated supplier.

1.4 ACTION SUBMITTALS

A. Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.

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 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 allowance.
- C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.6 COORDINATION

A. Coordinate allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

1.7 QUANTITY ALLOWANCES

A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include taxes, freight, installation, and delivery to Project site.

1.8 ADJUSTMENT OF ALLOWANCES

- A. Allowance Adjustment: To adjust allowance amounts, prepare a Change Order proposal based on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place where applicable. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.
 - 1. Include installation costs in purchase amount only where indicated as part of the allowance.
 - 2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed.
 - 3. Submit substantiation of a change in scope of work, if any, claimed in Change Orders related to unit-cost allowances.
 - 4. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.
- B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the purchase order amount or Contractor's handling, labor, installation, overhead, and profit.
 - 1. Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of work has changed from what could have been foreseen from information in the Contract Documents.
 - 2. No change to Contractor's indirect expense is permitted for selection of higher- or lowerpriced materials or systems of the same scope and nature as originally indicated.

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 ALLOWANCES

- A. Allowance No. 1: Quantity Allowance: Include 500 cu. yd. of fill material for backfill of existing water conduit. Cost shall include all costs including purchase, transport, and installation.
 - 1. Coordinate quantity allowance adjustment with unit-price requirements in Section 012200 "Unit Prices."
- B. Allowance No. 2: Quantity Allowance: Include 3,000 sf of repointing brick to brick joints as described in 04 0320 Historic Unit Masonry Repointing.
 - 1. Coordinate quantity allowance adjustment with unit-price requirements in Section 012200 "Unit Prices."
- C. Allowance No. 3: Lump-Sum Allowance: Include the sum of \$10,000 for replacement of deteriorated or damaged cast stone elements beyond the work specifically noted on the drawings.
 - 1. For the reuse of salvaged cast stone materials, this allowance includes handling, custom fabrication, installation and Contractor overhead and profit.
 - 2. For newly fabricated limestone trim, this allowance includes material cost, receiving, handling, and installation, and Contractor overhead and profit.
- D. Allowance No. 4: Lump-Sum Allowance: Include the sum of \$12,000 (Twelve Thousand Dollars) for Mosaic Tile Artwork in Lobby 100B.
- E. Allowance No. 5: Quantity Allowance: Include the sum of \$5,000 for Plaster Repair as described in Section 090320 "Historic Treatment of Plaster".
 - 1. Coordinate quantity allowance adjustment with unit price requirements in Section 012200 "Unit Prices"

END OF SECTION 012100

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SECTION 012200 - UNIT PRICES

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 unit prices.
- B. Related Requirements:
 - 1. Section 012600 "Contract Modification Procedures" for procedures for submitting and handling Change Orders.
 - 2. Section 014000 "Quality Requirements" for general testing and inspecting requirements.

1.3 DEFINITIONS

A. Unit price is an amount incorporated in the Agreement, applicable during the duration of the Work 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.

1.4 PROCEDURES

- A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.
- B. 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.
- C. 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.
- D. 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.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF UNIT PRICES

- A. Unit Price UP-1: Backfill of existing water conduit.
 - 1. Description: Provide and install satisfactory fill material or engineered fill from off site, as required, according to Section 312000 "Earth Moving."
 - 2. Unit of Measurement: Cubic yard of fill material, based on survey of volume required.
 - 3. Quantity Allowance: Coordinate unit price with allowance adjustment requirements in Section 012100 "Allowances."
- B. Unit Price UP-2: Brick Repointing.
 - 1. Description: Repointing of existing brick masonry, according to Section 04 0320 "Historic Masonry Repointing."
 - 2. Unit of Measurement: Square feet of brick masonry wall repointed.
 - 3. Quantity Allowance: Coordinate unit price with allowance adjustment requirements in Section 012100 "Allowances."
- C. Unit Price UP-3: Unsatisfactory Soil Excavation Replaced from Offsite
 - 1. Description: Removal of unsatisfactory soil from site and replacement with engineered fill from off site as described in Section 312000 "Earth Moving." Material below design grades.
 - 2. Unit of Measurement: Cubic yard of material removed and cubic yard of suitable replacement material delivered to the site.
- D. Unit Price UP-4: Unsatisfactory Soil Excavation Replaced from Onsite
 - 1. Description: Removal of unsatisfactory soil from the site and replacement with engineered fill from on site as described in Section 312000 "Earth Moving." Material below design grades.
 - 2. Unit of Measurement: Cubic yard of material removed and cubic yard of suitable replacement material delivered to the site.
- E. Unit Price UP-5: Open Excavation Rock with Replacement
 - 1. Description: Removal of classified rock from open excavations as described in Section 312000 "Earth Moving", paragraph 3.4. Unit price to include excavation and removal off site and purchase and transport to the site of satisfactory soil or engineered borrow.
 - 2. Unit of Measurement: Cubic yard of removed rock, measured before removal, and cubic yard of suitable replacement material delivered to the site.
- F. Unit Price UP-6: Trench Excavation Rock with Replacement
 - 1. Description: Removal of classified rock from trench excavations as described in Section 312000 "Earth Moving", paragraph 3.4. Unit price to include excavation and removal off site and purchase and transport to the site of satisfactory soil or engineered borrow.

- 2. Unit of Measurement: Cubic yard of removed rock, measured before removal, and cubic yard of suitable replacement material delivered to the site.
- G. Unit Price UP-7: Open Excavation Rock
 - 1. Description: Removal of classified rock from open excavations as described in Section 312000 "Earth Moving", paragraph 3.4. Unit price to include excavation and removal off site.
 - 2. Unit of Measurement: Cubic yard of removed rock, measured before removal.
- H. Unit Price UP-8: Trench Excavation Rock
 - 1. Description: Removal of classified rock from trench excavations as described in Section 312000 "Earth Moving", paragraph 3.4. Unit price to include excavation and removal off site.
 - 2. Unit of Measurement: Cubic yard of removed rock, measured before removal.
- I. Unit Price UP-9: Contaminated Soil Excavation with Replacement
 - 1. Description: Removal of contaminated soil from excavations including transport and disposal off site and purchase and transport to the site of satisfactory soil or engineered borrow.
 - 2. Unit of Measurement: Cubic yard of removed soil and cubic yard of suitable replacement material delivered to the site.
- J. Unit Price UP-10: Maintenance of SEC Entrances and Berms
 - 1. Description: Periodic maintenance of Stabilized Construction Entrances and Mountable Berms to standards described in Detail B-1, Sheet C-5.05, and Detail C-8, Sheet C-5.06.
 - 2. Unit of Measurement: Each
- K. Unit Price UP-11: Repair/Replacement of Existing Plaster
 - 1. Description: Repair and replacement of existing plaster walls and moldings as described in Section 090320 "Historic Treatment of Plaster" and on drawings.
 - 2. Unit of Measurement: Square foot of flat plaster and linear foot of plaster molding.

END OF SECTION 012200

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SECTION 012300 - ALTERNATES

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 alternates.

1.3 DEFINITIONS

- A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
 - 1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
 - 2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

- A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
 - 1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.
- B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated revisions to alternates.
- C. Execute accepted alternates under the same conditions as other work of the Contract.

D. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

- A. Alternate No. C-A1: Chain Link Fence.
 - 1. Base Bid: Provide Fence F2 at location identified as C-13 on drawings C1.08, C1.09, and C1.10 and as F2 on Landscape drawings L1.01 and L1.05 and as specified in Section 323119 "Decorative Metal Fence and Gates."
 - 2. Alternate: Provide 4'-0" black vinyl chain link fence with top and bottom rail in lieu of Base Bid above as specified in Section 323113 "Chain Link Fence and Gates."
- B. Alternate No. C-A2: Site Amenities.
 - 1. Base Bid: Provide Outdoor Learning Nooks with radius gravity seating walls (3/L1.07), Crushed Stone Paving (P4), and Mulch Pathway (P5) at the two Outdoor Learning Nooks in the northwest corner of the site as shown on Sheets C1.08, L1.01, 1/L1.03, and 2/L1.03.
 - 2. Alternate: Delete Base Bid work, provide continuous slope and seeding.
- C. Alternate No. C-A3: Unit Pavers
 - 1. Base Bid: Provide unit pavers, sub-slab, and compacted sub-base (1/L1.05) as indicated on Sheet C1.09, C5.02, L1.01, L1.02, L1.03, and L1.05.
 - 2. Alternate: Provide scored concrete sidewalk with compacted sub-base (C-5.02) at pedestrian areas and concrete paving with sub-base (C5.02) at vehicular areas. Scoring 3'-0" on center, beginning at the centerline.
- D. Alternate No. C-A4: Seat Blocks.
 - 1. Base Bid: Provide Seat Blocks as indicated as B2 on Sheet L1.02 and detailed at 3/L1.06
 - 2. Alternate: Delete Seat Blocks indicated as B2 on Sheet L1.02
- E. Alternate No. C-A5: Sod.
 - 1. Base Bid: Provide sod at areas as indicated on Sheet L2.01
 - 2. Alternate: Provide seed at areas indicated to receive sod.
- F. Alternate No. C-A6: Driveway Aprons.
 - 1. Base Bid: Provide driveway aprons as asphalt as indicated on Sheet C1.09

- 2. Alternate: Provide driveway aprons as concrete per Baltimore City Standards at 36th and Berry Streets from the curb line to the property line.
- G. Alternate No. C-A7: Site Wall Stencil.
 - 1. Base Bid: Provide no stenciling on Site Walls.
 - 2. Alternate: Provide Stenciling on Site walls as indicated on details on Sheet: L1.04
- H. Alternate No. C-A8: Berry Street Curb.
 - 1. Base Bid: Curb along Berry Street is to remain in its current condition.
 - 2. Alternate: Replace Berry Street curb where new sidewalk is scheduled. Include the removal of existing curb and roadway and any required paving to meet curb installation.
- I. Alternate No. A-A1: Resilient Tile Flooring.
 - 1. Base Bid: Provide Sustainable Floor Tile as specified in Section 096519 "Resilient Tile Flooring."
 - 2. Alternate: Provide Vinyl Composition Tile at all areas indicated to receive Sustainable Floor Tile as indicated on Sheet A-601 and as specified in Section 096519 "Resilient Tile Flooring."
- J. Alternate No. A-A2: Resilient Tile Corridor Flooring.
 - 1. Base Bid: Provide Sustainable Floor Tile at all Corridors as specified in Section 096519 "Resilient Tile Flooring."
 - 2. Alternate: Provide Vinyl Composition Tile at all Corridors indicated to receive Sustainable Floor Tile as indicated on Sheet A-601 and as specified in Section 096519 "Resilient Tile Flooring."
- K. Alternate No. A-A3: Ceramic Wall Tile.
 - 1. Base Bid: Provide Ceramic Wall Tile as indicated on Sheet A-530, A-531, and A-532
 - 2. Alternate: Provide Ceramic Wall Tile to 7'-0" AFF at all wet walls.
- L. Alternate No. A-A4: Asphalt Shingle Roofing.
 - 1. Base Bid: Provide Standing Seam Metal Roofing at Building A as indicated on Sheet A-112 and as specified in Section 074113.16 "Standing Seam Metal Roof Panels."
 - 2. Alternate: Provide 30-year Asphalt Shingle roofing in lieu of Standing Seam Metal Panels at Building A as specified in Section <Insert Section number> "<Insert Section title>." Note that nailboard insulation is required as shown in the construction documents.
- M. Alternate No. A-A5: Acoustical Panel Ceiling.
 - 1. Base Bid: Provide Acoustical Panel Ceilings as indicated on drawings and as specified in Section 095113 "Acoustical Panel Ceilings."
 - 2. Alternate: At Ceiling Types AT-1 and AT-2 provide ceiling panels matching AT-4 in type and at the same sizes as specified for AT-1 and AT-2.

- N. Alternate No. A-A6: Educational Casework.
 - 1. Base Bid: Provide plastic laminate Educational Casework as specified in Section 123216 "Manufactured Plastic Laminate Faced Casework."
 - 2. Alternate: At locations indicated to receive Educational Casework provide Wood Casework as specified in Section 123553.19 "Wood Laboratory Casework."
- O. Alternate No. A-A7: Canopy at Entry 001A.
 - 1. Base Bid: Canopy at Entry 001A is not included.
 - 2. Alternate: Provide Canopy at 001A as indicated on Sheet A-114 and as specified in Section 107300 "Translucent Canopies."
- P. Alternate No. A-A8: Canopy at Entry at Lobby 100H.
 - 1. Base Bid: Canopy at Entry at Lobby 100H is not included.
 - 2. Alternate: Provide Canopy at Entry at Lobby 100H as indicated on Sheet A-115, A-121, and A-512 and as specified in Section 107300 "Translucent Canopies."
- Q. Alternate No. A-A9: Canopy at Corridor 100G.
 - 1. Base Bid: Canopy at Corridor 100G is not included.
 - 2. Alternate: Provide three canopies at Corridor 100G as indicated on Sheet A-115, A-121, and A-512 and as specified in Section 107300 "Translucent Canopies."
- R. Alternate No. A-A10: Canopies at Receiving 031 and Stair C1-1.
 - 1. Base Bid: Canopies at Receiving 031 and Stair C1-1are not included.
 - 2. Alternate: Provide Receiving 031 and Stair C1-1 as indicated on Sheet A-113, A-115, A-121, A-404, A-405, and A-512 and as specified in Section 107300 "Translucent Canopies."
- S. Alternate No. A-A11: Music Room Ceiling.
 - 1. Base Bid: Provide Ceilings in rooms 329 Choral Music and 330 Instrumental Music as indicated on Sheet A-138 and as specified in Section 095113 "Acoustical Panel Ceilings."
 - 2. Alternate: Provide Ceilings in rooms 329 Choral Music and 330 Instrumental Music as indicated on drawing 2/A-138 and as specified in Section 095113 "Acoustical Panel Ceilings", Paragraph: "Acoustical Diffusing Panels."
- T. Alternate No. M-A1: Domestic Water Piping.
 - 1. Base Bid: Provide Domestic Water Piping as specified in Section 221116 "Domestic Water Piping."
 - 2. Alternate: Provide CPVC/PEX piping for domestic water piping as specified in Section 221116 "Domestic Water Piping."
- U. Alternate No. M-A2: Above Grade Storm and Sanitary Water Piping.

- 1. Base Bid: Provide above grade Storm and Sanitary Water Piping as specified in Section 221316 "Sanitary Waste and Vent Piping" and Section 221413 "Facility Strom Drainage Piping".
- 2. Alternate: Provide PVC above grade storm and sanitary piping as specified in Section 221316 "Sanitary Waste and Vent Piping" and Section 221413 "Facility Strom Drainage Piping".
- V. Alternate No. M-A3: Below Grade Storm and Sanitary Water Piping.
 - 1. Base Bid: Provide below grade Storm and Sanitary Water Piping as specified in Section 221316 "Sanitary Waste and Vent Piping" and Section 221413 "Facility Strom Drainage Piping"."
 - 2. Alternate: Provide PVC below grade storm and sanitary piping as specified in Section 221316 "Sanitary Waste and Vent Piping" and Section 221413 "Facility Strom Drainage Piping"."
- W. Alternate No. E-A1: Aluminum Electric Feeders.
 - 1. Base Bid: Provide copper conductors for all main and sub-distribution panel feeders as specified in Section 260519 "Building Wire and Cable."
 - 2. Alternate: Provide aluminum conductors, sized to maintain designed ampacity and voltage drops, for all main and sub-distribution panel feeders as specified in Section 260519 "Building Wire and Cable."

END OF SECTION 012300

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SECTION 013591 - HISTORIC TREATMENT 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 general protection and treatment procedures for designated historic areas and surfaces in Project.
- B. Historic areas include the existing A-Building, B-Building and the A-Building to B-Building Connector. Historic surfaces include all existing exterior masonry work (brickwork, cast stone work and terra cotta) to remain in those areas, the rooftop cupola (brickwork, terra cotta and copper) in B-Building, the rooftop cupola (copper) in A-Building, and decorative metal trim in both buildings. Also included is all existing masonry exposed to the interior, all existing terrazzo floors and any other item specifically indicated on the drawings.
- C. All historic treatment procedures are intended to be the most gentle, least destructive, effective restoration methods for the building historic fabric. The effect and effectiveness of the proposed restoration methods will be verified by on-site testing mock-ups prior to beginning work.

1.3 DEFINITIONS

- A. Consolidate: To strengthen loose or deteriorated materials in place.
- B. Design Reference Sample: A sample that represents the Architect's prebid selection of work to be matched; it may be existing work or work specially produced for the Project.
- C. Dismantle: To disassemble or detach a historic item from a surface, or a nonhistoric item from a historic surface, using gentle methods and equipment to prevent damage to historic items and surfaces; disposing of items unless indicated to be salvaged or reinstalled.
- D. Historic: Areas, surfaces, materials, finishes, and overall appearance that are important to the successful restoration and reconstruction as determined by Architect. Designated historic areas and surfaces are indicated in paragraph 1.2B above and shown on the drawings.
- E. Match: To blend with adjacent construction and manifest no apparent difference in material type, species, cut, form, detail, color, grain, texture, or finish; as approved by Architect.
- F. Refinish: To remove existing finishes to base material and apply new finish to match original, or as otherwise indicated.
- G. Reinstall: To protect removed or dismantled item, repair and clean it as indicated for reuse, and reinstall it in original position, or where indicated.

- H. Remove: To take down or detach a nonhistoric item located within a historic space, area, or room, using methods and equipment to prevent damage to historic items and surfaces; disposing of items unless indicated to be salvaged or reinstalled.
- I. Repair: To correct damage and defects, retaining existing materials, features, and finishes while employing as little new material as possible. This includes patching, piecing-in, splicing, consolidating, or otherwise reinforcing or upgrading materials.
- J. Replace: To remove, duplicate, and reinstall entire item with new material. The original item is the pattern for creating duplicates unless otherwise indicated.
- K. Reproduce: To fabricate a new item, accurate in detail to the original, and from either the same or a similar material as the original, unless otherwise indicated.
- L. Restore: To consolidate, reproduce, repair, and refinish as required to achieve the indicated results.
- M. Retain: To keep existing items that are not to be removed or dismantled.
- N. Reversible: New construction work, treatments, or processes that can be removed or undone in the future without damaging historic materials unless otherwise indicated.
- O. Salvage: To protect removed or dismantled items store ready for reuse.
- P. Stabilize: To provide structural reinforcement of unsafe or deteriorated items while maintaining the essential form as it exists at present; also, to reestablish a weather-resistant enclosure.
- Q. Strip: To remove existing finish down to base material unless otherwise indicated.

1.4 COORDINATION

- A. <u>Historic Treatment Subschedule</u>: A construction schedule coordinating the sequencing and scheduling of historic treatment work for entire Project, including each activity to be performed in historic areas and on historic surfaces; and based on Contractor's Construction Schedule. Secure time commitments for performing critical construction activities from separate entities responsible for historic treatment work.
 - 1. Schedule construction operations in sequence required to obtain best historic treatment results.
 - 2. Coordinate sequence of historic treatment work activities to accommodate the following:
 - a. Other known work in progress.
 - b. Tests and inspections.
 - 3. Detail sequence of historic treatment work, with start and end dates.
 - 4. Utility Services: Indicate how long utility services will be interrupted. Coordinate shutoff, capping, and continuation of utility services.
 - 5. Equipment Data: List gross loaded weight, axle-load distribution, and wheel-base dimension data for mobile and heavy equipment proposed for use. Do not use such equipment without certification from Contractor's professional engineer that the structure can support the imposed loadings without damage.

1.5 PROJECT MEETINGS FOR HISTORIC TREATMENT

A. <u>Preliminary Historic Treatment Conference</u>: Before starting historic treatment work, Construction Manager will conduct conference at Project site.

- 1. Attendees: In addition to representatives of Owner, Construction Manager, Architect, and Contractor, historic treatment specialists, chemical-cleaner manufacturer, and installers whose work interfaces with or affects historic treatment shall be represented at the meeting.
- 2. Agenda: Discuss items of significance that could affect progress of historic treatment work, including review of the following:
 - a. Historic Treatment Subschedule: Discuss and finalize; verify availability of materials, historic treatment specialists' personnel, equipment, and facilities needed to make progress and avoid delays.
 - b. Fire-prevention plan.
 - c. Governing regulations, including but not limited to, noise, traffic, dirt, dust, overspray, effluent, residue, odor, etc.
 - d. Areas where existing construction is to remain and the required protection.
 - e. Demolition requirements, protection and interface with historic treatment procedures.
 - f. Hauling routes.
 - g. Sequence of historic treatment work operations.
 - h. Storage, protection, and accounting for salvaged and specially fabricated items.
 - i. Existing conditions, staging, and structural loading limitations of areas where materials are stored.
 - j. Qualifications of personnel assigned to historic treatment work and assigned duties.
 - k. Requirements for extent and quality of work, tolerances, and required clearances.
 - 1. Methods and procedures related to historic treatments, including product manufacturers' written instructions and precautions regarding historic treatment procedures and their effects on materials, components, and vegetation.
 - m. Review of requirements for approval of mock-ups to demonstrate;
 - 1) Effect of procedure on historic fabric,
 - 2) Quality of restoration work,
 - 3) Comparison of alternative materials and work procedures.
 - n. Embedded work such as flashings and lintels, special details, collection of wastes, protection of occupants and the public, and condition of other construction that affect the Work or will affect the work.
- 3. Reporting: Construction Manager will record conference results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from conference.
- B. <u>Coordination Meetings</u>: Conduct coordination meetings specifically for historic treatment work at monthly intervals. Coordination meetings are in addition to progress meetings and shall occur immediately prior to or following regularly scheduled progress meetings.
 - 1. Attendees: In addition to representatives of Owner, Construction Manager, Architect, and Contractor, each historic treatment specialist and installer shall be represented at these meetings. All participants at conference shall be familiar with Project and authorized to conclude matters relating to historic treatment work.
 - 2. Agenda: Review and correct or approve minutes of previous coordination meeting. Review other items of significance that could affect progress of historic treatment work. Include topics for discussion as appropriate to status of Project.
 - a. Historic Treatment Subschedule: Review progress since last coordination meeting. Determine whether each schedule item is on time, ahead of schedule, or behind schedule. Determine how construction behind schedule will be expedited with retention of quality; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities are completed within the Contract Time.

- b. Schedule Updating: Revise Contractor's Historic Treatment Subschedule after each coordination meeting where revisions to schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
- c. Review present and future needs of each entity present, including review items listed in the "Preliminary Historic Treatment Conference" Paragraph above and the following:
 - 1) Interface requirements of historic treatment work with other Project Work.
 - 2) Status of submittals for historic treatment work.
 - 3) Access to historic treatment work.
 - 4) Effectiveness of fire-prevention plan.
 - 5) Quality and work standards of historic treatment work.
 - 6) Quality and effectiveness of restoration work to date.
 - 7) Change Orders for historic treatment work.
- 3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

1.6 MATERIALS OWNERSHIP

- A. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, medallions and other items of interest or value to Owner that may be encountered or uncovered during the Work, regardless of whether they were previously documented, remain Owner's property.
 - 1. Carefully dismantle and salvage each item or object and protect it from damage, then promptly deliver it to Owner where directed.

1.7 INFORMATIONAL SUBMITTALS

- A. <u>Historic Treatment Subschedule:</u>
 - 1. Submit historic treatment subschedule within seven days of date established for commencement of historic treatment work.
 - 2. Individual restoration specification section submittal log.
- B. <u>Preconstruction Documentation</u>: Show (photograph) preexisting conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by Contractor's historic treatment operations.
- C. <u>Historic Treatment Program</u>: Submit 30 days before work begins.
- D. <u>Fire-Prevention Plan</u>: Submit 30 days before work begins.

1.8 QUALITY ASSURANCE

A. <u>Historic Treatment Specialist Qualifications</u>: An experienced firm regularly engaged in historic treatments similar in nature, materials, design, and extent to this work as specified in each section and that has completed a minimum of five recent projects with a record of successful in-service performance that demonstrates the firm's qualifications to perform this work.

- 1. Field Supervisor Qualifications: Full-time supervisors experienced in historic treatment work similar in nature, material, design, and extent to that indicated for this Project. Supervisors shall be on Project site when historic treatment work begins and during its progress. Supervisors shall not be changed during Project except for causes beyond the control of the specialist firm.
 - a. Construct new mockups of required work whenever a supervisor is replaced.
- B. <u>Historic Treatment Program</u>: Prepare a written plan for historic treatment for whole Project, including each phase or process and protection of surrounding materials during operations. Describe in detail the materials, methods, and equipment to be used for each phase of work. Show compliance with indicated methods and procedures specified in this and other Sections. Coordinate this whole-Project historic treatment program with specific requirements of programs required in other historic treatment Sections.
 - 1. Dust, Waste-water and Noise Control: Include locations of proposed temporary dust, water and noise control measures coordinated with continuing on-site operations and other known work in progress.
 - 2. Debris Hauling and Traffic: Include plans clearly marked to show debris hauling routes, turning radii, and temporary protective barriers.
 - 3. Overspray, odors, etc.
- C. <u>Fire-Prevention Plan</u>: Prepare a written plan for preventing fires during the Work, including placement of fire extinguishers, fire blankets, rag buckets, and other fire-prevention devices during each phase or process. Coordinate plan with Owner's fire-protection equipment and requirements. Include fire watch personnel's training, duties, and authority to enforce fire safety.
- D. <u>Safety and Health Standard</u>: Comply with ANSI/ASSE A10.6.

1.9 STORAGE AND HANDLING OF HISTORIC MATERIALS

- A. Salvaged Historic Materials:
 - 1. Clean loose dirt and debris from salvaged historic items unless more extensive cleaning is indicated.
 - 2. Pack or crate items after cleaning; cushion against damage during handling. Label contents of containers.
 - 3. Store items in a secure area until delivery to Owner.
 - 4. Transport items to Owner's storage area off-site.
 - 5. Protect items from damage during transport and storage.
- B. Salvaged Historic Materials for Reinstallation:
 - 1. Repair and clean historic items for reuse as indicated.
 - 2. Pack or crate items after cleaning and repairing; cushion against damage during handling. Label 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 unless otherwise indicated. Provide connections, supports, and miscellaneous materials to make item functional for use indicated.
- C. Existing Historic Materials to Remain: Protect construction indicated to remain against damage and soiling from construction work. Where permitted by Architect, items may be dismantled and taken to a suitable, protected storage location during construction work and reinstalled in their original locations after historic treatment and construction work in the vicinity is complete.

- D. Storage: Catalog and store historic items within a weathertight enclosure where they are protected from moisture, weather, condensation, and freezing temperatures.
 - 1. Identify each item with a nonpermanent mark to document its original location. Indicate original locations on plans, elevations, sections, or photographs by annotating the identifying marks.
 - 2. Secure stored materials to protect from theft.
 - 3. Control humidity so that it does not exceed 85 percent. Maintain temperatures 5 deg F or more above the dew point.
- E. Storage Space:
 - 1. Arrange for off-site locations for storage and protection of historic material that cannot be properly stored and protected on-site.

1.10 FIELD CONDITIONS

A. Size Limitations in Historic Spaces: Materials, products, and equipment used for performing the Work and for transporting debris, materials, and products shall be of sizes that clear surfaces within historic spaces, areas, rooms, and openings, including temporary protection, by 12 inches or more.

PART 2 - PRODUCTS - (Not Used)

PART 3 - EXECUTION

3.1 PROTECTION, GENERAL

- A. Protect persons, motor vehicles, surrounding surfaces of building, building site, plants, and surrounding buildings from harm resulting from historic treatment procedures.
 - 1. Use only proven protection methods, appropriate to each area and surface being protected.
 - 2. Provide temporary barricades, barriers, and directional signage to exclude the public from areas where historic treatment work is being performed.
 - 3. Erect temporary barriers to form and maintain fire-egress routes.
 - 4. Erect temporary protective covers over walkways and at points of pedestrian and vehicular entrance and exit that must remain in service during historic treatment work.
 - 5. Contain dust, debris, odor, overspray, etc. generated by historic treatment work, and prevent it from reaching the public or adjacent surfaces.
 - 6. Provide shoring, bracing, and supports as necessary. Do not overload structural elements.
 - 7. Protect floors and other surfaces along hauling routes from damage, wear, and staining.
- B. Temporary Protection of Historic Materials:
 - 1. Protect existing historic materials with temporary protections and construction. Do not remove existing materials unless otherwise indicated.
 - 2. Do not attach temporary protection to historic surfaces except as indicated as part of the historic treatment program and approved by Architect.
- C. Comply with each product manufacturer's written instructions for protections and precautions. Protect against adverse effects of products and procedures on people and adjacent materials, components, and vegetation.

- D. Utility and Communications Services:
 - 1. Notify Owner, Architect, authorities having jurisdiction, and entities owning or controlling wires, conduits, pipes, and other services affected by historic treatment work before commencing operations.
 - 2. Disconnect and cap pipes and services as required by authorities having jurisdiction, as required for historic treatment work.
 - 3. Maintain existing services unless otherwise indicated; keep in service, and protect against damage during operations. Provide temporary services during interruptions to existing utilities.
- E. Existing Drains: Prior to the start of work in an area, test drainage system to ensure that it is functioning properly. Notify Architect immediately of inadequate drainage or blockage. Do not begin work in an area until the drainage system is functioning properly.
 - 1. Prevent solids such as stone or mortar residue or other debris from entering the drainage system. Clean out drains and drain lines that become sluggish or blocked by sand or other materials resulting from historic treatment work.
 - 2. Protect drains from pollutants. Block drains or filter out sediments, allowing only clean water to pass.
- F. Roofing: Prior to the start of work in an area, install roofing protection as required to prevent damage to either the existing roofing system to maintain the building weather tight or to prevent damage to any new construction roofing systems.

3.2 PROTECTION FROM FIRE

1.

- A. General: Follow fire-prevention plan and the following:
 - Remove and keep area free of combustibles, including rubbish, paper, waste, and chemicals, unless necessary for the immediate work.
 - a. If combustible material cannot be removed, provide fire blankets to cover such materials.
 - 2. Prohibit smoking by all persons within Project work and staging areas.
- B. Heat-Generating Equipment and Combustible Materials: Comply with the following procedures while performing work with heat-generating equipment or combustible materials, including welding, torchcutting, soldering, brazing, removing paint with heat, or other operations where open flames or implements using high heat or combustible solvents and chemicals are anticipated:
 - 1. Obtain Owner's approval for operations involving use of open-flame or welding or other high-heat equipment. Use of open-flame equipment is not permitted. Notify Owner at least 72 hours before each occurrence, indicating location of such work.
 - 2. As far as practicable, restrict heat-generating equipment to outside the building.
 - 3. Do not perform work with heat-generating equipment in or near rooms or in areas where flammable liquids or explosive vapors are present or thought to be present. Use a combustible gas indicator test to ensure that the area is safe.
 - 4. Use fireproof baffles to prevent flames, sparks, hot gases, or other high-temperature material from reaching surrounding combustible material.
 - 5. Prevent the spread of sparks and particles of hot metal through open windows, doors, holes, and cracks in floors, walls, ceilings, roofs, and other openings.
 - 6. Fire Watch: Before working with heat-generating equipment or combustible materials, station personnel to serve as a fire watch at each location where such work is performed. Fire-watch personnel shall have the authority to enforce fire safety. Station fire watch according to NFPA 51B, NFPA 241, and as follows:

- a. Train each fire watch in the proper operation of fire-control equipment and alarms.
- b. Prohibit fire-watch personnel from other work that would be a distraction from fire-watch duties.
- c. Cease work with heat-generating equipment whenever fire-watch personnel are not present.
- d. Have fire-watch personnel perform final fire-safety inspection each day beginning no sooner than 30 minutes after conclusion of work at each area of Project site to detect hidden or smoldering fires and to ensure that proper fire prevention is maintained.
- C. Fire Extinguishers, Fire Blankets, and Rag Buckets: Maintain fire extinguishers, fire blankets, and rag buckets for disposal of rags with combustible liquids. Maintain each as suitable for the type of fire risk in each work area. Ensure that nearby personnel and the fire-watch personnel are trained in fire-extinguisher and blanket use.
- D. Sprinklers: Where sprinkler protection exists and is functional, maintain it without interruption while operations are being performed. If operations are performed close to sprinklers, shield them temporarily with guards.
 - 1. Remove temporary guards at the end of work shifts, whenever operations are paused, and when nearby work is completed.

3.3 PROTECTION DURING APPLICATION OF CHEMICALS

- A. Protect motor vehicles, surrounding surfaces of building being restored, building site, plants, and surrounding buildings from harm or damage resulting from applications of chemicals and adhesives.
- B. Cover adjacent surfaces with protective materials that are proved to resist chemicals selected for Project unless chemicals being used will not damage adjacent surfaces as indicated in historic treatment program. Use covering materials and masking agents that are waterproof and UV resistant and that will not stain or leave residue on surfaces to which they are applied. Apply protective materials according to manufacturer's written instructions. Do not apply liquid masking agents or adhesives to painted or porous surfaces. When no longer needed, promptly remove protective materials.
- C. Do not apply chemicals during winds of sufficient force to spread them to unprotected surfaces.
- D. Neutralize alkaline and acid wastes and legally dispose of off Owner's property.
- E. Collect and dispose of runoff from chemical operations by legal means and in a manner that prevents soil contamination, soil erosion, undermining of paving and foundations, damage to landscaping, or water penetration into building interior.

3.4 GENERAL HISTORIC TREATMENT

- A. Have historic treatment work performed only by qualified historic treatment specialists.
- B. Ensure that supervisory personnel are present when historic treatment work begins and during its progress.
- C. Review and ensure compliance with all historic restoration procedures with materials and work plans per approved mock-ups.

- D. Record existing work before each procedure (preconstruction), and record progress during the work. Use digital preconstruction documentation photographs. Comply with requirements in Section 013233 "Photographic Documentation."
- E. Perform surveys of Project Site as the Work progresses to detect hazards resulting from historic treatment procedures.
- F. Follow the procedures in subparagraphs below and procedures approved in historic treatment program unless otherwise indicated:
 - 1. Retain as much existing material as possible; repair and consolidate rather than replace.
 - 2. Use additional material or structure to reinforce, strengthen, prop, tie, and support existing material or structure.
 - 3. Use reversible processes wherever possible.
 - 4. Use historically accurate repair and replacement materials and techniques unless otherwise indicated.
- G. Notify Architect of visible changes in the integrity of material or components whether from environmental causes including biological attack, UV degradation, freezing, or thawing or from structural defects including cracks, movement, or distortion.
 - 1. Do not proceed with the work in question until directed by Architect.
- H. Where missing features are indicated to be repaired or replaced, provide work with appearance based on accurate duplications rather than on conjecture, subject to approval of Architect.
- I. Where work requires existing features to be removed or dismantled and reinstalled, perform these operations without damage to the material itself, to adjacent materials, or to the substrate.
- J. Identify new and replacement materials and features with permanent marks hidden in the completed Work to distinguish them from original materials. Record a legend of identification marks and the locations of the items on record Drawings.

3.5 HISTORIC TREATMENT SCHEDULE

- A. Spaces, areas, rooms, and surfaces requiring special care and treatment to ensure successful preservation rehabilitation restoration and reconstruction are indicated on Drawings and generally described below.
 - 1. Indicated areas of existing A Building, A/B Connector and B Building.

END OF SECTION 013591

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SECTION 015639 - TEMPORARY TREE AND PLANT 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 general protection and pruning of existing trees and plants that are affected by execution of the Work, whether temporary or permanent construction. Work is to be coordinated with Site & Landscape Improvements and Tree Preservation Plans and details
- B. Related Requirements:
 - 1. Section 015000 "Temporary Facilities and Controls" for temporary site fencing.
 - 2. Section 311000 "Site Clearing" for removing existing trees and shrubs.

1.3 DEFINITIONS

- A. Caliper (DBH): Diameter breast height; diameter of a trunk as measured by a diameter tape or the average of the smallest and largest diameters at a height 54 inches above the ground line.
- B. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction and indicated on Drawings.
- C. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to temporary tree and plant protection including, but not limited to, the following:
 - a. Tree-service firm's personnel and equipment needed to make progress and avoid delays.
 - b. Arborist's responsibilities.
 - c. Quality-control program.
 - d. Coordination of Work and equipment movement with the locations of protection zones.
 - e. Trenching by hand or with air spade within protection zones.
 - f. Field quality control.

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g. Tree root protection matting and trunk protection.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings:
 - 1. Indicate extent of trenching by hand or with air spade within protection zones.
- C. Samples: For each type of the following:
 - 1. Organic Mulch: 1-quart volume of organic mulch; in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch.
- D. Tree Pruning Schedule: Written schedule detailing scope and extent of pruning of trees to remain that interfere with or are affected by construction.
 - 1. Species and size of tree.
 - 2. Location on site plan. Include unique identifier for each.
 - 3. Reason for pruning.
 - 4. Description of pruning to be performed.
 - 5. Description of maintenance following pruning.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For arborist and tree service firm.
 - 1. Contract Arborist shall submit project references from a minimum 3 high profile projects of tree preservation with mature trees within the Mid Atlantic region that demonstrates experience and competence with the full range of work of this Section.
- B. Tree Preservation Action Report: Certification from contract arborist for each Phase, preconstruction, mid construction and post construction, certifying that trees indicated to remain have been protected during construction according to recognized standards and that trees were promptly and properly treated and repaired when damaged.
- C. Tree Preservation Program: From contract arborist, Protection and Stress Reduction Measures and Coordination and Oversight of the Tree Protection and Preservation Program by the Project Arborist during construction and through the project plant and maintenance warranty period. This work shall include but is not limited to the following:
 - 1. Coordination of Temporary Tree and Plant Protection
 - 2. Selective tree removals for Removal by Arborist (RBA) within Plant Protection Areas (PPAs).
 - 3. Pruning and Supportive cabling.
 - 4. Root pruning.
 - 5. Temporary tree protection fencing(TPF)
 - 6. Tree protection sign installation
- 7. Temporary Mulching
- 8. Liquid subsurface fertilization Biostimulent / soil conditioners
- 9. Plant Growth Regulator (Paclobutizol)
- 10. Radial Aeration / Vertical Mulching
- 11. Soil Biological Testing and Multiple Amendments
- 12. Temporary Root Protection for construction access
- 13. Root Aeration Mat for permanent grade fills and walks
- 14. Seasonal Supplemental Watering (On-site water may be used.)
- 15. Monitor and Implement Tree Health Measures (2 visits during construction period and 2 visits during plant and maintenance warranty period. Recommendations shall be approved by the owner prior to implementation.)
- 16. Supersonic Air tool (SSAT) Excavation within TPAs
- 17. Contingency for Remedial Measures after construction
- D. Existing Conditions: Documentation of existing trees and plantings indicated to remain, which establishes preconstruction conditions that might be misconstrued as damage caused by construction activities.
 - 1. Use sufficiently detailed photographs or video recordings including references for scale.
 - 2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plants designated to remain.
- E. The Project Arborist shall submit soil sample for analysis during May through June. Take representative soil samples and combine from soil inside extent of crown of tree. Samples and procedures as follows. Forward reports to Architect and Owner:
 - Soil Foodweb New York, Inc. 1645 Washington Ave. Bohemia, NY 11716 Ph: 631-750-1553, Fax: 631-750-1554 soilfoodwebny@aol.com
 - 2. Approved equal testing company that can perform and analyze soils similar to the Soil Foodweb New York Bacterial and Fungi assays tests
 - a. Test to include total active amounts of fungi and bacteria in soil sample.
 - b. The test is to provide recommendations to adjust soil imbalances.
 - c. Soil samples to include a minimum of three 1" diameter core samples of the upper 3' of soil.
 - d. Soil samples are to be mixed, placed in a gallom size sealable plastic bag, and sent via next day mail to testing lab.
- F. Quality-control program.

1.7 QUALITY ASSURANCE

A. Arborist Qualifications: Certified Arborist as certified by ISA and Maryland Licensed Tree Expert.

- B. Tree Service Firm Qualifications: An experienced tree service firm that has successfully completed temporary tree and plant protection work similar to that required for this Project and that will assign an experienced, qualified arborist to Project site during execution of the Work.
- C. Quality-Control Program: Prepare a written program to systematically demonstrate the ability of personnel to properly follow procedures and handle materials and equipment during the Work without damaging trees and plantings. Include dimensioned diagrams for placement of protection zone fencing and signage, the arborist's and tree-service firm's responsibilities, instructions given to workers on the use and care of protection zones, and enforcement of requirements for protection zones.

1.8 FIELD CONDITIONS

- A. The following practices are prohibited within protection zones:
 - 1. Permitting grading operations or geo thermal well drilling operations or cleaning operations to drain to and in the plant protection areas.
 - 2. Storage of construction materials, debris, or excavated material.
 - 3. Moving or parking vehicles or equipment.
 - 4. Foot traffic.
 - 5. Erection of sheds or structures.
 - 6. Impoundment of water.
 - 7. Excavation or other digging unless otherwise indicated.
 - 8. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
- B. Do not direct vehicle or equipment exhaust toward protection zones.
- C. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones and organic mulch.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Backfill Soil: Planting soil of suitable moisture content and granular texture for placing around tree; free of stones, roots, plants, sod, 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.
 - 1. Planting Soil: Planting soil A as specified in Section 329113 "Soil Preparation"
- B. Organic Mulch: Free from deleterious materials and suitable as a top dressing for trees and shrubs, consisting of one of the following:
 - 1. Type: Shredded hardwood or wood and bark chips from on-site tree removal operations.
 - 2. Size Range: 3 inches maximum, 1/2 inch minimum.

- 3. Color: Natural. Dyed Mulch will be rejected.
- C. Protection-Zone Fencing: Fencing fixed in position and meeting the following requirements: Previously used materials may be used when approved by Architect.
 - 1. Chain-Link Protection-Zone Fencing: Galvanized-steel fencing fabricated from minimum 2-inch opening, 0.148-inch-diameter wire chain-link fabric; with 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 or with 0.177-inch-diameter top tension wire and 0.177-inch-diameter bottom tension wire; with tie wires, hog ring ties, and other accessories for a complete fence system.
 - a. Height: 72 inches and matching site construction fencing.
- D. Protection-Zone Signage: Shop-fabricated, rigid plastic or metal sheet with attachment holes pre-punched and reinforced; legibly printed with nonfading lettering and as follows:
 - 1. Size and Text: As shown on Drawings.
 - 2. Lettering: black characters on white background.
- E. Temporary Trunk Protection: Wood boards wrapping the trunk of specified trees to remain and meeting the following requirements: Previously used materials may be used when approved by Architect.
 - 1. Trunk Protection-Boards: Constructed of two 2-by-4-inch by 8' boards, abutting one another wrapping around the entire trunk firmly tied with rope in three equidistant places along the length of board.
 - a. The boards shall be sufficiently tight to protect the tree trunk during construction while loose enough to allow for tree movement and growth.
 - b. Boards shall be placed on the top of the root flare and extend up 8' or to the nearest branch.
- F. Root Aeration / Protection Matting: triple ply geo-composites consisting of inner permeable layer of high density polypropylene construction attached to outer layers of non- woven permeable fabric. Exact specifications or combinations of products to be determined by geotechnical professional in collaboration with qualified arborist based upon original soil characteristics and loading potential for use in specific tree preservation activities. Biaxial geogrid layer may be added for additional stabilization upon recommendation by geotechnical professional.
 - 1. Root Aeration Matting: material shall be AmerDrain® 700 perforated sheet drain or approved equivalent. (Manufacturer: American Wick Drain Corporation, 1209 Airport Road, Monroe, NC 28110; 1-800-242-WICK; www.americanwick.com)
 - 2. Root Protection Matting: material shall be Tenax Tendrain 750/2 tri-planar geonet or approved equivalent. (Manufacturer: Tenax Corporation, 4800 East Monument St., Baltimore, MD 21205; 1-800-356-8495; www.tenaxus.com)
 - 3. Biaxial Geogrid: several types of Tensar® Biaxial (BX) Geogrids or similar. Specific material to be determined by project engineer for specific applications. (Manufacturer: Tensar International Corporation, 5883 Glenridge Drive, Suite 200, Atlanta, GA 30328-5363, 1-888-828-5126; www.tensarcorp.com)

- G. Organic Mulch: Double ground hardwood, aged a minimum 6 months from production, free from deleterious materials. Green chips or mulch not aged more than 6 months shall be supplemented with surface applications of Compost Teas and Humates to counter high bacterial counts. No walnut mulch or chips will be placed on site. Source must be approved by Project Arborist.
- H. Hardwood Borer Control: Imidacloprid such as *Merit* or equivalent.
- I. Subsurface Fertilization / Soil Biostimulent: "PHC for Trees, Nutrient Management System" or equivalent: 27-9-9, consisting of the following components: Nitrogen from Urea formaldehyde, Urea, Potassium Phosphate, Potassium Nitrate, Boric Acid, Iron EDTA, Manganese EDTA, Zinc EDTA, Copper EDTA, Ammonium Molybdate, Potential Acidity of 920 lbs of Calcium Carbonate equivalent per ton, Soluble Humates derived from Leonardite, Soluble Seaweed Extract, Natural Sugars, B-Vitamins, RZ-3 Surfactant, Rhizosphere Bacteria. Wetting agent or adjuvant must be included.
- J. Compost tea: A mixture of water, compost, and other additives conducive to the rapid reproduction of bacteria, fungi, and other organisms as defined below, brewed while being infused with air. Compost tea shall be made and applied by a contractor, approved by the Project Arborist, experienced in the production and application of compost tea for use in landscape applications.
 - 1. Water shall be de-chlorinated by allowing the water to sit in an open topped vat for a minimum of 24 hours to allow the chlorine to evaporate.
 - 2. Compost and other additives shall be capable of producing the following levels of organisms after 24 hours of brewing. Levels of organisms in the tea shall be confirmed by assay performed by Soil Foodweb New York, Inc, phone 631 750 1553 or approved equivalent.

Decomposers Active bacterial biomass

Active bacterial biomass10 - 150 ug per mlTotal bacterial biomass150 - 3000 ug per mlActive fungal biomass2 - 10 ug per mlTotal fungal biomass2 - 20 ug per ml

Predators - Protozoa and Nematodes Flagellates 1000 per ml Amoebae 1000 per ml Ciliates 20 - 50 per ml Nematodes 2 - 10 per ml (no root feeders) E-coli should be undetectable.

- 3. Infuse air continuously thru the brewing liquid during the brewing and storage period. Maintain 6 ppm oxygen during the brew cycle and storage period.
- 4. Tea should be applied no later than 8 hours after the completion of brewing.
- 5. Brewed compositive is a concentrated material and must be diluted as required in section "Installation of Compost Tea".
- K. Liquid Kelp: Nature's Essence LSC or equivalent; Nature's Essence SEP powdered Seaweed extract
- L. Fish hydrolysate such as FH 2-3-1 or equivalent.

- M. Granular Humate such as Hum- Amend SG or equivalent
- N. Liquid Humate: Terra Vita SP-90 soluble humic acid powder or liquid form- Terra Vita LC-10 Plus 7 or equivalent.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Erosion and Sedimentation Control: Examine the site to verify that temporary erosion- and sedimentation-control measures are in place. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.
- B. The project arborist shall prepare a written report listing conditions detrimental to tree and plant protection.

3.2 PREPARATION

- A. Locate and clearly identify trees, shrubs, and other vegetation to remain. Tie a 1-inch blue vinyl tape around each tree trunk at 54 inches above the ground.
- B. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials. Protect root systems from ponding, eroding, or excessive wetting caused by dewatering operations.
- C. Tree-Protection Zones: Mulch areas inside tree-protection zones and other areas indicated. Do not exceed indicated thickness of mulch.
 - 1. Apply 4-inch uniform thickness of organic mulch unless otherwise indicated. Do not place mulch within 6 inches of tree trunks.

3.3 PROTECTION ZONES

- A. Protection-Zone Fencing: Install protection-zone fencing along edges of protection zones before materials or equipment are brought on the site and construction operations begin in a manner that will prevent people from easily entering protected areas except by entrance gates. Construct fencing so as not to obstruct safe passage or visibility at vehicle intersections where fencing is located adjacent to pedestrian walkways or in close proximity to street intersections, drives, or other vehicular circulation.
 - 1. Chain-Link Fencing: Install to comply with ASTM F 567 and with manufacturer's written instructions.
 - 2. Posts: Set or drive posts into ground one-third the total height of the fence without concrete footings. Where a post is located on existing paving or concrete to remain, provide appropriate means of post support acceptable to Architect.

- 3. Access Gates: Install one set; adjust to operate smoothly, easily, and quietly; free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.
- B. Protection-Zone Signage: Install protection-zone signage in visibly prominent locations in a manner approved by Architect. Install one sign spaced approximately every 20 feet on protection-zone fencing, but no fewer than four signs with each facing a different direction.
- C. Maintain protection zones free of weeds and trash.
- D. Maintain protection-zone fencing and signage in good condition as acceptable to Architect and remove when construction operations are complete and equipment has been removed from the site.
 - 1. Do not remove protection-zone fencing, even temporarily, to allow deliveries or equipment access through the protection zone.
 - 2. Temporary access is permitted subject to preapproval in writing by arborist if a root buffer effective against soil compaction is constructed as directed by arborist. Maintain root buffer so long as access is permitted.

3.4 EXCAVATION

- A. General: Excavate at edge of protection zones and for trenches indicated within protection zones according to requirements in Section 312000 "Earth Moving" unless otherwise indicated.
- B. Trenching within Protection Zones: Where utility trenches are required within protection zones, excavate under or around tree roots by hand or with air spade, or tunnel under the roots by drilling, auger boring, or pipe jacking. Do not cut main lateral tree roots or taproots; cut only smaller roots that interfere with installation of utilities. Cut roots as required for root pruning. If excavating by hand, use narrow-tine spading forks to comb soil and expose roots.
- C. Redirect roots in backfill areas where possible. If encountering large, main lateral roots, expose roots beyond excavation limits as required to bend and redirect them without breaking. If encountered immediately adjacent to location of new construction and redirection is not practical, cut roots approximately 3 inches back from new construction and as required for root pruning.
- D. Do not allow exposed roots to dry out before placing permanent backfill. Provide temporary earth cover or pack with peat moss and wrap with burlap. Water and maintain in a moist condition. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.

3.5 ROOT PRUNING

A. Prune tree roots that are affected by temporary and permanent construction. Prune roots as follows:

- 1. Cut roots manually by digging a trench and cutting exposed roots with sharp pruning instruments or vibratory knife; do not break, tear, chop, or slant the cuts. Do not use a backhoe or other equipment that rips, tears, or pulls roots.
- 2. Cut Ends: Do not paint cut root ends.
- 3. Temporarily support and protect roots from damage until they are permanently redirected and covered with soil.
- 4. Cover exposed roots with burlap and water regularly.
- 5. Backfill as soon as possible according to requirements in Section 312000 "Earth Moving."
- B. Root Pruning at Edge of Protection Zone: Prune tree roots 12 inches outside of the protection zone by cleanly cutting all roots to the depth of the required excavation.
- C. Root Pruning within Protection Zone: Clear and excavate by hand or with air spade to the depth of the required excavation to minimize damage to tree root systems. If excavating by hand, use narrow-tine spading forks to comb soil to expose roots. Cleanly cut roots as close to excavation as possible.

3.6 CROWN PRUNING

- A. Prune branches that are affected by temporary and permanent construction. Prune branches under direction of project arborist and as directed by arborist.
 - 1. Prune to remove only injured, broken, dying, or dead branches unless otherwise indicated. Do not prune for shape unless otherwise indicated.
 - 2. Do not remove or reduce living branches to compensate for root loss caused by damaging or cutting root system.
 - 3. Pruning Standards: Prune trees according to ANSI A300 (Part 1).
 - a. Type of Pruning: Cleaning and raising where indicated.
- B. Unless otherwise directed by arborist and acceptable to Architect, do not cut tree leaders.
- C. Cut branches with sharp pruning instruments; do not break or chop.
- D. Do not paint or apply sealants to wounds.
- E. Provide subsequent maintenance pruning during Contract period as recommended by arborist.
- F. Chip removed branches and spread over areas identified by Architect.

3.7 REGRADING

A. Lowering Grade: Where new finish grade is indicated below existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.

- B. Lowering Grade within Protection Zone: Where new finish grade is indicated below existing grade around trees, slope grade away from trees as recommended by arborist unless otherwise indicated.
 - 1. Root Pruning: Prune tree roots exposed by lowering the grade. Do not cut main lateral roots or taproots; cut only smaller roots less than ¹/₂" dameter. Cut roots as required for root pruning.
- C. Raising Grade: Where new finish grade is indicated above existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.
- D. Minor Fill within Protection Zone: Where existing grade is 12 inches or less below elevation of finish grade, fill with planting soil mix. Place backfill soil in a single uncompacted layer and hand grade to required finish elevations.

3.8 VERTICAL MULCHING

- A. Decompact extent of excavated pavement areas to be planted areas using a an air spade or soil auger within excavation limits defined in Section 31200 " Earth Moving" and in areas indicated on the documents.
 - 1. Auger holes 12-18" deep, 2" diameter and 24" on center.
 - 2. Fill Auger holes with 50 sand and 50 backfill soil mixture.

3.9 FIELD QUALITY CONTROL

A. Inspections: Engage a qualified arborist to direct plant-protection measures in the vicinity of trees, shrubs, and other vegetation indicated to remain and to prepare inspection reports.

3.10 REPAIR AND REPLACEMENT

- A. General: Repair or replace trees, shrubs, and other vegetation indicated to remain or to be relocated that are damaged by construction operations, in a manner approved by Architect.
 - 1. Submit details of proposed pruning and repairs.
 - 2. Perform repairs of damaged trunks, branches, and roots within 24 hours according to arborist's written instructions.
 - 3. Replace trees and other plants that cannot be repaired and restored to full-growth status, as determined by Architect.
- B. Trees: Remove and replace trees indicated to remain that are more than [25] percent dead or in an unhealthy condition before the end of the corrections period or are damaged during construction operations that Architect determines are incapable of restoring to normal growth pattern.
 - 1. Small Trees: Provide new trees of same size and species as those being replaced for each tree that measures 4 inches or smaller in caliper size.

- 2. Large Trees: Provide an equivalent number of new tree(s) of 4-inch caliper size totaling the cumulative caliper inches of each tree being replaced that measures more than 4 inches in caliper size.
 - a. Species: As selected by Architect.
- 3. Plant and maintain new trees as specified in Section 329300 "Plants."
- C. Excess Mulch: Rake mulched area within protection zones, being careful not to injure roots. Rake to loosen and remove mulch that exceeds a 4-inch uniform thickness to remain.
- D. Soil Aeration: Where directed by Architect, aerate surface soil compacted during construction. Aerate 10 feet beyond drip line and no closer than 36 inches to tree trunk. Drill 2-inch-diameter holes a minimum of 12 inches deep at 24 inches o.c. Backfill holes with an equal mix of augered soil and sand.

3.11 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove excess excavated material, displaced trees, trash, and debris and legally dispose of them off Owner's property.

END OF SECTION 015639

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SECTION 017419 - 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.

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 011200 "Multiple Contract Summary" for coordination of responsibilities for waste management.
 - 2. Section 024116 "Structure Demolition" for disposition of waste resulting from demolition of buildings, structures, and site improvements.
 - 3. Section 024119 "Selective Demolition" for disposition of waste resulting from partial demolition of buildings, structures, and site improvements.
 - 4. 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 95 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. Asphalt paving.
 - b. Concrete.
 - c. Concrete reinforcing steel.
 - d. Brick.
 - e. Concrete masonry units.
 - f. Wood studs.
 - g. Plywood and oriented strand board.
 - h. Wood trim.
 - i. Structural and miscellaneous steel.
 - j. Rough hardware.
 - k. Roofing.
 - l. Insulation.
 - m. Doors and frames.
 - n. Door hardware.
 - o. Windows.
 - p. Glazing.
 - q. Metal studs.
 - r. Gypsum board.
 - s. Acoustical tile and panels.
 - t. Carpet.
 - u. Carpet pad.
 - v. Equipment.
 - w. Cabinets.
 - x. Plumbing fixtures.
 - y. 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. Electrical devices.
 - jj. Switchgear and panelboards.
 - kk. Transformers.
 - 2. Construction Waste:

- a. Masonry and CMU.
- b. Lumber.
- c. Wood sheet materials.
- d. Wood trim.
- e. Metals.
- f. Roofing.
- g. Insulation.
- h. Carpet.
- i. Gypsum board.
- j. Piping.
- k. Electrical conduit.
- 1. 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.

1.5 ACTION SUBMITTALS

- A. Waste Management Plan: Submit plan within 30 days of date established for the Notice to Proceed.
 - 1. Not more than 30 days after the Preconstruction Meeting, prepare and submit for the Architect and LEED Consultants approval, an electronic copy of the draft Construction Waste Management Plan (CWMP) in an electronic file including, but not limited to, descriptions of the following:
 - a. Estimate of total project waste to be generated, name of landfill where project waste would normally be disposed, tipping fees, and estimated cost of disposing of project waste in landfill.
 - b. Estimate of total tons of the following waste category to be diverted from the landfill:
 - 1) Concrete
 - 2) Asphalt Concrete
 - 3) Brick
 - 4) Clean dimensional wood, pallet wood
 - 5) Plywood, OSB, and particle board
 - 6) Cardboard, paper and packaging
 - 7) Other

B.

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. Not more than 30 days after Substantial Completion provide the final CWM report.
- D. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.
- E. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.
- F. 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.
- G. 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.
- H. 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.
- I. Qualification Data: For waste management coordinator and refrigerant recovery technician.
- J. 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.
- 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.
- 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 CONSTRUCTION WASTE MANAGEMENT, GENERAL

- A. Clean materials which are contaminated prior to placing in collection containers. Deliver materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.
- B. Utilize any on-site existing paving materials that are scheduled for demolition as granulated fill or subbase material, and include the weight of this material in the calculations for material diverted from landfill disposal.
- C. Arrange for materials collection by or materials delivery to the appropriate recycling or reuse facility.
- D. Tax credits and other savings obtained or revenue generated for recycled or reused materials accrue to the Contractor.

E. Discuss CWMP procedures and measures as an agenda item at all regular job meetings conducted during the course of work at the site, and record progress in meeting minutes.

3.2 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.
- 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.
- E. Waste Management in Historic Zones or Areas: Hauling equipment and other materials shall be of sizes that clear surfaces within historic spaces, areas, rooms, and openings, by 12 inches or more.

3.3 SALVAGING DEMOLITION WASTE

- A. Salvaged Items for Reuse in the Work: Salvage items for reuse and handle as follows:
 - 1. Clean salvaged items.
 - 2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
 - 3. Store items in a secure area until installation.
 - 4. Protect items from damage during transport and storage.
 - 5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.
- B. Salvaged Items for Sale and Donation: Not permitted on Project site.
- C. Salvaged Items for Owner's Use: Salvage items for Owner's use and handle as follows:

- 1. Clean salvaged items.
- 2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
- 3. Store items in a secure area until delivery to Owner.
- 4. Transport items to Owner's storage area designated by Owner.
- 5. Protect items from damage during transport and storage.
- D. Doors and Hardware: Brace open end of door frames. Except for removing door closers, leave door hardware attached to doors.
- E. Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.
- F. Plumbing Fixtures: Separate by type and size.
- G. Lighting Fixtures: Separate lamps by type and protect from breakage.
- H. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.

3.4 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 Owner.
- 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.

3.5 RECYCLING DEMOLITION WASTE

- A. Asphalt Paving: Grind asphalt to maximum 1-1/2-inch size.
 - 1. Crush asphaltic concrete paving and screen to comply with requirements in Section 312000 "Earth Moving" for use as general fill.
- B. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.
 - 1. Pulverize concrete to maximum 1-1/2-inch size.
 - 2. Crush concrete and screen to comply with requirements in Section 312000 "Earth Moving" for use as satisfactory soil for fill or subbase.
- C. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.
 - 1. Pulverize masonry to maximum 1-1/2-inch size.
 - a. Crush masonry and screen to comply with requirements in Section 312000 "Earth Moving" for use as satisfactory soil for fill or subbase.
 - 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.
- D. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.
- E. 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.
- F. Asphalt Shingle Roofing: Separate organic and glass-fiber asphalt shingles and felts. Remove and dispose of nails, staples, and accessories.
- 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: 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.

3.6 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.

3.7 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.

END OF SECTION 017419

SECTION 018113.23 - SUSTAINABLE DESIGN REQUIREMENTS - LEED 2009 FOR SCHOOLS

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. Divisions 2 through 33 for Sustainable Design Requirements specific to the Work of each Section.
 - 2. 01 7419 Construction Waste Management
 - 3. 01 8119 Testing for Indoor Air Quality
 - 4. 01 9100 General Commissioning Requirements

1.2 SUMMARY

- A. Section includes general requirements and procedures for compliance with certain prerequisites and credits needed for Project to obtain "LEED 2009 for Schools New Construction and Major Renovations" (LEED for Schools) Gold certification based on USGBC's "LEED for Schools.
 - 1. Specific requirements for LEED are also included in other Sections.
 - 2. Some 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. A copy of the LEED Project checklist is attached at the end of this Section for information only.
 - a. Some 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.
- B. To minimize the environmental impacts of the construction and operation, the Contractor during the construction phase of this project shall implement the following procedures singly or in combination:
 - 1. Select products that minimize consumption of non-renewable resources consume reduced amounts of energy and minimize amounts of pollution to produce, and employ recycled and/or recyclable materials.
 - 2. Control sources for potential IAQ pollutants by controlled selection of materials and processes used in project construction in order to attain superior IAQ.
 - 3. Products and processes that achieve the above objectives to the extent currently possible and practical have been selected and included in these Construction Documents. The Contractor is responsible to maintain and support these objectives in developing means and methods for performing the work of this Contract and in proposing product substitutions and/or changes to specified processes

1.3 DEFINITIONS

- A. LEED: USGBC's "LEED 2009 for Schools New Construction & Major Renovations."
 - 1. Definitions that are a part of "LEED 2009 for Schools New Construction & Major Renovations" (LEED for Schools) apply to this Section.
- B. 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. Certificates shall include evidence that manufacturer is certified for chain of custody by an FSC-accredited certification body.
- C. Regional Materials: Materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles 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.
- D. 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. "Postconsumer" 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. "Preconsumer" 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.
- E. Agrifiber Products: Composite panel products derived from agricultural fiber
- F. Biobased Content: The weight of the biobased material divided by the total weight of the product and expressed as a percentage by weight
- G. Biobased Product: As defined in the 2002 Farm Bill, a product determined by the Secretary to be a commercial or industrial product (other than food or feed) that is composed, in whole or in significant part, of biological products or renewable domestic agricultural materials (including plant, animal, and marine materials) or forestry materials
- H. Composite Wood: A product consisting of wood fiber or other plant particles bonded together by a resin or binder
- I. Construction and Demolition Waste: Includes solid wastes, such as building materials, packaging, rubbish, debris, and rubble resulting from construction, remodeling, repair, and demolition operations. A construction waste management plan is to be provided by the Contractor as defined in Section 01 74 19.
- J. Light Pollution: Light that extends beyond its source such that the additional light is wasted in an unwanted area or in an area where it inhibits view of the night sky.

- K. Post-Consumer Recycled Content: The percentage by weight of constituent materials that have been recovered or otherwise diverted from the solid-waste stream after consumer use
- L. Pre-Consumer Recycled Content: Materials that have been recovered or otherwise diverted from the solid-waste stream during the manufacturing process. Pre-consumer content must be material that would not have otherwise entered the waste stream as per Section 5 of the FTC Act, Part 260 "Guidelines for the Use of Environmental Marketing Claims": www.ftc.gov/bcp/grnrule/guides980427
- M. Recycled Content Materials: Products that contain pre-consumer or post- consumer materials as all or part of their feedstock
- N. Regional Materials: Materials that are extracted, harvested, recovered, and manufactured within a radius of 500 miles from the Project site
- O. Salvaged or Reused Materials: Materials extracted from existing buildings in order to be reused in other buildings without being manufactured
- P. Sealant: Any material that fills and seals gaps between other materials
- Q. Type 1 Finishes: Materials and finishes which have a potential for short- term levels of off gassing from chemicals inherent in their manufacturing process, or which are applied in a form requiring vehicles or carriers for spreading which release a high level of particulate matter in the process of installation and/or curing.
- R. Type 2 Finishes: "Fuzzy" materials and finishes which are woven, fibrous, or porous in nature and tend to adsorb chemicals off-gassed by Type 1 finishes or may be adversely affected by particulates. These materials become "sinks" for deleterious substances which may be released much later, or collectors of contaminants that may promote subsequent bacterial growth.
- S. Volatile Organic Compounds (VOCs): Any compound of carbon, excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonate, which participates in atmospheric photochemical reactions. Compounds that have negligible photochemical reactivity, listed in EPA 40 CFR 51.100(s), are also excluded from this regulatory definition.

1.4 REFERENCED STANDARDS

- A. ASHRAE/IESNA 90.1- 2007 Energy Standard for Buildings (www.ashrae.org)
- B. ASHRAE 62.1-2007 Ventilation for Acceptable Indoor Air Quality
- C. ASHRAE 55-2004, Thermal Environmental Conditions for Human Occupancy
- D. ASHRAE Reference Guide Chapter 11, for energy analysis
- E. SMACNA IAQ Guidelines for Occupied Buildings Under Construction, 1995, chapter 3

- F. SCAQMD: South Coast Air Quality Management District Rule #1168, Adhesives, Sealants, Primers.
- G. GreenSeal Standard 36 (GS-36) October, 2000, Commercial Adhesive
- H. GreenSeal Standard GS-11, Paint
- I. GreenSeal Standard GS-3, Anti-corrosive Paints
- J. Carpet and Rug Institute Green Label Plus Testing Program
- K. FloorScore
- L. South Coast Air Quality Management District (SCAQMD) Rule 1113, Architectural Coatings
- M. USDOE IPMVP International Performance Measurement
- N. USGBC: United States Green Building Council, the governing body that is responsible for certifying, recording and tracking LEED rated projects

1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site. Review LEED requirements and action plans for meeting requirements.

1.6 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 credification application. Document responses as informational submittals.
- B. Submit documentation to USGBC and respond to questions and requests from 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.
 - 1. Document correspondence with USGBC as informational submittals.

1.7 ACTION SUBMITTALS

- A. General: Submit additional sustainable design submittals required by other Specification Sections.
- B. Sustainable design submittals are in addition to other submittals.
 - 1. If submitted item is identical to that submitted to comply with other requirements, include an additional copy with other submittal as a record copy of compliance with indicated

LEED requirements instead of separate sustainable design submittal. Mark additional copy "Sustainable design submittal."

- C. Sustainable Design Documentation Submittals:
 - 1. Credit EA 5: Product data and wiring diagrams for sensors and data collection system used to provide continuous metering of building energy-consumption performance over time.
 - 2. Credit MR 2: Comply with Section 017419 "Construction Waste Management and Disposal."
 - 3. Credit MR 4: Product data for recycled content, indicating postconsumer and preconsumer recycled content and cost.
 - 4. Credit MR 5: Product data 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.
 - 5. Credit MR 7: Product data and chain-of-custody certificates for products containing certified wood. Include statement indicating cost for each certified wood product.
 - 6. Credit IEQ 3.1:
 - a. Construction indoor-air-quality (IAQ) management plan.
 - b. Product data for temporary filtration media.
 - c. Product data for filtration media used during occupancy.
 - d. Construction Documentation: Six photographs at each of three different times during the construction period, along with a brief description of the SMACNA approach employed, documenting implementation of the IAQ management measures, such as protection of ducts and on-site stored or installed absorptive materials.
 - 7. Credit IEQ 3.2:
 - a. 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.
 - b. Product data for filtration media used during flush-out and during occupancy.
 - c. Report from testing and inspecting agency, indicating results of IAQ testing and documentation showing compliance with IAQ testing procedures and requirements.
 - 8. Credit IEQ 4: Laboratory test reports for the following products and systems installed inside the weatherproofing system, indicating compliance with requirements for low-emitting materials.
 - a. Adhesives and sealants.
 - b. Paints and coatings.
 - c. Composite wood and agrifiber products.

1.8 INFORMATIONAL SUBMITTALS

A. Qualification Data: For LEED coordinator.

- B. Project Materials Cost Data: Provide statement within 60 days of the Notice to Proceed indicating total cost for materials used for Project. Costs exclude labor, overhead, and profit. Include breakout of costs for the following categories of items:
 - 1. Plumbing.
 - 2. Mechanical.
 - 3. Electrical.
 - 4. Specialty items, such as elevators and equipment.
 - 5. Wood-based construction materials.
- C. Not more than 60 days after the Preconstruction Meeting, the General Contractor shall provide to the LEED Consultant and Architect a preliminary schedule of materials costs for all materials used for the Project organized by specification section. Exclude labor costs and all mechanical, electrical, and plumbing (MEP) systems materials and labor costs. Include the following:
 - 1. Identify each reused or salvaged material, its cost, and its replacement value.
 - 2. Identify each recycled-content material, its post-consumer and pre-consumer recycled content as a percentage the product's weight, its cost, its combined recycled content value (defined as the sum of the post-consumer recycled content value plus one- half of the pre-consumer recycled content value), and the total combined recycled content value for all materials as a percentage of total materials costs.
 - 3. Identify each regional material, its cost, its manufacturing location, the distance of this location from the Project site, the source location for each raw material component of the material, the distance of these extraction locations from the Project site, and the total value of regional materials as a percentage of total materials costs.
 - 4. Identify each biobased material, its source, its cost, and the total value of biobased materials as a percentage of total materials costs. Also provide the total value of rapidly renewable materials (materials made from plants that are harvested in less than a 10-year cycle) as a percentage of total materials costs.
 - 5. Identify each wood-based material, its cost, the total wood- based materials cost, each FSC Certified wood material, its cost, and the total value of FSC Certified wood as a percentage of total wood-based materials costs.
- D. Provide final versions of the above spreadsheets to the LEED Consultant and Architect not more than 14 days after Substantial Completion.
- E. Sustainable Design Action Plans: Provide preliminary submittals within 30 days of date established for the Notice to Proceed, indicating how the following requirements will be met:
 - 1. Credit MR 2: Waste management plan complying with Section 017419 "Construction Waste Management and Disposal."
 - 2. Credit MR 4: List of proposed materials with recycled content. Indicate cost, postconsumer recycled content, and preconsumer recycled content for each product having recycled content.
 - 3. 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.
 - 4. Credit MR 7: List of proposed certified wood products. Indicate each product containing certified wood, including its source and cost of certified wood products.
 - 5. Credit IEQ 3.1: Construction IAQ management plan.

F. Sustainable Design Progress Reports: Concurrent with each Application for Payment, submit reports comparing actual construction and purchasing activities with sustainable design action plans.

1.9 QUALITY ASSURANCE

A. LEED Coordinator: Engage an experienced LEED-accredited professional to coordinate LEED requirements. LEED coordinator may also serve as waste management coordinator.

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 these LEED credits, the Contractor shall provide additional materials and procedures necessary to obtain LEED credits indicated.

2.2 RECYCLED CONTENT OF MATERIALS

- A. Credit MR 4: Building materials shall have recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content for Project constitutes a minimum of 20 percent of cost of materials used for Project.
 - 1. Cost of postconsumer recycled content plus one-half of preconsumer recycled content of an item shall be determined by dividing the weight of postconsumer recycled content plus one-half of preconsumer recycled content in the item by the total weight of the item and multiplying by cost of the item.
 - 2. Do not include furniture, plumbing, mechanical and electrical components, and specialty items, such as elevators and equipment in the calculation.

2.3 REGIONAL MATERIALS

A. Credit MR 5: Not less than 20 percent of building materials, by cost, shall be regional materials.

2.4 CERTIFIED WOOD

- A. Credit MR 7: Not less than 50 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.
 - 1. Wood-based materials include, but are not limited to, the following materials when made from wood, engineered wood products, or wood-based panel products:
 - a. Rough carpentry.

- b. Miscellaneous carpentry.
- c. Finish carpentry.
- d. Architectural woodwork.
- e. Wood flooring.
- f. Wood cabinets.

2.5 LOW-EMITTING MATERIALS

- A. Credit IEQ 4: The following products and systems, where installed inside the weatherproofing system, 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. Adhesives and sealants.
 - 2. Paints and coatings.
 - 3. Flooring systems.
 - 4. Composite wood and agrifiber products.

PART 3 - EXECUTION

3.1 NONSMOKING BUILDING

A. Smoking is not permitted within the building or within 25 feet of entrances, operable windows, or outdoor-air intakes.

3.2 REFRIGERANT REMOVAL

A. Prerequisite EA 3: Remove CFC-based refrigerants according to Section 024119 "Selective Demolition" 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.

3.3 CONSTRUCTION WASTE MANAGEMENT

A. Credit MR 2: Comply with Section 017419 "Construction Waste Management and Disposal."

3.4 CONSTRUCTION IAQ MANAGEMENT

- A. Credit IEQ 3.1: Comply with SMACNA's "IAQ Guideline for Occupied Buildings under Construction."
 - 1. If Owner authorizes use of permanent heating, cooling, and ventilating systems during construction period as specified in Section 015000 "Temporary Facilities and Controls," install MERV 8 filter media according to ASHRAE 52.2 at each return-air inlet for the air-handling system used during construction.

2. Replace air filters immediately prior to occupancy.

3.5 IAQ ASSESSMENT

- A. Flush-Out:
 - 1. 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. of outdoor air per sq. ft. of floor area while maintaining an internal temperature of at least 60 deg F and a relative humidity of no higher than 60 percent.
 - 2. If occupancy is desired prior to flush-out completion, the space may be occupied following delivery of a minimum of 3500 cu. ft. of outdoor air per sq. ft. of floor area to the space. Once a space is occupied, it shall be ventilated at a minimum rate of 0.30 cfm per sq. ft. of outside air or the design minimum outside air rate, whichever is greater. During each day of the flush-out period, ventilation shall begin a minimum of three hours prior to occupancy and continue during occupancy. These conditions shall be maintained until a total of 14000 cu. ft./sq. ft. of outside air has been delivered to the space.

END OF SECTION 018113.23

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SECTION 019113 - COMMISSIONING GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Contract Drawings and provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections apply to this Section.
- B. Commissioning Plan

1.2 DESCRIPTION OF WORK

- A. An independent third party Commissioning Agent has been retained to lead the project participants through the commissioning process. The section below is provided for informational purposes and to inform the contractor of the extent of the commissioning process and the involvement required. The Commissioning Agent is RMF Engineering, Inc.
- B. The purpose of the construction phase commissioning is to provide the Owner and Operators of the facility with a high level of assurance that each commissioned system has been installed in the prescribed manner and operates within the performance guidelines set forth in the design intent. The Commissioning Agent shall provide the Owner with an unbiased, objective view of the system's installation, operation, and performance. This commissioning process shall not take away or reduce the responsibility of the System Design Professional(s) or installing contractors to provide a finished product. Commissioning is intended to enhance the quality of system start-up and aid in the orderly transfer of systems to beneficial use by the owner. The Commissioning Agent will be a member of the construction team, cooperating and coordinating all commissioning activities with the Owner, Design Professionals, Construction Manager or General Contractor, Subcontractors, Manufacturers and Equipment Suppliers.

1.3 DEFINITIONS

- A. Commissioning Agent: The Commissioning Agent is a third party consulting company interested in providing quality control to the project and quality assurance to the Owner. The Commissioning Agent provides a non-biased perspective of issues. The goal of the Commissioning Agent is to discover equipment and system issues early and resolve them quickly for an overall smooth construction process and to keep costs down for both the Owner and Contractor(s).
- B. Commissioning Team: The Commissioning Team is a group of individuals selected by each company to represent that company for direct involvement in the commissioning activities during the construction phase of the project. A minimum of one individual must be included to represent every company. Companies include but are not limited to; Commissioning Agent, Owner, Architect, System Design Engineer, Construction Manager or General Contractor, and all Sub-Contracting Companies.
- C. System Design Professional(s): The System Design Professional(s) are the designers and design firm representatives for the mechanical, electrical, plumbing, telecommunications and other systems outside of the scope of the Architect. Typically, the System Design Professional(s) do not include structural and civil design representatives unless structural or civil systems are specifically included within, or are associated with the systems being commissioned.

- D. Contractor(s): The term Contractor(s) utilized herein refers to the primary contracting party responsible for the specific item being referenced. Contractor(s) may refer to one or more of the general contractors, construction managers, sub-contractors and/or venders whom are responsible for the construction or other provisions regarding any of the systems to be commissioned as outlined within Specification 01 91 13 Section 1.5 Systems to be Included in Commissioning. Contracting parties outside of the scope of the systems being commissioned are not included.
- E. Subcontractors: The term Subcontractors utilized herein refers to the any and all subcontracting companies or venders whom are responsible for the construction or other provisions regarding any of the systems to be commissioned as outlined within Specification 01 91 13 Section 1.5 Systems to be Included in Commissioning. Subcontracting parties outside of the scope of the systems being commissioned are not included.

1.4 ROLES AND RESPONSIBILITIES

- A. Owner
 - 1. The commissioning roles and responsibilities of the Owner are outlined within the Commissioning Plan. The Owner is not contractually obligated to complete any tasks defined within the Commissioning Plan. Rather, the roles and responsibilities defined within the Commissioning Plan are in the best interest of the Owner and are highly recommended for the successful completion of Commissioning.
 - 2. If the Owner's Project Requirements have been outlined and documented, the Owner shall provide a copy of this document to the Commissioning Agent. This document shall set the goals towards which each of the commissioning tools implemented will drive the final product.
 - 3. The Owner shall be required to review many Commissioning Forms prior to their completion. The Owner must verify that the forms are constructed and being utilized in the most effective way for their own benefit. Commissioning documentation should only provide information which will be useful to the Owner and their Operations and Maintenance staff throughout the construction process and in the future.
- B. Commissioning Agent
 - 1. Schedule the Construction Phase Commissioning Kick-Off meeting at some convenient location and at a time suitable to the Contractor and System Design Professional(s). This meeting shall be for the purpose of reviewing the complete commissioning program and establishing tentative schedules for system orientation and inspections, O&M submittals, training sessions, system flushing and testing, job completion, test, adjust and balance (TAB) work, and verification and functional performance testing. A commissioning plan will be distributed prior to or at this meeting to the Construction Manager or General Contractor, System Design Professional(s), and prime contractors outlining the specific commissioning process for this project and the names and contact information, to be determined at this meeting, of all commissioning team members. A final plan will be issued soon after the meeting listing all team contact information.
 - 2. Coordinate the integration of Commissioning Activities into the Construction Schedule.
 - 3. Review all documentation regarding changes to the Contract Documents or Clarifications. These include Meeting Minutes, Addendums, RFI's, Change Orders, ASI's, etc. for their effect on Commissioning.

- 4. The Commissioning Agent shall receive a copy of all submittals pertaining to the systems being commissioned from the Contractor(s). The Commissioning Agent shall review submittals associated with systems to be commissioned (e.g. equipment, ductwork, piping, automatic controls, and TAB procedures, etc.) for their effect on the commissioning process and the final performance of the HVAC system. Commissioning submittal review may be coordinated with the System Design Professional(s) review to avoid redundancy. Submittal review/comments by the Commissioning Agent shall not supersede any submittal comments, approval, or rejection by the System Design Professional(s).
- 5. The Commissioning Agent shall receive a copy of all controls submittals from the Contractor(s). The Commissioning Agent shall perform an explicit review of these submittals to verify their compliance with the design sequences of operation and Owner's Project Requirements. This information is also required to produce job specific Functional Performance Tests (FPT).
- 6. The Commissioning Agent shall conduct Commissioning Meetings throughout the construction phase. Meetings shall be held more frequently as Commissioning Activities increase. Meetings are typically held monthly until systems are prepared for verification testing. The Commissioning Agent shall prepare minutes for every Commissioning Meeting and distribute copies to all attendees and other interested parties.
- 7. Attend select Coordination Meetings, aside from Commissioning Meetings, held between the Owner, System Design Professional(s) and Contractor(s).
- 8. The Commissioning Agent shall conduct periodic observations of work in progress and shall generate and distribute a report for effort. The Commissioning Agent may also perform select site visits for the explicit purpose of witnessing duct and piping pressure test procedures. All issues and discrepancies found during these inspections shall be listed on a Commissioning Issues Log, maintained by the Commissioning Agent.
- 9. Provide detailed installation checklists entitled Pre-Functional Checklists (PFC's). These checklists are developed by the Commissioning Agent specific to the project and shall be completed by the installing contractors. The Commissioning Agent is required only to spotcheck these checklists upon notification by the contractors of the completion of the installations.
- 10. Submit detailed Functional Performance Test procedures for review and acceptance by the Commissioning Team. These tests are specifically custom designed by the Commissioning Agent for verifying each system operates per the design intent and meets both the Basis of Design (BOD) and the Owner's Project Requirements (OPR.)
- 11. Provide and install data loggers to monitor and record data as may be required by the Functional Performance Tests.
- 12. Upon receipt of notification from the System Design Professional(s) and/or contractor that the mechanical systems have been completed and are operational, the Commissioning Agent shall proceed to verify the TAB report and operation of the control systems, on a random sampling basis.
- **13**. Oversee Functional Performance Testing which shall be performed by the installing contractors. All issues and discrepancies found during Functional Performance Testing shall be listed on the Commissioning Issues Log, maintained by the Commissioning Agent.

- 14. The Commissioning Agent shall not perform any site visits for the purpose of witnessing Functional Performance Testing until the installing contractor has verified that the system is ready for Functional Performance Testing and made proper notice to the Commissioning Agent with appropriate lead time.
- 15. Witness repeated conducting of Functional Performance Tests if deficiencies are found during the original testing. The Commissioning Agent will invoice the Owner for additional time, plus expenses, required for any retesting; and the Owner. at his discretion, may deduct this cost from the CM/GC's Application for Payment. It is the Contractors' responsibility to properly de-bug systems and verify successful system performance prior to inviting the Commissioning Agent to witness the test.
- 16. The Commissioning Agent shall review all Training Documentation at the end of the project to verify all contractual obligations have been met. The Commissioning Agent shall review the Operations and Maintenance Manuals for completeness and accuracy. The Commissioning Agent shall review the Record Documents for completeness and accuracy.
- 17. Prepare the Final Commissioning Report. Submit completed Functional Performance Tests as part of Final Report to the owner. Recommend acceptance of the Final Product, by the Owner, based upon the results of Commissioning.
- 18. Repeat Functional Performance Tests to accommodate seasonal tests.
- C. Construction Manager / General Contractor
 - 1. Read, understand and follow the Commissioning Plan as a guideline for the Commissioning Process implemented into this construction project.
 - 2. Include commissioning requirements in all subcontracts relating to the systems to be commissioned as outlined within Specification 01 91 13 Section 1.5 Systems to be Included in Commissioning. Ensure full cooperation of all contracting, manufacturing and testing parties required to participate in commissioning.
 - 3. Include cost for commissioning requirements in the contract price. Include specific line items within the Schedule of Values according to Specification 01 91 13 Section 2.2 Schedule of Values.
 - 4. Provide copies of the Project Schedule to the Commissioning Agent as outlined within Specification 01 91 13 Section 2.1 Project Schedule. Update the overall project schedule to reflect all Commissioning Activities. Ensure cooperation by subcontractors in coordinating the inclusion of subcontractor activities related to commissioning into the overall Project schedule.
 - 5. Provide all submittals to the Commissioning Agent as outlined within Specification 01 91 13 Section 2.3 Submittals.
 - 6. Ensure acceptable representation, with the means and authority to prepare and coordinate execution of the entire commissioning program as described in the contract documents.
 - 7. Provide a representative to regularly attend every Commissioning Meeting. Ensure all Subcontractors also provide a representative at each Commissioning Meeting.

- 8. Coordinate all scheduled commissioning activities with the Commissioning Agent. The Contractor(s) must apprise the Commissioning Agent of various construction activities. These activities include but are not limited to: System Start-up, Equipment Start-up, Duct Pressure Tests, Pipe Pressure Tests, Completion of Pre-Functional Checklists, readiness for Functional Performance Testing and System Completion.
- 9. Remedy all contractual deficiencies as outlined within the Commissioning Issues Log. The Commissioning Agent shall issue an updated deficiency log throughout construction based upon site visits, Pre-Functional Checklist completion, Commissioning Meeting topics and Functional Performance Test results.
- 10. Maintain a master copy of all PFC's. There are several methods for keeping these documents organized which is the responsibility of the Construction Manager/General Contractor. Reference the Commissioning Plan for examples of methods previously utilized to keep these documents organized. The Construction Manager/General Contractor must verify all PFC's are complete. Sign all completed PFC's prior to inviting the Commissioning Agent to witness and sign-off on these documents.
- 11. Evaluate performance deficiencies identified in the completed FPT's for non-conformance with contract documents. Remedy all contractual deficiencies identified through Functional Performance Testing and other verification tests.
- 12. The Commissioning Agent shall not have any direct authority to order construction changes or make any project alterations without the written approval of the Owner or System Design Professional. Any changes or project alterations made by a Contractor(s) without such written approval shall be the responsibility of that Contractor(s).
- D. Subcontractors
 - 1. Provide a representative at each Commissioning Meeting.
 - 2. All Subcontractors must follow the same procedure for the completion of Pre-Functional Checklists as organized by the Construction Manager/General Contractor.
 - 3. The Commissioning Agent shall not have any direct authority to order construction changes or make any project alterations without the written approval of the Owner or System Design Professional. Any changes or project alterations made by any Contractor(s) without such written approval shall be the responsibility of that Contractor(s).

1.5 SYSTEMS TO BE INCLUDED IN COMMISSIONING

- A. For the purposes of identifying the systems included in the commissioning process for this project, the following general system descriptions are provided. Additional details for individual system equipment, components, and designations are provided within the project documents and the Commissioning Plan.
 - 1. HVAC Systems, including all associated distribution and controls.
 - 2. Domestic Hot Water System(s), including all associated distribution and controls.
 - 3. Normal Electrical Power Distribution System.

- 4. Emergency Electrical Power Distribution System.
- 5. Interior Lighting and Lighting Controls Systems.
- 6. Building Envelope
- B. For the systems listed, all requirements specified within the Commissioning Specifications Sections shall apply including, but not limited to:
 - 1. All system related documentation shall be tracked within forms provided by the Commissioning Agent.
 - 2. All required equipment and component submittals shall be copied to the Commissioning Agent per Specification 01 91 13 Section 2.3 Submittals.
 - **3.** All system related documentation shall be copied by the Contractor and provided to the Commissioning Agent for inclusion into the Commissioning Record Documents.
 - 4. All systems shall be inspected by the Commissioning Agent while under construction and all issues discovered by the Commissioning Agent shall be corrected or otherwise addressed by the contractor.
 - 5. All systems shall have Pre-Functional Checklists and Functional Performance Tests provided by the Commissioning Agent and completed by the Contractor(s) as per Specification 01 91 13 Sections 2.4 Pre-Functional Checklists and 2.6 Functional Performance Tests.

1.6 COORDINATION

- A. General coordination is required by the Owner, Architect, System Design Professional(s), Contractor(s) and the Commissioning Agent to maintain an efficient commissioning process.
- B. The Architect, System Design Professional(s) and Contractor(s) shall submit to the Commissioning Agent a copy of all construction documents, addenda, change orders, overall project schedule, and any approved submittals, shop drawings, value engineering proposals and training plans related to commissioned systems.
- C. The Commissioning Agent's primary responsibility is to the Owner, and as such, shall regularly apprise the Contractor and the Owner of progress, pending problems and/or disputes, and shall provide regular status updates on progress with each system.
- D. The Commissioning Agent shall coordinate the schedule of commissioning activities with the construction schedule with assistance from the Owner, Architect, System Design Professional(s) and Contractor(s).
- E. The Contractor(s) must apprise the Commissioning Agent of various construction activities. These activities include, but are not limited to: System Start-up, Duct Pressure Tests, Pipe Pressure Tests, Completion of Pre-Functional Checklists, readiness for Functional Performance Testing and System Completion.
1.7 SCHEDULE

- A. Commissioning of systems shall proceed per the criteria established in the specific sections that follow, with activities to be performed on a timely basis. Site visits which are specifically scheduled for the purpose of demonstrating system functionality shall be coordinated by the Contractor(s) such that all required parties are present during the visit. The Contractor(s) shall be responsible for demonstrating system functionality during these scheduled periods.
- B. All Commissioning activities which require the presence of the Commissioning Agent shall be scheduled such that the Commissioning Agent is made aware of the required site visit with a minimum of two weeks (14 days) notice.
- C. Upon the discovery of deficient items during inspection or testing, the Contractor(s) shall be notified via distribution of an updated Commissioning Issues Log. Additional visits to the site for re-inspection or re-testing shall be scheduled as required. Prior to these additional visits, related deficiencies shall be rectified by the responsible party. The Contractor(s) shall be responsible for ensuring that all required corrective actions are performed in a timely manner in order to maintain the project schedule.
- D. Contractor schedules and scheduling is the responsibility of the Contractor(s). The Commissioning Agent shall provide commissioning scheduling information to the Construction Manager or General Contractor for incorporation into the main project schedule for review and planning activities.
- E. Prior to substantial completion, all Functional Performance Tests must be successfully completed and documented by the Commissioning Agent, such that each tested system has proven full and efficient functionality.

1.8 RELATED WORK SPECIFIED ELSEWHERE

- A. Commissioning requires support from the contractors. The commissioning process does not relieve any contractors from their obligations to complete all portions of work in a satisfactory manner prior to commissioning any system.
- B. Refer to other Commissioning Specification Sections for contractor responsibilities relative to the commissioning process.

PART 2 - PRODUCTS

2.1 PROJECT SCHEDULE

- A. Contractor(s) shall submit copies of a complete project schedule to the Commissioning Agent. The Contractor(s) must submit the schedule no later than two weeks after the Commissioning Kick-Off Meeting.
- B. Contractor(s) shall be required to incorporate all Commissioning Activities into the overall project schedule.

2.2 SCHEDULE OF VALUES

- A. The Contractor(s) shall include within the Schedule of Values, specific line items to reflect Commissioning progress. For each system to be commissioned as outlined in Specification 01 91 13 Section 1.5 – Systems to be Included in Commissioning, a line item shall be listed in the Schedule of Values for the following:
 - 1. Pre-Functional Checklist
 - 2. System Start-Up
 - 3. Functional Performance Test
 - 4. Equipment/System Training
- B. The Contractor(s) shall submit copies of the Schedule of Values to the Commissioning Agent for review. The Commissioning Agent shall review and comment on line items relevant to commissioning and systems to be commissioned. Any comments by the Commissioning Agent will be forwarded to the System Design Professional(s) for review and inclusion.

2.3 SUBMITTALS

- A. Contractor(s) shall submit copies of all equipment and component submittals to the Commissioning Agent for each of the Systems to Be Commissioned as outlined within this specification section. Any comments by the Commissioning Agent will be forwarded to the Commissioning Team. Comments may require responses from the System Design Professional and/or contractor.
- B. Manufacturer's Product Data: The Contractor(s) shall provide to the Commissioning Agent all product data as required within each individual specification section.
- C. Coordination Drawings: The Contractor(s) shall provide to the Commissioning Agent all Coordination Drawings as required within each individual specification section.
- D. Manufacturer's Installation Instructions: The Contractor(s) shall provide to the Commissioning Agent a copy of installation instructions for every piece of equipment and accessory included as part of a commissioned system.
- E. Manufacturer's Controls Calibration Instructions: The Contractor(s) shall provide to the Commissioning Agent a copy of calibration instructions for each type of control device to be installed. Submit only control device calibration instructions for devices which have been approved by the System Design Professional(s).
- F. The Contractor(s) shall submit a copy of the Record Documents to the Commissioning Agent for review. The Commissioning Agent shall forward comments to the Owner, Architect, System Design Professionals and Contractor(s). The Commissioning Agent shall recommend approval of the Record Documentation.
- G. The Contractor(s) shall submit a copy of all Operations and Maintenance Manuals to the Commissioning Agent for review. The Commissioning Agent shall forward comments to the Owner, Architect, System Design Professionals and Contractor(s). The Commissioning Agent shall recommend approval of the O&M Manuals.

H. The Contractor(s) shall submit a copy of all final Training Documentation to the Commissioning Agent for review. The Commissioning Agent shall forward comments to the Owner, Architect, System Design Professionals and Contractor(s). The Commissioning Agent shall recommend approval of the Training based upon the documentation provided.

2.4 PRE-FUNCTIONAL CHECKLISTS

- A. Pre-Functional Checklists (PFC) shall be developed by the Commissioning Agent and distributed to the Commissioning Team. The PFCs shall consist of a series of installation checklist items, required to be completed by the installing contractors. Each PFC is customized for each type of equipment or system component. The PFCs may be filled out by hand or electronically if the contractor(s) prefer. The Construction Manager/General Contractor shall indicate completion and verification of each PFC by signing and submitting each PFC to the Commissioning Agent.
- B. It is the contractor's responsibility to estimate the extent and depth of the PFC requirements, based upon the level of involvement required to install each individual piece of equipment or system component. Each contractor shall be responsible for providing a cost associated with Pre-Functional Checklists based upon this extent and depth.
 - 1. The number of checklist items for each piece of equipment or system component shall range from approximately 10 checklist items up to approximately 30 checklist items with respect to the level of involvement required by the contractors. For example, a PFC of only 10 checklist items would represent a piece of equipment which requires only to be connected to an inlet and outlet pipe such as a strainer or other pipe accessory. A PFC of 30 checklist items is more involved and requires in depth installation and adjustment by multiple contractors, such as a Variable Volume Terminal Reheat Box.
 - 2. All checklist items on a PFC are static installation requirements. Proper storage and installation methods may be included within the PFC checklists. Operational checklist items and test, adjustment and balance items are also included. PFCs may include checklist items requiring submittals to be completed which indicate operational characteristics have been verified.
 - **3**. Equipment PFCs shall list for comparison the manufacturer's data of the equipment as per the design, approved submittal and the installed equipment. These items are initially blank on the forms provided to the contractors by the Commissioning Agent. The Contractors are responsible for obtaining this information and filling in these blanks.
 - a. Design: The manufacturer's data shall be filled in by the contractor according to the design criteria outlined within the design specifications or equipment schedules. The Commissioning Agent, at his discretion, may provide the design data prior to issuing the PFCs to the contractor.
 - b. Submitted: The manufacturer's data shall be filled in by the contractor according to the product submittal, submitted by the contractor and approved of by the design representative
 - c. Installed: The manufacturer's data shall be filled in by the contractor according to the actual piece of equipment installed in the field nameplate data.
 - 4. The Commissioning Agent shall typically assist by completing the Design portion of each PFC based upon the contract documents. However, the contractor shall remain responsible for completing all manufacturer's data. PFC manufacturer's data are not considered checklist items

and are not included in the range of installation checklist items defined in Specification 01 91 13 Section 2.4 – Pre-Functional Checklists, Sub-section B-1 above

- 5. PFCs shall not require an extension of the project schedule. PFCs require no additional installation work above and beyond the scope of the contract documents. PFC checklist items shall be checked-off as equipment is being installed according to the project schedule. PFCs shall be completed in conjunction with the completion of equipment installations.
- C. PFCs are multi-discipline and therefore must be partially completed by multiple contractors. The division of each PFC is the contractor's responsibility. Division of project work is determined by the CM/GC and subcontractors and is not within the jurisdiction of the Commissioning Agent. Therefore, the division of work outlined within each PFC is generalized and has not taken into account the true scope of each individual sub-contracting company. Each contractor must review every PFC to determine their own obligation to the installation checklist items described therein.
- D. PFCs shall include full calibration documentation of all field calibrated devices as required by the specifications of equipment or controls.
- E. In the event, the Commissioning Agent has omitted a piece of equipment or system component from its applicable PFC form, which is included within the systems to be commissioned, the sub-contractor shall remain responsible for completing a column of checklist items within the appropriate PFC form for that particular piece of equipment or system component. The contractor may bring the omitted item to the attention of the Commissioning Team or Commissioning Agent, whom may in turn provide an additional form for the omitted item. The contractor shall otherwise copy an existing blank PFC form and alter the equipment or system component designation at the top of one column of checklist items to represent the omitted item. The contractor shall then complete the column of checklist items and include the form within the master PFC.
- F. The CM/GC shall be responsible for maintaining a master PFC for each PFC provided by the Commissioning Agent. Each PFC checklist item shall be verified by the responsible contractor and checked-off on the master copy of the respective PFC. Sub-contractors may utilize their personal copies of each PFC's in the field to verify installations and then transfer all checks, notes an initials to the master PFC. Once completed, each master PFC shall be signed by the CM/GC and submitted to the Commissioning Agent for review.
- G. Each PFC checklist item shall be checked by the responsible contractor. The specific individual person who checks off any single item on a PFC shall legibly scribe their personal three-letter initials in the space provided adjacent to the item checkbox. Upon completion of any contractor's portion of checklist items, the responsible manager or field superintendent for that company shall sign their full signature in all required places indicated on the PFC. The day's date shall be scribed next to the signature. Typically, the only signature space shall be on the title page of each PFC.
- H. The CM/GC shall be responsible to verify any general contracting items, for which the sub-contractors are not responsible. The CM/GC shall be responsible for determining these checklist items within each PFC and completing them in kind.
- I. The CM/GC shall be responsible to verify all sub-contractors complete each checklist item for which they are responsible. The CM/GC may complete any outstanding checklist items which have not been completed by the sub-contractors, understanding that by checking and initialing any blank item, the CM/GC accepts responsibility for the truthful state of that installation item.

- J. Checklist items within a PFC shall not require any additional work or installation above and beyond that which is called for in the project construction documents or manufacturer's installation requirements. Items above and beyond the scope outlined within the construction documents or manufacturer's installation requirements may be brought to the attention of the Commissioning Team or Commissioning Agent and will likely be removed from the PFC checklist requirements.
- K. Prior to proceeding with any particular system Functional Performance Test, all PFCs associated with equipment or system components which fall under the scope of that particular system, shall be 100% complete and accepted.
- L. The Commissioning Agent shall require the following for the acceptance of each Pre-Functional Checklist: Each checklist item shall be checked or noted otherwise. Each checklist item shall bear a three-letter initial next to it if an initial space is provided. Each piece of manufacturer's data shall be complete and accurate. Each device calibration checklist shall be complete. Every space on each PFC which requires a signature shall bear the appropriate signature. All marks shall be black and legible according to the Owner or Commissioning Agent.

2.5 START-UP AND TEST REPORTS

A. Contractor(s) shall submit copies of all start-up reports for systems to be commissioned, test reports and any additional reports relating to work performed by subcontractors and manufacturers as required by the project specifications. Reports shall be submitted with the appropriate Pre-Functional Checklists. Reports shall include but are not limited to: equipment start-up, weld tests, pressure tests, system flushing, system cleaning, chemical treatment, equipment repair, feeder tests, grounding tests, electrical equipment tests, gauge calibration, etc.

2.6 FUNCTIONAL PERFORMANCE TESTS

- A. Functional Performance Tests (FPTs) shall be issued by the Commissioning Agent to the Commissioning Team. Each member of the Commissioning Team representing a project contractor shall receive a minimum of one copy of every FPT issued by the Commissioning Agent. Each system FPT shall consist of a multitude of operational procedures which shall encompass all operational procedures for which that system is required to be capable of performing per the contract documents. Each FPT is customized for each system according to the specifications, contract drawings and equipment submittals.
- B. A Functional Performance Test must be completed for each of the systems to be commissioned as outlined in Specification 01 91 13 Section 1.5 Systems to be Included in Commissioning.
- C. It is the contractor's responsibility to estimate the extent and depth of the FTP requirements, based upon the level of involvement required to perform each individual sequence of operations. Each contractor shall be responsible for providing a cost associated with Functional Performance Testing based upon this extent and depth.
 - 1. Functional Performance Tests shall be composed of a very detailed series of step-by-step procedures required to be performed by the installing contractors in order to prove the sequence of operations has been properly met according to the construction documents.
 - 2. FPTs shall include functional test procedures for each operational piece of equipment within a system. Each piece of equipment shall be individually tested for correct operation and load capabilities according to the contract documents. These shall be tested by both the remote BAS

control system as well as any localized controls. Local controls may range from a fully programmable control panel down to a simple disconnect switch. Equipment which has been adjusted by the TAB contractor shall be tested against the information provided by the TAB Contractor within the TAB Report. Certain parameters may be required for Functional Performance Testing which are not fully encompassed within the Test, Adjustment and Balance scope if these parameters are essential for verifying equipment operational characteristics or performance.

- 3. Every sequence of operation shall be tested as identified within the contract documents. Various sequence requirements are outlined within the project specifications and several requirements are outlined within the contract drawings. Sequences tested shall verify equipment integration and overall system performance. Items identified during system testing include correct order of operations and system efficiencies. System sequence of operations testing shall test every sequence of operations for every case-scenario possible. Each sequence of operations shall be tested for each piece of redundant equipment. Each sequence of operations which has a reverse process shall be tested through the reverse process. Sequence of operations test shall encompass all controls devices as well as all major equipment.
- 4. Each auxiliary system requirement shall be tested as identified within the contract documents. Various auxiliary requirements are outlined within the project specifications and several requirements are outlined within the contract drawings. Auxiliaries tested shall verify system alarms, notifications and operation of auxiliary equipment. Equipment failures shall be tested to verify system response. Sub-systems to large systems which have not been functionally tested elsewhere shall be tested, such as a refrigerant pump-out system to a chilled water system.
- D. The contractor must account for performing each Functional Performance Test two (2) times:
 - Upon receipt of each Functional Performance Test, the contractor shall be responsible for reviewing all steps and procedures within, to verify each test is congruent to the applicable system as installed. The contractor is responsible for updating the Commissioning Team and Commissioning Agent of any and all changes within the project which may have an effect on the sequence of operations of any system as it is tested by Functional Performance Test. It is important that the Final Functional Performance Tests, performed in the field and witnessed by the Commissioning Agent are in-fact finalized drafts which encompass all changes made to the systems.
 - 2. The contractor shall be responsible for performing all steps within a Functional Performance Test prior to issuing a formal request for the Commissioning Agent to witness functional testing. The contractor shall utilize the Functional Performance Tests as received from the Commissioning Agent to internally verify all sequences are fully operational. Upon successful completion of each Functional Performance Test, the contractor may request the presence of the Commissioning Agent to witness the test. The Commissioning Agent shall then witness each test in its entirety.

E. Multiple Identical Equipment: A Functional Performance Test shall be provided to test every piece of multiple identical equipment that is non-life safety or otherwise non-critical equipment. The contractor shall be responsible for testing every unit to verify correct operation. All multiple identical equipment shall not necessarily be retested and witnessed by the Commissioning Agent. The Commissioning Agent will select a certain percentage of multiple identical equipment to be tested. These units shall be chosen at random by the Commissioning Agent, during functional testing. A failure of a certain percentage (typically 10%) or greater of the multiple identical equipment tested shall indicate improper installation and performance and shall result in system failure and result in additional testing. Terminal Reheat Boxes are an example of multiple identical equipment which are typically tested by random sampling.

2.7 TAB VERIFICATION

A. The Test, Adjustment and Balance Report is to be spot-checked by the Commissioning Agent. The TAB Contractor shall be required to repeat measurements selected at random by the Commissioning Agent to confirm the accuracy of the submitted report. TAB Verifications shall be included within the scope of the Functional Performance Testing.

2.8 TEST EQUIPMENT

- A. All industry standard test equipment required for performing the specified tests shall be provided by the contractors. Any proprietary vendor specific test equipment shall be provided by that vendor or manufacturer.
- B. Any portable or hand-held setup / calibration devices required to initialize the control system shall be made available by the control vendor (at no cost) to the Commissioning Agent.
- C. The instrumentation provided by the contractor shall meet the following standards:
 - 1. Be of sufficient quality and accuracy to test and/or measure system performance within the tolerances required.
 - 2. Be calibrated at the manufacturer's recommended intervals with calibration tags permanently affixed to the instrument
 - **3**. Be maintained in good repair and operating condition throughout the duration of use on this project.
 - 4. Be immediately replaced if dropped and/or damaged in any way during use on this project.

PART 3 - EXECUTION

- 3.1 COMMISSIONING PLAN AND SCHEDULE
 - A. The Contractor(s) shall submit to the Commissioning Agent a copy of the overall project schedule. The Contractor(s) shall be responsible for submitting updated copies of this schedule to the Commissioning Agent.

- B. The Commissioning Agent will, in coordination with the Commissioning Team, develop a general commissioning schedule with the ideal time frame for implementation of the various commissioning tasks. The Commissioning Schedule will be reviewed with the Owner, the System Design Professional(s) and Construction Manager or General Contractor for integration into the overall project construction schedule. All commissioning tasks as well as critical milestone dates will be tracked on the master project schedule.
- C. The Construction Manager/General Contractor and Contractor(s) shall be responsible for providing periodic updates to the commissioning tasks within the master schedule, identifying areas where commissioning is falling behind schedule.
- D. After the pre-construction meeting, a Commissioning Kick-Off Meeting will be held and attended by all Contractor(s) involved in the commissioning process. A commissioning plan will be distributed at this meeting to the Construction Manager or General Contractor, System Design Professional(s), and prime contractors outlining the specific commissioning process for this project and the names and contact information, to be determined at this meeting, of all commissioning team members. A final plan will be issued soon after the meeting listing all team contact information.

3.2 CONSTRUCTION OBSERVATION

- A. The Architect and System Design Professional(s) may make standard construction inspection site visits as required by their respective contracts with the Owner.
- B. Construction observation by the Commissioning Agent is required as part of the commissioning and coordination process. A specific number of scheduled site visits will be provided during construction and prior to Functional Performance Testing. Functional Performance Testing shall not be for the purposes of installation inspection and shall be scheduled separately.

3.3 PRE-FUNCTIONAL CHECKLISTS AND FUNCTIONAL PERFORMANCE TEST PROCEDURES

A. Pre-functional checklists and functional performance testing forms will be provided by the Commissioning Agent after equipment submittal and start-up information is provided by the contractors to the Commissioning Agent. The contractors shall use only PFC and FPT forms provided by the Commissioning Agent. PFC and FPT forms are required to be completed by the Contractor(s) and approved by the Commissioning Agent.

3.4 PRE-FUNCTIONAL CHECKLISTS - OBSERVATION

- A. The pre-functional checklist forms shall be completed by the installing contractor, manufacturer's, and all others with related involvement with the commissioned equipment. The test forms shall be signed verifying completion by the Construction Manager or General Contractor and all related contractors and sub-contractors. The Commissioning Agent shall spot check forms to verify completion. If the spot check reveals discrepancies, the contractors will be required to redo the forms. The Commissioning Agent again spot check the forms and will invoice the Owner for additional time, plus expenses, required for any retesting required due to failed PFCs, and the Owner at his discretion may deduct this cost from the Construction Manager or General Contractor's Application for Payment. It is the contractor's responsibility to properly install equipment and components and verify such prior to inviting the Commissioning Agent to spot check these installations.
- B. Checklists shall be completely comprehensive and to the extent necessary to enable the Commissioning Agent to assure the Owner and System Design Professional(s) that the systems are installed correctly.

3.5 FUNCTIONAL PERFORMANCE TESTING - OBSERVATION

- A. The functional performance testing shall be performed by the installing contractor. The Commissioning Agent shall direct and witness final testing. The Contractor(s) shall initiate the tests provided by the Commissioning Agent, debug the systems, and verify compliance prior to requesting the tests be witnessed by the Commissioning Agent. The Commissioning Agent, upon witness of any system functional deficiency shall require complete retesting. The Commissioning Agent will invoice the Owner for additional time, plus expenses, required for any retesting required due to failed FPTs, and the Owner, at his discretion, may deduct this cost from the CM/GC's Application for Payment. It is the contractor's responsibility to properly de-bug systems and verify successful system performance prior to inviting the Commissioning Agent to witness the test.
- B. Tests shall be completed comprehensively and to the extent necessary to enable the Commissioning Agent to assure the Owner and System Design Professional(s) that the systems do perform per the design intent.

3.6 TRAINING

- A. The Commissioning Agent shall review the Contractor(s) Training Plan for adequacy. The Contractor(s) may otherwise utilize forms provided by the Commissioning Agent to facilitate the Training Plan. Forms shall facilitate the scheduling, agendas, and Operations and Maintenance Staff review of each training session.
- B. The Contractor(s) shall be required to complete all training requirements set forth throughout the specifications. The Commissioning Agent shall verify all training requirements have been met through collection of all training documentation. The Commissioning Agent shall review the training documentation for approval.

3.7 EXCLUSIONS

- A. Responsibility for construction means and methods: The Commissioning Agent is not responsible for construction means, methods, job safety, or any construction management functions on the job site.
- B. Hands-on work by the Commissioning Agent: The contractors shall provide all services requiring tools or the use of tools to start-up, test, adjust, or otherwise bring equipment and systems into a fully operational state. The Commissioning Agent shall coordinate and observe these procedures (and may make minor adjustments), but shall not perform construction or technician services other than verification of testing, adjusting, balancing, and control functions.

3.8 PREREQUISITES TO SUBSTANTIAL COMPLETION

- A. All commissioning of systems must be complete prior to Substantial Completion. Exceptions to this are the planned control system training performed after occupancy and any required seasonal or approved deferred testing. Prerequisites include for all systems, but are not limited to:
 - 1. Completed and signed start-up and pre-functional checklist documentation
 - 2. Submission of final approved TAB report
 - **3**. Completion of all functional testing

- 4. Required training of Owner personnel completed and approved
- 5. Submission of the approved O&M manuals
- 6. All identified deficiencies have been corrected or are approved by the Owner for substantial completion.
- B. The Owner's Project Manager will determine the date of Functional Completion after reviewing the Commissioning Agent's recommendation for Substantial Completion.
- **C.** Commissioning activities are non-compensable and cannot be a cause for delay claims. Failure of the contractors to complete all work, including commissioning activities, in a timely manner resulting in overall project delays shall be the fault of the contractor.

3.9 COMMISSIONING DURING WARRANTY PERIOD

- A. System review will be conducted at 10 months after Substantial Completion of the entire project. This review will be concentrated on outstanding commissioning issues, operational deficiencies, equipment failure, building operator and occupant complaints, and results from automated controls systems monitoring and trending. Documentation will be made of all systems operation, maintenance, performance, systems alterations and changes, and re-testing and re-commissioning needs, as required.
- B. Contractors are required to assist in this testing in the same manner as specified for functional testing during construction.

END OF SECTION 01 91 13

SECTION 024116 - 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 buildings.
 - 2. Removing below-grade construction.
 - 3. Disconnecting, capping or sealing, and removing site utilities.
- B. Related Requirements:
 - 1. Section 01 1000 "Summary" for use of the premises and phasing requirements.
 - 2. Section 01 3200 "Construction Progress Documentation" for preconstruction photographs taken before building demolition.
 - 3. Section 02 4119 "Selective Demolition" for partial demolition of buildings, structures, and site improvements.
 - 4. Section 31 1000 "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 unless indicated to be salvaged.
- B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and store. Include fasteners or brackets needed for reattachment elsewhere.

1.4 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.
- B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
 - 1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.5 PREINSTALLATION MEETINGS

- A. Pre-demolition 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 adjoining buildings and improvements to remain.
 - 7. Review items to be salvaged and returned to Owner.
 - 8. Review schedule and timely removal of demolished materials from the project site.

1.6 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. Adjoining Buildings: Detail special measures proposed to protect adjoining buildings to remain.
 - 2. Buildings in Vicinity: Detail special measures proposed to maintain to maximum extent possible the public convenience services, and health and safety conditions for the families in the immediate neighborhoods surrounding the school.
- 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 of utility services.
- E. Pre-demolition 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 01 3233 "Photographic Documentation." Submit before the Work begins.
- F. Rodent Control: Prior to commencing demolition, the Contractor shall submit certification that the structures to be demolished have been properly exterminated of rodents and other household pests by a licensed pest control business.
- G. 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 CLOSEOUT SUBMITTALS

A. Inventory: Submit a list of items that have been removed and salvaged.

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. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- C. Hazardous Materials: are 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. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified by the Owner.
- D. 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.

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 31 2000 "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. Engage a professional engineer to perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during building demolition operations.
- 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.
- B. Salvaged Items: Comply with the following:
 - 1. Clean salvaged items of dirt and demolition debris.
 - 2. Pack or crate items after cleaning. Identify contents of containers.
 - 3. Store items in a secure area until delivery to Owner.
 - 4. Transport items to storage area designated by Owner.
 - 5. Protect items from damage during transport and storage.
 - 6. Prepare a written inventory of items, numbers/quantities of items and location of items to the Owner.

3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Utilities to be Disconnected: Locate, identify, disconnect, and seal or cap off utilities serving structures to be demolished.
 - 1. Arrange to shut off utilities with utility companies.
 - 2. If removal of utility services will affect adjoining buildings, then provide temporary utilities that bypass structures to be demolished and that maintain continuity of service for work to be performed in other structures.
 - 3. Do not start demolition work until utility disconnecting and sealing have been completed and verified in writing.

3.4 **PROTECTION**

- A. Existing Facilities: Protect adjoining construction to remain and any building or site features to remain during demolition operations.
- 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 or of adjoining construction to remain.
- C. Existing Utilities to Remain: Maintain utility services to remain and protect from damage during demolition operations.
- 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 adjoining buildings and facilities from damage due to demolition activities.
 - 2. Protect existing site improvements, appurtenances, and landscaping to remain.
 - 3. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.
 - 4. Provide temporary barricades and other protection required to prevent injury to people and damage to adjoining buildings and facilities to remain.
 - 5. Provide protection to ensure safe passage of people around building demolition area.
 - 6. Protect walls, windows, roofs, and other adjoining exterior construction that are to remain and that are exposed to building demolition operations.
- 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 fire watch during and for at least 4 hours after flame-cutting operations.
 - 3. Maintain adequate ventilation when using cutting torches.
 - 4. 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 traffic ways 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. When removing concrete slabs, the slab must be saw-cut at the limits of removal to assure a smooth, uniform joint with new concrete installation.
- C. Carefully remove masonry walls adjacent to or covering existing historic masonry to remain using hand work as required to cause the least amount of damage to the masonry to remain.
- D. 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.
- E. Salvage: Items to be removed and salvaged are indicated on Drawings.
- F. Below-Grade Construction: Demolish foundation walls and other below-grade construction.
 - 1. Remove below-grade construction, including basements, foundation walls, and footings, completely.
- G. Existing Utilities: Demolish and remove existing utilities and below-grade utility structures.
- H. Hydraulic Elevator Systems: Demolish and remove elevator system, including cylinder, plunger, well assembly, steel well casing and liner, oil supply lines, and tanks.

3.7 SITE RESTORATION

A. Below-Grade Areas: Completely fill below-grade areas and voids resulting from building demolition operations with satisfactory soil materials according to backfill requirements in Section 312000 "Earth Moving."

3.8 REPAIRS

A. Promptly repair damage to adjacent buildings caused by demolition operations.

STRUCTURE DEMOLITION

3.9 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.
- B. Do not burn demolished materials.

3.10 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 4116

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SECTION 024119 – 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 historic building or structure including but not limited to;
 - a. A-Building; transformer vault.
 - b. A-Building; stage and stage mezzanine at west end and balcony at east end.
 - c. A-Building to B-Building connector; exterior access stair to the north of the building.
 - d. B-Building; east side half level stairs to C Building
 - e. B-Building; interior floor slab modifications at existing interior stair reconfigurations.
 - f. B-Building; east side of building, removal of B-Building to C-Building elevator shaft.
 - g. B-Building; north side and east side of building, demolition related to the new construction north addition and the C-Building addition.
 - 2. Salvage of existing items to be reused or recycled.
- B. Related Requirements:
 - 1. Section 011000 "Summary" for restrictions on use of the premises, Owner-occupancy requirements, and phasing requirements.
 - 2. Section 013591 "Historic Treatment Procedures" for general historic requirements.
 - 3. Section 015639 "Temporary Tree and Plant Protection" for temporary protection of existing trees and plants that are affected by selective demolition.
 - 4. Section 017300 "Execution" for cutting and patching procedures.
 - 5. Section 013516 "Alteration Project Procedures" for general protection and work procedures for alteration projects.
 - 6. Section 311000 "Site Clearing" for site clearing and removal of above- and below-grade improvements not part of selective demolition.

1.3 DEFINITIONS

A. Remove: Carefully detach items from existing historic construction and dispose of them off-site unless indicated to be salvaged or reinstalled.

- B. Remove and Salvage: Carefully detach items from existing historic construction, in a manner to prevent damage, and store.
- C. Remove and Reinstall: Carefully detach items from existing historic construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.
- D. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.
- E. Dismantle: To carefully 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.
- B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
 - 1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.5 PREINSTALLATION MEETINGS

- A. Predemolition Conference: Conduct conference at Project site.
 - 1. Review minutes of Preliminary Historic Treatment Conference that pertain to removal and dismantling procedures and protection of historic areas and surfaces.
 - 2. Inspect and discuss condition of each type of construction to be selectively demolished.
 - 3. Review structural load limitations of existing structure.
 - 4. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
 - 5. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
 - 6. Review areas where existing construction is to remain and requires protection.

1.6 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 to be Coordinated with and Included in the Historic Treatment Subschedule: 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.
- E. Pre-demolition 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.

1.7 CLOSEOUT SUBMITTALS

A. Inventory: Submit a list of items that have been removed and salvaged.

1.8 QUALITY ASSURANCE

- A. Historic Treatment Program: Provide a written, detailed description of materials, methods, equipment, and sequence of operations to be used for each phase of demolition work, including protection of surrounding and substrate materials.
- B. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

1.9 FIELD CONDITIONS

- A. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- B. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- C. 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. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified by the Owner.

- D. Historic Areas: Demolition and hauling equipment and other materials shall be of sizes that clear surfaces within historic spaces, areas, rooms, and openings, including temporary protection, by 12 inches or more.
- 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.

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. Engage a professional engineer to perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned

collapse of any portion of structure or adjacent structures during selective building demolition operations.

- 1. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.
- D. Verify that hazardous materials have been remediated before proceeding with building demolition operations.
- E. 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. Arrange to shut off utilities with utility companies.
 - 2. 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.
 - 3. 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. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
 - e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.

- f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
- g. 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.
 - 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. 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. Cut holes and slots neatly to size required, with minimum disturbance of adjacent work. 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 fire watch during and for at least four hours after flame-cutting operations.
 - 6. Maintain adequate ventilation when using cutting torches.

- 7. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
- 8. Remove masonry and structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
- 9. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
- 10. 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. Removing Items on or Near Historic Surfaces:
 - 1. Protect historic surface from contact with or damage by tools.
 - 2. Support each item as it becomes loosened to prevent stress and damage to the adjacent historic surface.
 - 3. Dismantle anchorages.
- D. Removing Masonry Walls:
 - 1. Remove masonry carefully, and erect temporary bracing and supports as needed to prevent collapse of materials being removed.
 - 2. Dismantle top edge and sides before removing wall. Stop work and inform Architect if any structural elements above or adjacent to the work show signs of distress or dislocation during any phase of removal work.
 - 3. Remove wall in easily managed pieces.
 - 4. During removal, maintain the stability of the partially remaining wall.
- E. Removed and Salvaged Items:
 - 1. Clean salvaged items.
 - 2. Pack or crate items after cleaning. Identify contents of containers.
 - 3. Store items in a secure area until delivery to Owner.
 - 4. Transport items to Owner's storage area on-site designated by Owner.
 - 5. Protect items from damage during transport and storage.
- F. 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.
- G. 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 Slabs-on-Grade: Carefully saw-cut perimeter of area to be demolished in a straight, true line, and then break up and remove.
- C. 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.
- D. 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 Sections 070150.19, "Preparation for Re-Roofing and 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 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.

END OF SECTION 024119

SECTION 033000 - 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.
- B. Related Requirements:
 - 1. Section 312000 "Earth Moving" for drainage fill under slabs-on-grade.
 - 2. Section 321313 "Concrete Paving" 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, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.
- B. W/C Ratio: The ratio by weight of water to cementitious materials.

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. 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.
 - 3. Laboratory Test Reports: For liquid floor treatments and curing and sealing compounds, indicating compliance with requirements for low-emitting materials.
- C. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
 - 1. Indicate amounts of mixing water to be withheld for later addition at Project site.

- D. 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.
- E. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
 - 1. Location of construction joints is subject to approval of the Architect.

1.5 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For each of the following, signed by manufacturers:
 - 1. Cementitious materials.
 - 2. Admixtures.
 - 3. Form materials and form-release agents.
 - 4. Steel reinforcement and accessories.
 - 5. Fiber reinforcement.
 - 6. Waterstops.
 - 7. Curing compounds.
 - 8. Floor and slab treatments.
 - 9. Bonding agents.
 - 10. Adhesives.
 - 11. Vapor retarders.
 - 12. Semirigid joint filler.
 - 13. Joint-filler strips.
 - 14. Repair materials.
- B. Material Test Reports: For the following, from a qualified testing agency:
 - 1. Aggregates: Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.
- C. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer, detailing fabrication, assembly, and support of formwork.
 - 1. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and reshoring installation and removal.
- D. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.
- E. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. 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. 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.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage
- B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

1.8 FIELD CONDITIONS

- A. 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 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.
- B. Hot-Weather Placement: Comply with ACI 301 and as follows:
 - 1. Maintain concrete temperature below 90 deg F 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.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

- A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
 - 1. ACI 301.
 - 2. ACI 117.

2.2 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that 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.
 - 2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - a. High-density overlay, Class 1 or better.
 - b. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
 - c. Structural 1, B-B or better; mill oiled and edge sealed.
 - d. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.
 - 3. Overlaid Finnish birch plywood.
- 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. Void Forms: Biodegradable paper surface, treated for moisture resistance, structurally sufficient to support weight of plastic concrete and other superimposed loads.
- D. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.
- E. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.
- F. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.
 - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- G. Form Ties: Factory-fabricated, removable or snap-off glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
 - 1. Furnish units that leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
 - 2. Furnish ties that, when removed, leave holes no larger than 1 inch in diameter in concrete surface.
 - 3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.3 STEEL REINFORCEMENT

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 60 percent.
- B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- C. Deformed-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, flat sheet.

2.4 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.
- B. 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.

2.5 CONCRETE MATERIALS

- A. Regional Materials: Concrete shall be manufactured within 500 miles of Project site from aggregates and cementitious materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.
- B. 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.
- C. Cementitious Materials:
 - 1. Portland Cement: ASTM C 150/C 150M, Type I/II Fly Ash: ASTM C 618, Class F
 - 2. Slag Cement: ASTM C 989/C 989M, Grade 100 or 120.
 - 3. Silica Fume: ASTM C 1240, amorphous silica.
- D. Normal-Weight Aggregates: ASTM C 33/C 33Mcoarse aggregate or better, graded. Provide aggregates from a single source
 - 1. Maximum Coarse-Aggregate Size: 1-1/2 inches
 - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- E. Lightweight Aggregate: ASTM C 330/C 330M, 3/4-inch nominal maximum aggregate size.
- F. Air-Entraining Admixture: ASTM C 260/C 260M.
- G. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do 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.
- H. Water: ASTM C 94/C 94M and potable.

2.6 WATERSTOPS

- A. Flexible PVC Waterstops: CE CRD-C 572, with factory-installed metal eyelets, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.
 - 1. Profile: Ribbed with center bulb -
 - 2. Dimensions: 4 inches by 3/16 inch thick nontapered.
- B. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 3/4 by 1 inch.

2.7 VAPOR RETARDERS

A. Sheet Vapor Retarder: ASTM E 1745, Class AInclude manufacturer's recommended adhesive or pressure-sensitive tape.

2.8 LIQUID FLOOR TREATMENTS

- A. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces.
 - 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."

2.9 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- C. Water: Potable.
- D. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

2.10 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1752, cork or self-expanding cork.
- B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 according to ASTM D 2240.
- C. Bonding Agent: ASTM C 1059/C 1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.
- D. 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:
 - 1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
- E. Reglets: Fabricate reglets of not less than 0.022-inch- thick, galvanized-steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.
- F. Dovetail Anchor Slots: Hot-dip galvanized-steel sheet, not less than 0.034 inch thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.11 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C 150/C 150M, 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 or coarse sand as recommended by underlayment manufacturer.
 - 4. Compressive Strength: Not less than 4100 psi 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 and that can be filled in over a scarified surface to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C 150/C 150M, 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 or coarse sand as recommended by topping manufacturer.
 - 4. Compressive Strength: Not less than 5000 psi 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. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
- C. 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 w/c ratio below 0.50.

2.13 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Footings: Normal-weight concrete.
 - 1. Minimum Compressive Strength: 4500 psi at 28 days.
 - 2. Maximum W/C Ratio: 0.45.
 - 3. Slump Limit: 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.
 - 4. Air Content: 5.5 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size.
- B. Foundation Walls: Normal-weight concrete.
 - 1. Minimum Compressive Strength: 4500 psi at 28 days.
 - 2. Maximum W/C Ratio: 0.45.
 - 3. Slump Limit: 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.
 - 4. Air Content: 5.5 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size.
- C. Slabs-on-Grade: Normal-weight concrete.
 - 1. Minimum Compressive Strength: 3500 psi at 28 days.
 - 2. Maximum W/C Ratio: 0.50.
 - 3. Slump Limit: 4 inchesplus or minus 1 inch.
 - 4. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.
- D. Suspended Slabs: Normal-weight concrete.
 - 1. Minimum Compressive Strength: 3000 psiat 28 days.
 - 2. Maximum W/C Ratio: 0.50
 - 3. Slump Limit: 4 inches, plus or minus 1 inch.
 - 4. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.

- E. Concrete Toppings: Light-weight concrete.
 - 1. Minimum Compressive Strength: 3000 psi at 28 days.
 - 2. Slump Limit: 4 inches plus or minus 1 inch.
 - 3. Air Content: Do not allow air content of trowel-finished toppings 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 ASTM C 1116/C 1116M, and furnish batch ticket information.
 - 1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK INSTALLATION

- 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 for smooth-formed finished surfaces.
 - 2. Class C, 1/2 inch for rough-formed finished surfaces.
- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Construct 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.
- 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 ITEM INSTALLATION

- 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.
 - 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.
 - 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.

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 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 basement walls in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material are not 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 SHORING AND RESHORING INSTALLATION

- A. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring.
 - 1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.
- B. 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-RETARDER INSTALLATION

- 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 and seal with manufacturer's recommended tape.

3.6 STEEL REINFORCEMENT INSTALLATION

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting 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 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.
- 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.

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. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.

- 3. 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.
- 4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
- 5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
- 6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- 7. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. 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. 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- wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- 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 or more than 1 inch 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 WATERSTOP INSTALLATION

- A. Flexible Waterstops: Install in construction joints and at other joints indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of the Work. Field fabricate joints in waterstops according to manufacturer's written instructions.
- B. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, adhesive bonding, mechanically fastening, and firmly pressing into place. Install in longest lengths practicable.

3.9 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.
- 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 is 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 not to 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 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.

3.10 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 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.

3.11 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. 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 to receive trowel finish.
- C. 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 exposed to view 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, for a randomly trafficked floor surface:
 - a. Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17; for slabs-on-grade.
 - b. 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.
- D. 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.

3.12 MISCELLANEOUS CONCRETE ITEM INSTALLATION

- 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 inplace 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:
 - 1. Coordinate sizes and locations of concrete bases with actual equipment provided.
 - 2. Construct concrete bases as indicated, and extend base not less than 6 inches in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated or unless required for seismic anchor support.
 - 3. Minimum Compressive Strength: **3000 psi**at 28 days.
 - 4. 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.
 - 5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete substrate.
 - 6. Prior to pouring concrete, place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 7. Cast anchor-bolt insert into bases. Install anchor bolts to elevations required for proper attachment to supported 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.

3.13 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. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. 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 remainder of curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

- E. 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 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, 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 does not interfere with bonding of floor covering used on Project.
 - 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project.
 - 4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.14 LIQUID FLOOR TREATMENT APPLICATION

- 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 seven 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.
- B. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller according to manufacturer's written instructions.

3.15 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 joints clean and dry.
- C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.16 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 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 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 in any dimension to solid concrete. Limit cut depth to 3/4 inch. 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 matches 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 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 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 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 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 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.

3.17 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Inspections:
 - 1. Steel reinforcement placement.
 - 2. Headed bolts and studs.
 - 3. Verification of use of required design mixture.
 - 4. Concrete placement, including conveying and depositing.
 - 5. Curing procedures and maintenance of curing temperature.
 - 6. 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/C 172M 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., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
 - 2. 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.

- 3. Air Content: ASTM C 231/C 231M, 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.
- 4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample.
- 5. Unit Weight: ASTM C 567/C 567M, 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.
- 6. Compression Test Specimens: ASTM C 31/C 31M.
 - a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
- 7. 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.
- 8. When strength of field-cured cylinders is less than 85 percent of companion laboratorycured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
- 9. 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.
- 10. 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.
- 11. 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.
- 12. 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.
- 13. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- 14. 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 within 48 hours of finishing.

3.18 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 033000

SECTION 040310 - HISTORIC MASONRY CLEANING

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 historic treatment work consisting of cleaning all exterior and exposed interior brick and cast stone masonry in the existing buildings to remain (A-Building, B-Building and Connector);
 - 1. Historic clay brick
 - 2. Historic cast stone masonry
 - 3. Historic glazed terra cotta
- B. Cleaning methods and materials are intended to be most gentle, least destructive, effective methods for restoration of the building masonry. All care shall be taken to avoid damage to the building historic fabric.
- C. Related Requirements:
 - Specifications:
 - a. Section 013591 HISTORIC TREATMENT PROCEDURES
 - b. Section 040320 HISTORIC UNIT MASONRY REPAIR
 - c. Section 040340 HISTORIC UNIT MASONRY REPOINTING
 - 2. Drawings: BUILDING ELEVATIONS and DETAILS.

1.3 DEFINITIONS

1.

- A. Very Low-Pressure Spray: Less than 100 psi.
- B. Low-Pressure Spray: 100 to 400 psi; 4 to 6 gpm.

1.4 PREINSTALLATION MEETINGS

- A. Pre-installation Conference: Conduct conference on historic masonry cleaning, repair and repointing at Project site.
 - 1. Review methods and procedures related to cleaning historic masonry, including, but not limited to, the following:
 - a. Historic treatment specialist's personnel, equipment, and facilities needed to make progress and avoid delays.
 - b. Materials, material application, and sequencing.
 - c. Protection of adjacent materials and landscaping/planting.
 - d. Quality-control program.

- e. Environmental protection plan.
- f. Fire-protection plan.
- g. Cleaning program.

1.5 SEQUENCING AND SCHEDULING

- A. Work Sequence: Perform historic masonry cleaning work within the following Historic Masonry Cleaning, Repair & Repointing sequence (or obtain formal written approval from the Architect for a modified procedure):
 - 1. Remove plant growth.
 - 2. Clean brick and stone masonry with soda blast.
 - 3. After soda blasting has been completed, perform a final rinse to remove residues from the masonry. Water flush the site sufficiently to prevent damage to the surrounding foliage from increased soda ph.
 - 4. Clean terra cotta with detergent solution and rinse as required.
 - 5. Inspect masonry for open mortar joints and masonry areas requiring repair.
 - 6. Remove remaining paint and rust stains from brick and stone masonry as well as terra cotta.
 - 7. Rake out mortar from joints surrounding masonry to be replaced and from joints adjacent to masonry repairs along joints.
 - 8. Rake out terra cotta sealant joints (it appears that most terra cotta to terra cotta joints have been replaced with sealant joints).
 - 9. Repair masonry, including replacing existing masonry with salvaged masonry materials.
 - 10. Remove existing stone coping and replace with new as indicated on the drawings and in the specifications.
 - 11. Rake out mortar from all joints to be repointed.
 - 12. Repoint mortar joints and reseal sealant joints (sealant only between dissimilar masonry materials and as noted at new stone coping installation).
 - 13. After repairs and repointing have been completed, perform a final cleaning to remove residues from this work.
- B. As scaffolding is removed, patch anchor holes used to attach scaffolding. Patch any holes in masonry units according to Section 040340 HISTORIC UNIT MASONRY REPAIR. Patch holes in mortar joints according to historic masonry repointing Sections.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product or process.
 - 1. Include material descriptions and application instructions.
 - 2. Include test data substantiating that products comply with requirements.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For historic treatment specialists including field supervisors and workers paint-remover manufacturer and chemical-cleaner manufacturer.
- B. Environmental protection plan detailing the application and collection of cleaning solution as well as rinsing solution.

C. Unit Masonry Historic Treatment Program.

1.8 QUALITY ASSURANCE

- A. Historic Treatment Specialist Qualifications: A qualified historic masonry cleaning specialist. Experience cleaning new masonry work is insufficient experience for historic treatment work.
- B. Paint-Remover Manufacturer Qualifications: A firm regularly engaged in producing masonry paint removal and cleaning processes that have been used for similar applications with successful results, and with factory-authorized service representatives who are available for consultation and Project-site inspection and on-site assistance.
- C. Chemical-Cleaner Manufacturer Qualifications: A firm regularly engaged in producing masonry cleaners that have been used for similar applications with successful results, and with factory-authorized service representatives who are available for consultation and Project-site inspection and on-site assistance.
- D. Sodium Bicarbonate based Blast Media Manufacturer Qualifications: A firm regularly engaged in producing sodium bicarbonate-based blast media that has been used is similar applications with successful results in removing atmospheric dirt, paint, rust, and similar stains from clay masonry and cast stone masonry without deleterious effect on the substrate and without objectionable residue if applied per manufacturer's recommendations.
- E. Quality-Control Program: Prepare a written quality-control program for this Project to systematically demonstrate the ability of personnel to properly follow methods and use materials and tools without damaging masonry. Include provisions for written bi-weekly reports of observations of work in place, supervising performance and preventing damage.
- F. Cleaning Program: Prepare a written cleaning program that describes cleaning process in detail, separately for each type of masonry, including materials, methods, sequence, and equipment to be used; protection of surrounding materials; and control of runoff during operations.
 - 1. If materials and methods other than those indicated are proposed for any phase of cleaning work, add to the quality-control program a written description of such materials and methods, including evidence of successful use on comparable projects, and demonstrations to show their effectiveness for this Project.
- G. Mock-Ups: Immediately following conditional approval (pending Mock-Up approval) of Contractor's cleaning materials and cleaning program, prepare mock-ups of cleaning process on existing surfaces to demonstrate aesthetic effects and to set quality standards for materials and execution.
 - 1. Cleaning: Clean a designated area for each type of masonry and surface condition using approved materials and methods.
 - a. For brick masonry; clean two areas of 50sf each with differing dirt and stain characteristics.
 - b. For stone masonry; clean an 8'-0" section of water table stone and one window sill and jamb.
 - c. For terra cotta masonry; clean one area of 25sf.
 - d. Test cleaners and methods on samples of adjacent materials for possible adverse reactions. Do not test cleaners and methods known to have deleterious effect.

- e. Allow a waiting period of not less than seven days after completion of sample cleaning to permit a study of sample panels for negative reactions.
- 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. Revise written Cleaning Program to reflect any changes to materials or process as a result of Mock-Up approvals.

1.9 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit masonry cleaning work to be performed according to product manufacturers' written instructions and specified requirements.
- B. Clean masonry surfaces only when air temperature is 40 deg F and above and is predicted to remain so for at least seven days after completion of cleaning.

PART 2 - PRODUCTS

2.1 GENERAL CLEANING MATERIALS

- A. Water: Potable.
- B. Hot Water: Water heated to a temperature of 140 to 160 deg F.
- C. Detergent Solution, Job Mixed: Solution prepared by mixing 2 cups of tetrasodium pyrophosphate (TSPP), 1/2 cup of laundry detergent, and 20 quarts of hot water for every 5 gal. of solution required.
- D. General Detergent cleaning is to be used for the initial cleaning of terra cotta.

2.2 GENERAL PAINT AND DIRT REMOVERS

- A. Sodium Bicarbonate Blast Media Paint and Dirt Remover: Manufacturer's standard sodium bicarbonate media, water soluble, non-toxic without solvent or caustic chemicals. Contains a flow aid and may be applied wet or dry.
 - 1. Armex Blast Media Maintenance Formula XL.
- B. Application Equipment: Soda blast equipment shall include an air drying device and be capable of delivery from 15 psi to 125 psi. Delivery system shall be light weight and capable of efficient and effective application from scaffolding or a lift device to an approximate height of 75 feet above grade.
- C. Soda-Blasting is to be used for the initial cleaning of brick and stone masonry following the removal of any plant growth.

2.3 CHEMICAL-CLEANING SOLUTIONS

- A. Dilute chemical cleaners with water to produce solutions not exceeding concentration recommended in writing by chemical cleaner manufacturer
- B. Non-acidic, VOC compliant restoration cleaner suitable for exterior glazed terra cotta.
 - 1. Materials by ProSoCo, Inc.
 - a. EnviroKlean EK Restoration Cleaner.
- C. For follow-up cleaning of terra cotta if detergent wash fails to remove atmospheric dirt.

2.4 POULTICES

- A. Poultice: For rust or other stains in cast stone, brick and terra cotta that test resistant to soda blasting and chemical-cleaning, use poulticing procedures and materials appropriate for specific stains.
 - 1. Materials by ProSoCo, Inc.
- B. For final cleaning of rust and other stubborn stains remaining in historic masonry.

2.5 ACCESSORY MATERIALS

- A. Liquid Strippable Masking Agent: Manufacturer's standard liquid, film-forming, strippable masking material for protecting glass, metal, glazed masonry, and polished stone surfaces from damaging effects of cleaning methods
- B. Other Products: Select materials and methods of use based on the following, subject to approval of a mockup:
 - 1. Breathable tarpaulins for protection of planting and foliage during cleaning and postclean rinsing.
 - 2. Do not use products or tools that could do the following:
 - a. Remove, alter, or harm the present condition or future preservation of existing surfaces, including all surrounding and adjacent surfaces.
 - b. Leave residue on surfaces.

PART 3 - EXECUTION

3.1 CLEANING MASONRY, GENERAL

- A. Cleaning Appearance Standard: Cleaned surfaces are to have a uniform appearance as viewed from 20 feet away by Architect.
- B. Proceed with cleaning in an orderly manner; work from bottom to top of each scaffold width and from one end of each elevation to the other. Keep all surfaces wet below the area being cleaned. Ensure that dirty residues and rinse water do not wash over <u>dry</u>, cleaned surfaces.

- C. Use only those cleaning methods indicated and approved for each masonry material and location.
 - 1. Brushes: Do not use wire brushes or brushes that are not resistant to chemical cleaner being used.
 - 2. Spray Equipment: Use spray equipment with pressure gauges that provides controlled application at volume and pressure indicated, measured at nozzle. Adjust pressure and volume to ensure that cleaning methods do not damage masonry.
- D. Perform each cleaning method indicated in a manner that results in uniform coverage of all surfaces, including corners, moldings, and interstices, and that produces an even effect without streaking or damaging masonry surfaces. Keep wall wet below area being cleaned to prevent streaking from runoff.
- E. Perform additional general cleaning, paint and stain removal, and spot cleaning of small areas that are noticeably different when viewed according to the approved mock-ups, so that cleaned surfaces blend smoothly into surrounding areas.
- F. Water Application Methods:
 - 1. Water-Soak Application: Soak masonry surfaces by applying water continuously and uniformly to limited area for time indicated. Apply water at low pressures and low volumes in multiple fine sprays using perforated hoses or multiple spray nozzles. Erect a protective enclosure constructed of polyethylene sheeting to cover area being sprayed.
- G. Sodium Bicarbonate Based Cleaner Application Methods:
 - 1. Apply sodium bicarbonate based blast media to unpainted masonry/concrete and painted masonry/concrete per manufacturer's instructions with approved equipment to completely remove dirt, oil, grease and other surface contaminants.
 - 2. Rinse off residue resulting from blasting process with potable water per manufacturer's instructions to completely remove all traces of media. Protect adjacent grass areas and landscaping from the media effluent. Dispose of effluent in accordance with local laws and environmental regulations.
- H. Chemical-Cleaner Application Methods: Apply chemical cleaners to masonry surfaces according to chemical-cleaner manufacturer's written instructions; use brush application. Do not allow chemicals to remain on surface for periods longer than those indicated or recommended in writing by manufacturer.
 - 1. Rinse off chemical residue and soil by working upward from bottom to top of each treated area at each stage or scaffold setting. Periodically during each rinse, test pH of rinse water running off of cleaned area to determine that chemical cleaner is completely removed. Bottom-to-top rinsing helps ensure thorough and uniform rinse; rinse water leaving bottom of wall while top is being rinsed will be clear only if entire wall is thoroughly rinsed. Entire wall will be wet when rinsing is completed, resulting in more uniform drying and less streaking.
 - 2. Apply neutralizing agent and repeat rinse if necessary to produce tested pH of between 6.7 and 7.5.
- I. After cleaning is complete, remove protection no longer required. Remove tape and adhesive marks.

3.2 PRELIMINARY CLEANING

- A. Removing Plant Growth: Completely remove visible plant, moss, and shrub growth from masonry surfaces. Carefully remove plants, creepers, and vegetation by cutting at roots and allowing remaining growth to dry as long as possible before removal. Remove loose soil and plant debris from open masonry joints to whatever depth they occur.
- B. Preliminary Cleaning: Before beginning general cleaning, report to the Architect any extraneous substances found on any masonry that are resistant to planned cleaning methods.

3.3 CLEANING BRICKWORK

A. Sodium Bicarbonate Blast:

- 1. Use light-weight soda blasting equipment with wet applied standard sodium bicarbonate media to remove all dirt, oil, grease, paint and other surface contaminants.
- 2. Promptly remove residue from the blasting process in accordance with the manufacturer's rinsing procedures.
- 3. Protect surrounding plants, trees, shrubs, and lawn from the residue of the blasting process.
- 4. Provide three cycles of low-pressure water rinse with water at a minimum temperature of 70 degF. Separate cycles by 2 minute intervals.
- 5. Remove soil and softened surface encrustation from surface with cold water applied by low-pressure spray.
- 6. Remove all visible residue from the masonry surface prior to the final rinsing process.
- 7. Rinse from the lowest point on the lift to the highest keeping all surfaces wet below the area being rinsed. Ensure that dirty rinse water does not wash over dry, cleaned surfaces. Thoroughly rinse all jointed areas.
- 8. Provide a final check of the masonry surface for any trace of contaminants.
- 9. Contractor shall dispose of residue as required by local regulatory agencies.
- B. Cleaning with Poultice: As required to treat any stains remaining on historic brick masonry following soda blasting procedures. Follow manufacturer's recommended procedure and materials for specific stains.

3.4 CLEANING GLAZED TERRA COTTA

- A. Detergent Cleaning:
 - 1. Wet surface with warm water applied by low-pressure spray.
 - 2. Scrub surface with detergent solution using medium-soft brushes until soil is thoroughly dislodged and can be removed by rinsing. Use small brushes to remove soil from mortar joints and crevices. Dip brush in solution often to ensure that adequate fresh detergent is used and that surface remains wet.
 - 3. Rinse with cold water applied by low-pressure spray to remove detergent solution and soil.
 - 4. Repeat cleaning procedure above, where required to produce cleaning effect established by mockup.
- B. Cleaning with Poultice: As required to treat any stains remaining on historic brick masonry following soda blasting procedures. Follow manufacturer's recommended procedure and materials for specific stains.

3.5 CLEANING STONEWORK

- A. Sodium Bicarbonate Blast:
 - 1. Use light-weight soda blasting equipment with wet applied standard sodium bicarbonate media to remove all dirt, oil, grease, paint and other surface contaminants.
 - 2. Promptly remove residue from the blasting process in accordance with the manufacturer's rinsing procedures.
 - 3. Protect surrounding plants, trees, shrubs, and lawn from the residue of the blasting process.
 - 4. Provide three cycles of low-pressure water rinse with water at a minimum temperature of 70 degF. Separate cycles by 2 minute intervals.
 - 5. Remove soil and softened surface encrustation from surface with cold water applied by low-pressure spray.
 - 6. Remove all visible residue from the masonry surface prior to the final rinsing process.
 - 7. Rinse from the lowest point on the lift to the highest keeping all surfaces wet below the area being rinsed. Ensure that dirty rinse water does not wash over dry, cleaned surfaces. Thoroughly rinse all jointed areas.
 - 8. Provide a final check of the masonry surface for any trace of contaminants.
 - 9. Contractor shall dispose of residue as required by local regulatory agencies.
- B. Cleaning with Poultice: As required to treat any stains remaining on historic brick masonry following soda blasting procedures. Follow manufacturer's recommended procedure and materials for specific stains.

3.6 FINAL CLEANING

- A. Clean adjacent nonmasonry surfaces of spillage and debris. Use detergent and soft brushes or cloths.
- B. Rinse off roof and flush roof drains, gutters and downspouts.
- C. Remove masking materials, leaving no residues that could trap dirt.

3.7 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections. Allow inspectors use of lift devices and scaffolding, as needed, to perform inspections.
- B. Notify inspectors and Architect's Project representatives in advance of times when lift devices and scaffolding will be relocated. Do not relocate lift devices and scaffolding until inspectors have had reasonable opportunity to make inspections and observations of work areas at lift device or scaffold location.
- C. Manufacturer's Field Service: Engage blast media/equipment manufacturer's and chemicalcleaner manufacturer's factory-authorized service representatives for consultation and Projectsite inspection and provide on-site assistance when requested by Architect. Have blast media/equipment manufacturer's factory-authorized service representatives visit Project site not less than twice to observe progress and quality of the Work.

END OF SECTION 040310

SECTION 040320 - HISTORIC UNIT MASONRY REPOINTING

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 historic treatment work consisting of repointing masonry as follows:
 - 1. Historic brick unit masonry repointing allow for 4,000 sf of repointing brick to brick joints and for complete repointing of B-Building parapet above the watertable stone on both the exterior face and interior face.
 - 2. Historic stone masonry repointing repoint all stone to stone joints and seal all stone to brick joints.
 - 3. Historic terra cotta unit masonry repointing repoint all terra cotta to terra cotta joints and seal all terra cotta to brick joints.
 - 4. Repointing joints with mortar and sealant as indicated. Allow for separate color formulations for each mortar (3 thus Brick, Stone and Terra Cotta).
 - a. Brick to brick joints mortar unless otherwise indicated.
 - b. Stone to stone joints mortar unless otherwise indicated.
 - c. Terra cotta to terra cotta joints mortar unless otherwise indicated.
 - d. Brick to stone joints sealant unless otherwise indicated.
 - e. Brick to terra cotta joints sealant unless otherwise indicated.
 - f. Brick, stone & terra cotta to dissimilar material joints sealant unless otherwise noted.
- B. Related Requirements:
 - 1. Section 013591 HISTORIC TREATMENT PROCEDURES for general historic treatment requirements.
 - 2. Section 040310 HISTORIC MASONRY CLEANING for cleaning requirements for all exterior masonry.
 - 3. Section 040340 HISTORIC UNIT MASONRY REPAIR for repair requirements for exterior masonry.

1.3 UNIT PRICES

- A. Work of this Section is affected by unit prices specified in Section 012200 "Unit Prices."
 - 1. Perform historic brick unit masonry repointing work in excess of specified amount per listed unit price and only as authorized. Authorized work includes only work as directed in writing by the Architect.
 - 2. Unit prices apply to authorized work covered by estimated quantities.

1.4 PREINSTALLATION MEETINGS

- A. Pre-installation Conference: Conduct conference on historic masonry cleaning, repair and repointing at Project site.
 - 1. Review methods and procedures related to repointing historic brick masonry, including, but not limited to, the following:
 - a. Historic treatment specialist's personnel, equipment, and facilities needed to make progress and avoid delays.
 - b. Materials, material application, sequencing, tolerances, and required clearances.
 - c. Quality-control program.
 - d. Fire-protection plan.
 - e. Unit masonry historic treatment program.

1.5 SEQUENCING AND SCHEDULING

- A. Order sand and white and gray portland cement for pointing mortar immediately after approval of mockups. Take delivery of and store at Project site a sufficient quantity to complete Project.
- A. Work Sequence: Perform historic masonry repointing work within the following Historic Masonry Cleaning, Repair & Repointing sequence (or obtain formal written approval from the Architect for a modified procedure):
 - 1. Remove plant growth.
 - 2. Clean brick and stone masonry with soda blast.
 - 3. After soda blasting has been completed, perform a final rinse to remove residues from the masonry. Water flush the site sufficiently to prevent damage to the surrounding foliage from increased soda ph.
 - 4. Clean terra cotta with detergent solution and rinse as required.
 - 5. Inspect masonry for open mortar joints and masonry areas requiring repair.
 - 6. Remove remaining paint and rust stains from brick and stone masonry as well as terra cotta.
 - 7. Rake out mortar from joints surrounding masonry to be replaced and from joints adjacent to masonry repairs along joints.
 - 8. Rake out terra cotta sealant joints (it appears that most terra cotta to terra cotta joints have been replaced with sealant joints).
 - 9. Repair masonry, including replacing existing masonry with salvaged masonry materials.
 - 10. Remove existing stone coping and replace with new as indicated on the drawings and in the specifications.
 - 11. Rake out mortar from all joints to be repointed.
 - 12. Repoint mortar joints and reseal sealant joints (sealant only between dissimilar masonry materials and as noted at new stone coping installation).
 - 13. After repairs and repointing have been completed, perform a final cleaning to remove residues from this work.
- B. As scaffolding is removed, patch anchor holes used to attach scaffolding. Patch any holes in masonry units according to Section 040340 HISTORIC UNIT MASONRY REPAIR. Patch holes in mortar joints according to repointing historic masonry sections.

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.
 - 2. Include recommendations for product application and use. Include test data substantiating that products comply with requirements.
- B. Shop Drawings:
 - 1. Include plans, elevations, sections, and locations of repointing work on the structure.
 - 2. Show provisions for expansion joints or other sealant joints.
 - 3. Show locations of scaffolding and points of scaffolding in contact with masonry. Include details of contact or anchorage.
- C. Samples for Initial Selection (Separate sets for brick, stone, terra cotta): For the following:
 - 1. Pointing Mortar: Submit sets of mortar for pointing in the form of sample mortar strips, 6 inches long by 1/2 inch wide, set in aluminum or plastic channels.
 - a. Have each set contain a close color range of at least three Samples of different mixes of colored sands and cements that produce a mortar matching the existing, cleaned mortar when cured and dry.
 - b. Submit with precise measurements on ingredients, proportions, gradations, and sources of colored sands from which each Sample was made.
 - 2. Sand Type Used for Pointing Mortar: Minimum 8 oz. of each in plastic screw-top jars.
 - a. For blended sands, provide Samples of each component and blend. Identify blend ratio.
 - b. Identify sources, both supplier and quarry, of each type of sand.
 - 3. Sealant materials.
 - 4. Include similar Samples of accessories involving color selection.
- D. Samples for Verification (Separate sets for brick, stone, terra cotta): For the following:
 - 1. Each type, color, and texture of pointing mortar in the form of sample mortar strips, 6 inches long by 1/2 inch wide, set in aluminum or plastic channels.
 - a. Include with each Sample a list of ingredients with proportions of each. Identify sources, both supplier and quarry, of each type of sand and brand names of cementitious materials and pigments if any.
 - 2. Sealant materials.
 - 3. Accessories: Each type of anchor, accessory, and miscellaneous support.

1.7 INFORMATIONAL SUBMITTALS

- 1.8 Qualification Data: For historic treatment specialists including field supervisors and workers.
 - A. Quality-control program.
 - B. Unit Masonry Historic Treatment Program.

1.9 QUALITY ASSURANCE

- A. Historic Treatment Specialist Qualifications: A qualified historic masonry repointing specialist. Experience in pointing or repointing only new or nonhistoric masonry is insufficient experience for masonry historic treatment work.
- B. Quality-Control Program: Prepare a written quality-control program for this Project to systematically demonstrate the ability of personnel to properly follow methods and use materials and tools without damaging masonry. Include provisions for supervising worker performance and preventing damage.
- C. Unit Masonry Historic Treatment Program: Prepare a written, detailed description of materials, methods, equipment, and sequence of operations to be used for each phase of historic treatment work, including protection of surrounding materials and Project site.
 - 1. Include methods for keeping pointing mortar damp during curing period.
 - 2. If materials and methods other than those indicated are proposed for any phase of historic treatment work, add to the quality-control program a written description of such materials and methods, including evidence of successful use on comparable projects, and demonstrations to show their effectiveness for this Project.
- D. Mockups: Immediately following conditional approval (pending mock-up approval) of Contractor's repointing materials and repointing program, prepare mockups of historic treatment on existing surfaces to demonstrate aesthetic effects and to set quality standards for materials and execution.
 - 1. Repointing: Rake out joints in two separate areas each for brick, stone and terra cotta, each approximately 36 inches high by 48 inches wide and repoint one of the areas for each masonry type to demonstrate standard for raking-out, re-pointing procedure and joint profile, and color resolution. Re-point second areas incorporating any comments regarding raking, repointing and color. Continue process until each individual mock-up is aesthetically acceptable to the Architect.
 - 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.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Deliver packaged materials to Project site in manufacturer's original and unopened containers, labeled with manufacturer's name and type of products.
- 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 hydrated lime in manufacturer's original and unopened containers. Discard lime if containers have been damaged or have been opened for more than two days.
- D. Store lime putty covered with water in sealed containers.
- E. Store sand where grading and other required characteristics can be maintained and contamination avoided.

1.11 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit repointing work to be performed according to product manufacturers' written instructions and specified requirements.
- B. Temperature Limits, General: Repoint mortar joints only when air temperature is between 40 and 90 deg F and is predicted to remain so for at least seven days after completion of the Work unless otherwise indicated.
- C. Cold-Weather Requirements: Comply with the following procedures for mortar-joint pointing unless otherwise indicated:
 - 1. When air temperature is below 40 deg F, heat mortar ingredients and existing masonry walls to produce temperatures between 40 and 120 deg F.
 - 2. When mean daily air temperature is below 40 deg F, provide enclosure and heat to maintain temperatures above 32 deg F within the enclosure for seven days after pointing.
- D. Hot-Weather Requirements: Protect mortar-joint pointing when temperature and humidity conditions produce excessive evaporation of water from mortar materials. Provide artificial shade and wind breaks, and use cooled materials as required to minimize evaporation. Do not apply mortar to substrates with temperatures of 90 deg F and above unless otherwise indicated.
- E. For manufactured repair materials, perform work within the environmental limits set by each manufacturer.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Source Limitations: Obtain each type of material for repointing historic masonry (cement, sand, etc.) from single source with resources to provide materials of consistent quality in appearance and physical properties.

2.2 MORTAR MATERIALS

- A. Portland Cement: ASTM C 150/C 150, Type I or Type II; white or gray or both where required for color matching of exposed mortar.
 - 1. Provide cement containing not more than 0.60 percent total alkali when tested according to ASTM C 114.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Factory-Prepared Lime Putty: ASTM C 1489.
- D. Quicklime: ASTM C 5, pulverized lime.
- E. Mortar Sand: ASTM C 144 unless otherwise indicated.
 - 1. Match size, texture, and gradation of existing mortar sand as closely as possible. Blend several sands if necessary to achieve suitable match.
 - 2. Color: Provide natural sand of color necessary to produce required mortar color.
 - 3. Provide sand with rounded edges.
- F. Mortar Pigments: ASTM C 979/C 979M, compounded for use in mortar mixes, and having a record of satisfactory performance in masonry mortars.
- G. Water: Potable.

2.3 ACCESSORY MATERIALS

- A. Sealant Materials:
 - 1. Sealant manufacturer's standard elastomeric sealant(s) of base polymer and characteristics indicated below and according to applicable requirements in Section 079200 JOINT SEALANTS.
 - a. Type: Single-component, nonsag urethane sealant.
 - 2. Colors: Provide colors of exposed sealants to match colors of mortar adjoining installed sealant unless otherwise indicated.
- B. Joint-Sealant Backing:

- 1. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- 2. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended in writing by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.
- C. Masking Tape: Nonstaining, nonabsorbent material; compatible with mortar, joint primers, sealants, and surfaces adjacent to joints; and that easily comes off entirely, including adhesive.
- D. Other Products: Select materials and methods of use based on the following, subject to approval of a mockup:
 - 1. Previous effectiveness in performing the work involved.
 - 2. Minimal possibility of damaging exposed surfaces.
 - 3. Consistency of each application.
 - 4. Uniformity of the resulting overall appearance.
 - 5. Do not use products or tools that could do the following:
 - a. Remove, alter, or harm the present condition or future preservation of existing surfaces, including surrounding surfaces not in Contract.
 - b. Leave residue on surfaces.

2.4 MORTAR MIXES

- A. Preparing Lime Putty: Slake quicklime and prepare lime putty according to appendix to ASTM C 5 and manufacturer's written instructions.
- B. Measurement and Mixing: Measure cementitious materials and sand in a dry condition by volume or equivalent weight. Do not measure by shovel; use known measure. Mix materials in a clean, mechanical batch mixer.
 - 1. Mixing Pointing Mortar: Thoroughly mix cementitious materials and sand together before adding any water. Then mix again adding only enough water to produce a damp, unworkable mix that will retain its form when pressed into a ball. Maintain mortar in this dampened condition for 15 to 30 minutes. Add remaining water in small portions until mortar reaches desired consistency. Use mortar within one hour of final mixing; do not retemper or use partially hardened material.
- C. Colored Mortar: Produce mortar of color required by using specified ingredients. Do not alter specified proportions without Architect's approval.
 - 1. Mortar Pigments: Where mortar pigments are indicated, do not add pigment exceeding 10 percent by weight of the cementitious or binder materials, except for carbon black, which is limited to 2 percent, unless otherwise demonstrated by a satisfactory history of performance.
- D. Do not use admixtures in mortar unless otherwise indicated.

- E. Mixes: Mix mortar materials in the following proportions:
 - 1. Pointing Mortar by Volume: ASTM C 270, Proportion Specification, 1 part portland cement, 2 parts lime, and 7 parts sand.

PART 3 - EXECUTION

3.1 **PROTECTION**

- A. Prevent mortar from staining face of surrounding masonry and other surfaces.
 - 1. Cover sills, ledges, decorative stone work and other projecting items to protect them from mortar droppings.
 - 2. Keep wall area wet below rebuilding and pointing work to discourage mortar from adhering.
 - 3. Immediately remove mortar splatters in contact with exposed masonry and other surfaces.

3.2 MASONRY REPOINTING, GENERAL

- A. Appearance Standard: Repointed surfaces are to have a uniform appearance as viewed from 20 feet away by Architect.
- 3.3 WIDENING JOINTS
 - A. Do not widen a joint.

3.4 REPOINTING MASONRY

- A. Rake out and repoint joints to the following extent:
 - 1. All joints in areas indicated.
 - 2. Joints indicated as sealant-filled joints.
 - 3. Joints at locations of the following defects:
 - a. Holes and missing mortar.
 - b. Cracks 1/16 inch (1.6 mm) or more in width and of any depth.
 - c. Hollow-sounding joints when tapped by metal object.
 - d. Eroded surfaces 1/4 inch (6 mm) or more deep.
 - e. Deterioration to point that mortar can be easily removed by hand, without tools.
 - f. Joints filled with substances other than mortar.
- B. Do not rake out and repoint joints where not required.
- C. Rake out joints as follows, according to procedures demonstrated in approved mockup:
 - 1. Remove mortar from joints to depth of 2-1/2 times joint width, but not less than 3/4 inch (20 mm) or not less than that required to expose sound, unweathered mortar. Do not remove unsound mortar more than 2 inches (50 mm) deep; consult Architect for direction.

- 2. Remove mortar from masonry surfaces within raked-out joints to provide reveals with square backs and to expose masonry for contact with pointing mortar. Brush, vacuum, or flush joints to remove dirt and loose debris.
- 3. Do not spall edges of masonry units or widen joints. Replace or patch damaged masonry units as directed by Architect.
 - a. Cut out mortar by hand with chisel and resilient mallet. Do not use power-operated grinders without Architect's written approval based on approved quality-control program.
- D. Notify Architect of unforeseen detrimental conditions, including voids in mortar joints, cracks, loose masonry units, rotted wood, rusted metal, and other deteriorated items.
- E. Pointing with Mortar:
 - 1. Rinse joint surfaces with water to remove dust and mortar particles. Time rinsing application so, at time of pointing, joint surfaces are damp but free of standing water. If rinse water dries, dampen joint surfaces before pointing.
 - 2. Apply pointing mortar first to areas where existing mortar was removed to depths greater than surrounding areas. Apply in layers not greater than 3/8 inch (9 mm) until a uniform depth is formed. Fully compact each layer thoroughly and allow it to become thumbprint hard before applying next layer.
 - 3. After deep areas have been filled to same depth as remaining joints, point joints by placing mortar in layers not greater than 3/8 inch (9 mm). Fully compact each layer and allow it to become thumbprint hard before applying next layer. Where existing masonry units have worn or rounded edges, slightly recess finished mortar surface below face of masonry to avoid widened joint faces. Take care not to spread mortar beyond joint edges onto exposed masonry surfaces or to featheredge the mortar.
 - 4. When mortar is thumbprint hard, tool joints to match original appearance of joints as demonstrated in approved mockup. Remove excess mortar from edge of joint by brushing.
 - 5. Cure mortar by maintaining in thoroughly damp condition for at least 72 consecutive hours, including weekends and holidays.
 - a. Acceptable curing methods include covering with wet burlap and plastic sheeting, periodic hand misting, and periodic mist spraying using system of pipes, mist heads, and timers.
 - b. Adjust curing methods to ensure that pointing mortar is damp throughout its depth without eroding surface mortar.
 - 6. Hairline cracking within the mortar or mortar separation at edge of a joint is unacceptable. Remove mortar and repoint.
- F. Pointing with Sealant: Comply with Section 079200 "Joint Sealants" and as follows:
 - 1. After raking out, keep joints dry and free of mortar and debris.
 - 2. Clean and prepare joint surfaces. Prime joint surfaces unless sealant manufacturer recommends against priming. Do not allow primer to spill or migrate onto adjoining surfaces.
 - 3. Fill sealant joints with specified joint sealant:
 - a. Install cylindrical sealant backing beneath the sealant. Where space is insufficient for cylindrical sealant backing, install bond-breaker tape.
 - b. Install sealant using only proven installation techniques that ensure that sealant is deposited in a uniform, continuous ribbon, without gaps or air pockets, and with

complete wetting of the joint bond surfaces equally on both sides. Fill joint flush with surrounding masonry and matching the contour of adjoining mortar joints.

- c. Install sealant as recommended in writing by sealant manufacturer but within the following general limitations, measured at the center (thin) section of the bead:
 - 1) Fill joints to a depth equal to joint width, but not more than 1/2 inch (13 mm) deep or less than 1/4 inch (6 mm) deep.
- d. Tool sealant to form smooth, uniform beads, slightly concave. Remove excess sealant from surfaces adjacent to joint.
- e. Do not allow sealant to overflow or spill onto adjoining surfaces, or to migrate into the voids of adjoining surfaces, particularly rough textures. Remove excess and spillage of sealant promptly as the work progresses. Clean adjoining surfaces by the means necessary to eliminate evidence of spillage, without damage to adjoining surfaces or finishes, as demonstrated in an approved mockup.
- G. Where repointing work precedes cleaning of existing masonry, allow mortar to harden at least 30 days before beginning cleaning work.

3.5 FINAL CLEANING

- A. After mortar has fully hardened, thoroughly clean exposed masonry surfaces of excess mortar and foreign matter; use wood scrapers, stiff-nylon or -fiber brushes, and clean water, applied by low-pressure spray.
 - 1. Do not use metal scrapers or brushes.
 - 2. Do not use acidic or alkaline cleaners.
- B. Clean adjacent nonmasonry surfaces. Use detergent and soft brushes or cloths.
- C. Clean mortar and debris from roof; remove debris from gutters and downspouts. Rinse off roof and flush gutters and downspouts.
- D. Remove masking materials, leaving no residues that could trap dirt.

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage qualified testing agencies to perform tests and inspections. Allow inspectors use of lift devices and scaffolding, as needed, to perform inspections.
- B. Notify testing agency and Architect's Project representatives in advance of times when lift devices and scaffolding will be relocated. Do not relocate lift devices and scaffolding until inspectors have had reasonable opportunity to make inspections and observations of work areas at lift device or scaffold location.

END OF SECTION 040320

SECTION 040340 - HISTORIC UNIT MASONRY REPAIR

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 historic treatment work consisting of repairing masonry as follows:
 - 1. Historic brick unit masonry repair -- repairing historic clay brick masonry as follows:
 - a. Repairing unit masonry, including replacing damaged units.
 - b. Removing abandoned anchors.
 - c. Prep and Paint steel uncovered during the work.
 - d. Re-anchoring wythes.
 - 2. Historic stone masonry repair repairing historic stone assemblies as follows:
 - a. Repairing stone masonry, including replacing whole and partial damaged units.
 - b. Removing abandoned anchors.
 - c. Prep and Paint steel uncovered during the work..
 - d. Re-anchoring stone
 - 3. Historic terra cotta masonry repair repairing historic terra cotta masonry as follows;
 - a. Repairing terra cotta masonry, including replacing whole and partial damaged units.
 - b. Removing abandoned anchors.
 - c. Prep and Paint steel uncovered during the work.
 - d. Re-anchoring terra cotta.
 - e. Re-coating eroded unit glazing.
- B. Related Requirements:
 - 1. Section 013591 HISTORIC TREATMENT PROCEDURES for general historic treatment requirements.
 - 2. Section 040310 HISTORIC MASONRY CLEANING
 - 3. Section 040320 HISTORIC UNIT MASONRY REPOINTING
 - 4. Section 076200 SHEET METAL FLASHING AND TRIM for metal flashing installed in or on repaired masonry.

1.3 DEFINITIONS

A. Rebuilding (Setting) Mortar: Mortar used to set and anchor masonry in a structure, distinct from pointing mortar installed after masonry is set in place.

B. Saturation Co-efficient: Ratio of the rate of water absorbed during immersion in cold water to weight absorbed during immersion in boiling water, used as an indication of resistance of terra cotta units to freezing and thawing.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference on historic masonry cleaning, repair and repointing at Project site.
 - 1. Review methods and procedures related to repairing historic brick masonry, including, but not limited to, the following:
 - a. Historic treatment specialist's personnel, equipment, and facilities needed to make progress and avoid delays.
 - b. Materials, material application, sequencing, tolerances, and required clearances.
 - c. Quality-control program.
 - d. Fire-protection plan.
 - e. Unit masonry historic treatment program.

1.5 SEQUENCING AND SCHEDULING

- A. Order sand and white and gray portland cement for colored mortar immediately after approval of mockups. Take delivery of and store at Project site a sufficient quantity to complete Project.
- B. Work Sequence: Perform masonry historic treatment work in the following sequence, which includes work specified in this and other Sections (or obtain written formal approval from the architect for a modified procedure):
 - 1. Remove plant growth.
 - 2. Clean brick and stone masonry with soda blast.
 - 3. After soda blasting has been completed, perform a final rinse to remove residues from the masonry. Water flush the site sufficiently to prevent damage to the surrounding foliage from increased soda ph.
 - 4. Clean terra cotta with detergent solution and rinse as required.
 - 5. Inspect masonry for open mortar joints and masonry areas requiring repair.
 - 6. Remove remaining paint and rust stains from brick and stone masonry as well as terra cotta.
 - 7. Rake out mortar from joints surrounding masonry to be replaced and from joints adjacent to masonry repairs along joints.
 - 8. Rake out terra cotta sealant joints (it appears that most terra cotta to terra cotta joints have been replaced with sealant joints).
 - 9. Repair masonry, including replacing existing masonry with salvaged masonry materials.
 - 10. Remove existing stone coping and replace with new as indicated on the drawings and in the specifications.
 - 11. Rake out mortar from all joints to be repointed.
 - 12. Repoint mortar joints and reseal sealant joints (sealant only between dissimilar masonry materials and as noted at new stone coping installation).
 - 13. After repairs and repointing have been completed, perform a final cleaning to remove residues from this work.

C. As scaffolding is removed, patch anchor holes used to attach scaffolding. Patch any holes in masonry units according to Section 040340 HISTORIC UNIT MASONRY REPAIR. Patch holes in mortar joints according to historic masonry re-pointing sections.

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.
 - 2. Include recommendations for product application and use. Include test data substantiating that products comply with requirements.
- B. Shop Drawings:
 - 1. Include descriptions and locations of masonry repair work on the structure.
 - 2. Show full-size patterns with complete dimensions for salvaged brick, stone or terra cotta units to be used in repair work and their jointing, showing relationship of existing units to new units.
 - 3. Show provisions for expansion joints or other sealant joints.
 - 4. Show provisions for flashing and weep holes as required.
 - 5. Show replacement and repair anchors as required.
 - 6. Show areas of terra cotta re-glazing as required.
- C. Samples for Initial Selection: For the following (Separate sets for brick, stone, terra cotta):
 - 1. Colored Mortar: Submit sets of mortar that will be left exposed in the form of sample mortar strips, 6 inches long by 1/2 inch wide, set in aluminum or plastic channels.
 - a. Have each set contain a close color range of at least six Samples of different mixes of colored sands and cements that produce a mortar matching the existing, cleaned mortar when cured and dry.
 - b. Submit with precise measurements on ingredients, proportions, gradations, and sources of colored sands from which each Sample was made.
 - 2. Sand Types Used for Mortar: Minimum 8 oz. of each in plastic screw-top jars.
 - a. For blended sands, provide Samples of each component and blend. Identify blend ratio.
 - b. Identify sources, both supplier and quarry, of each type of sand.
 - 3. Patching Compound: Submit sets of patching compound Samples in the form of plugs (patches in drilled holes) in sample units of masonry representative of the range of masonry colors on the building.
 - a. Have each set contain a close color range of at least six Samples of different mixes of patching compound that match the variations in existing masonry when cured and dry.
 - 4. Include similar Samples of accessories involving color selection.
- D. Samples for Verification: For the following (Separate sets for brick, stone, terra cotta):
 - 1. Each type of patching compound in the form of briquettes, at least 3 inches long by 1-1/2 inches wide. Document each Sample with manufacturer and stock number or other information necessary to order additional material.
 - 2. Accessories: Each type of anchor, accessory, and miscellaneous support.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For historic treatment specialists including field supervisors and workers.
- B. Quality-control program.
- C. Unit masonry historic treatment program.

1.8 QUALITY ASSURANCE

- A. Historic Treatment Specialist Qualifications: A qualified historic masonry repair specialist. Experience installing standard unit masonry is insufficient experience for masonry historic treatment work.
 - 1. Historic Treatment Worker Qualifications: When masonry units are being patched, assign at least one worker per crew who is trained and certified by manufacturer of patching compound to apply its products.
- B. Quality-Control Program: Prepare a written quality-control program for this Project to systematically demonstrate the ability of personnel to properly follow methods and use materials and tools without damaging masonry. Include provisions for supervising worker performance and preventing damage.
- C. Unit Masonry Historic Treatment Program: Prepare a written, detailed description of materials, methods, equipment, and sequence of operations to be used for each phase of historic treatment work, including protection of surrounding materials and Project site.
 - 1. Include methods for keeping exposed mortar damp during curing period.
 - 2. If materials and methods other than those indicated are proposed for any phase of historic treatment work, add to the quality-control program a written description of such materials and methods, including evidence of successful use on comparable projects, and demonstrations to show their effectiveness for this Project.
- D. Mockups: Prepare mockups of historic treatment on existing surfaces where directed to demonstrate aesthetic effects and to set quality standards for materials and execution, and for fabrication and installation.
 - 1. Masonry Repair: Prepare sample areas for each type of masonry material indicated to have repair work performed. If not otherwise indicated, size each mockup not smaller than two adjacent whole units or approximately 48 inches in least dimension. Construct sample areas in locations in existing walls where directed by Architect unless otherwise indicated. Demonstrate quality of materials, workmanship, and blending with existing work. Include the following as a minimum:
 - a. Replacement/repair:
 - 1) Two brick units replaced/one cracked brick repaired.
 - 2) One stone unit replaced/one cracked stone unit repaired.
 - 3) Two terra cotta units repaired/two eroded units re-surfaced
 - b. Re-anchoring Veneers: Install one masonry repair anchor in mockup wall assembly of each anchor type required.
 - c. Patching: Three small holes at least 1 inch in diameter for each type of masonry material including terra cotta, so as to leave minimal evidence of repair.

- 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 masonry units to Project site strapped together in suitable packs or pallets or in heavyduty cartons and protected against impact and chipping.
- B. Deliver packaged materials to Project site in manufacturer's original and unopened containers, labeled with manufacturer's name and type of products.
- 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 hydrated lime in manufacturer's original and unopened containers. Discard lime if containers have been damaged or have been opened for more than two days.
- E. Store lime putty covered with water in sealed containers.
- F. Store sand where grading and other required characteristics can be maintained and contamination avoided.
- G. Handle masonry units to prevent overstressing, chipping, defacement, and other damage.

1.10 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit repair work to be performed according to product manufacturers' written instructions and specified requirements.
- B. Temperature Limits, General: Repair masonry units only when air temperature is between 40 and 90 deg F and is predicted to remain so for at least seven days after completion of the Work unless otherwise indicated.
- C. Cold-Weather Requirements: Comply with the following procedures for masonry repair unless otherwise indicated:
 - 1. When air temperature is below 40 deg F, heat mortar ingredients, masonry repair materials, and existing masonry walls to produce temperatures between 40 and 120 deg F.
 - 2. When mean daily air temperature is below 40 deg F, provide enclosure and heat to maintain temperatures above 32 deg F within the enclosure for seven days after repair.
- D. Hot-Weather Requirements: Protect masonry repair when temperature and humidity conditions produce excessive evaporation of water from mortar and repair materials. Provide artificial shade and wind breaks, and use cooled materials as required to minimize evaporation. Do not apply mortar to substrates with temperatures of 90 deg F and above unless otherwise indicated.

E. For manufactured repair materials, perform work within the environmental limits set by each manufacturer.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Source Limitations: Obtain each type of material for repairing historic masonry (cement, sand, etc.) from single source with resources to provide materials of consistent quality in appearance and physical properties.

2.2 MASONRY MATERIALS

- A. Face Brick: Provide a minimum of 2,100 salvaged, undamaged, cleaned existing brick masonry units from existing window infill to be carefully removed as indicated on the drawings. Provide in color range and mix percentage representative of existing masonry work. Clean off residual mortar so unit is ready to be re-laid in finish work and be indistinguishable from adjacent masonry.
- B. Stone Units: Provide 10 salvaged, undamaged, cleaned existing limestone belt course four foot units carefully removed from existing three-story addition to be demolished. Also provide 3 belt course outside corners. Clean off residual mortar and sealant and remove staining so units are ready to be re-laid in finish work.
- C. Terra Cotta Units: All existing terra cotta units are intended to be reused with cracks and spalls being repaired and eroded glazing being re-coated.

2.3 MORTAR MATERIALS

- A. Portland Cement: ASTM C 150/C 150M, Type I or Type II; white or gray or both where required for color matching of mortar.
 - 1. Provide cement containing not more than 0.60 percent total alkali when tested according to ASTM C 114.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Factory-Prepared Lime Putty: ASTM C 1489.
- D. Quicklime: ASTM C 5, pulverized lime.
- E. Mortar Sand: ASTM C 144 unless otherwise indicated.
 - 1. Match size, texture, and gradation of existing mortar sand as closely as possible. Blend several sands if necessary to achieve suitable match.
 - 2. Colored Mortar: Provide natural sand of color necessary to produce required mortar color.
 - 3. For exposed mortar, provide sand with rounded edges.

- F. Mortar Pigments: ASTM C 979/C 979M, compounded for use in mortar mixes, and having a record of satisfactory performance in masonry mortars.
- G. Water: Potable.

2.4 MANUFACTURED REPAIR MATERIALS

- A. Brick Patching Compound: Factory-mixed cementitious product that is custom manufactured for patching brick masonry.
 - 1. Use formulation that is vapor and water permeable (equal to or more than the masonry unit), exhibits low shrinkage, has lower modulus of elasticity than the masonry units being repaired, and develops high bond strength to all types of masonry.
 - 2. Use formulation having working qualities and retardation control to permit forming and sculpturing where necessary.
 - 3. Formulate patching compound used for patching brick in colors and textures to match each unit being patched. Provide sufficient number of colors to enable matching the color, texture, and variation of each unit.
- B. Stone Patching Compound: Factory-mixed cementitious product that is custom manufactured for patching stone masonry.
 - 1. Use formulation that is vapor and water permeable (equal to or more than the masonry unit), exhibits low shrinkage, has lower modulus of elasticity than the masonry units being repaired, and develops high bond strength to all types of masonry.
 - 2. Use formulation having working qualities and retardation control to permit forming and sculpturing where necessary.
 - 3. Formulate patching compound used for patching stone in colors and textures to match each unit being patched. Provide sufficient number of colors to enable matching the color, texture, and variation of each unit.
- C. Terra Cotta Re-glazing Compound: Waterborne acrylic epoxy product that is custom manufactured for exterior coating of glazed masonry.
 - 1. Use formulation that is high build, low odor, non-yellowing and face resistant, and stain, abrasion, chemical and moisture resistant.

2.5 ACCESSORY MATERIALS

- A. Masonry Repair Anchors, Spiral Type: Driven-in, Type 304 stainless-steel spiral rods designed to be installed in drilled holes and relying on screw effect rather than adhesive to secure them to backup and veneer. Anchors are flexible in plane of veneer but rigid perpendicular to it.
- B. Setting Buttons and Shims: Resilient plastic, nonstaining to masonry, sized to suit joint thicknesses and bed depths of masonry units, less the required depth of pointing materials unless removed before pointing.
- C. Masking Tape: Nonstaining, nonabsorbent material; compatible with mortar, joint primers, sealants, and surfaces adjacent to joints; and that easily comes off entirely, including adhesive.
- D. Antirust Coating: Fast-curing, lead- and chromate-free, self-curing, universal modified-alkyd primer according to SSPC-Paint 20 or SSPC-Paint 29 zinc-rich coating.

- 1. Surface Preparation: Use coating requiring no better than SSPC-SP 3, "Power Tool Cleaning" surface preparation according to manufacturer's literature or certified statement.
- 2. VOC Limit: Use coating with a VOC content of 400 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- E. Other Products: Select materials and methods of use based on the following, subject to approval of a mockup:
 - 1. Previous effectiveness in performing the work involved.
 - 2. Minimal possibility of damaging exposed surfaces.
 - 3. Consistency of each application.
 - 4. Uniformity of the resulting overall appearance.
 - 5. Do not use products or tools that could do the following:
 - a. Remove, alter, or harm the present condition or future preservation of existing surfaces, including surrounding surfaces not in Contract.
 - b. Leave residue on surfaces.

2.6 MORTAR MIXES

- A. Preparing Lime Putty: Slake quicklime and prepare lime putty according to appendix to ASTM C 5 and manufacturer's written instructions.
- B. Measurement and Mixing: Measure cementitious materials and sand in a dry condition by volume or equivalent weight. Do not measure by shovel; use known measure. Mix materials in a clean, mechanical batch mixer.
- C. Colored Mortar: Produce mortar of color required by using specified ingredients. Do not alter specified proportions without Architect's approval.
 - 1. Mortar Pigments: Where mortar pigments are indicated, do not add pigment exceeding 10 percent by weight of the cementitious or binder materials, except for carbon black which is limited to 2 percent, unless otherwise demonstrated by a satisfactory history of performance.
- D. Do not use admixtures in mortar unless otherwise indicated.
- E. Mixes: Mix mortar materials in the following proportions:
 - 1. Rebuilding (Setting) Mortar by Volume: ASTM C 270, Proportion Specification, 1 part portland cement, 2 parts lime, and 7 parts sand.
 - 2. Colored Mortar: Add mortar pigments to produce exposed, setting (repointing) mortar of colors required.

PART 3 - EXECUTION

3.1 **PROTECTION**

- A. Prevent mortar from staining face of surrounding stone and other surfaces.
 - 1. Cover sills, ledges, decorative stone work and other projecting items to protect them from mortar droppings.
- 2. Keep wall area wet below rebuilding and pointing work to discourage mortar from adhering.
- 3. Immediately remove mortar splatters in contact with exposed masonry and other surfaces.

3.2 STONE REPAIR, GENERAL

A. Repair Appearance Standard: Repaired surfaces are to have a uniform appearance as viewed from 20 feet away by Architect.

3.3 ABANDONED ANCHOR REMOVAL

- A. Remove abandoned anchors, brackets, wood nailers, and other extraneous items no longer in use unless indicated to remain.
 - 1. Remove items carefully to avoid spalling or cracking stone.
 - 2. Notify Architect before proceeding if an item cannot be removed without damaging surrounding stone; do the following where directed:
 - a. Cut or grind off item approximately 3/4 inch beneath surface and core drill a recess of same depth in surrounding stone as close around item as practical.
 - b. Immediately paint exposed end of item with two coats of antirust coating, following coating manufacturer's written instructions and without exceeding manufacturer's recommended dry film thickness per coat. Keep paint off sides of recess.
 - 3. Patch the hole where each item was removed unless directed to remove and replace the stone unit.

3.4 STONE REMOVAL AND REPLACEMENT

- A. At locations indicated, remove stone that has deteriorated or is damaged beyond repair or is to be reused. Carefully remove entire units from joint to joint, without damaging surrounding masonry, in a manner that permits replacement with full-size units.
- B. Support and protect remaining masonry that was supported by removed stone.
- C. Maintain flashing, reinforcement, lintels, and adjoining construction in an undamaged condition. Coordinate with new flashing, reinforcement, and lintels, which are specified in other Sections.
- D. Notify Architect of unforeseen detrimental conditions including voids, cracks, bulges, loose units in existing stone or unit masonry backup, rotted wood, rusted metal, and other deteriorated items.
- E. Remove in an undamaged condition as many whole stone units as possible.
 - 1. Remove mortar, loose particles, and soil from stone by cleaning with hand chisels, brushes, and water.
 - 2. Remove sealants by cutting close to stone with utility knife and cleaning with solvents.
 - 3. Store stone for reuse. Store off ground, on skids, and protected from weather.
 - 4. Deliver cleaned stone not required for reuse to Owner unless otherwise indicated.

- F. Clean masonry surrounding removal areas by removing mortar, dust, and loose particles in preparation for stone replacement.
- G. Replace removed damaged stone with other removed stone and salvaged stone in good condition, where possible, or with new stone matching existing stone. Do not use broken units unless they can be cut to usable size.
- H. Rift: Do not allow face bedding of stone. Before setting, inspect to verify that each stone has been cut so that, when it is set in final position, the rift or natural bedding planes are predominantly horizontal except for arches, where bedding planes are predominantly radial or vertical, but perpendicular to the wall. Reject stone with vertical bedding planes except as required for arches, lintels, and copings.
- I. Install replacement stone into bonding and coursing pattern of existing stone. If cutting is required, use a motor-driven saw designed to cut stone with clean, sharp, unchipped edges. Finish edges to blend with appearance of edges of existing stone.
 - 1. Maintain joint width for replacement stone to match existing joints.
 - 2. Use setting buttons or shims to set stone accurately spaced with uniform joints.
- J. Set replacement stone with rebuilding (setting) mortar and with completely filled bed, head, and collar joints. Butter vertical joints for full width before setting and set units in full bed of mortar unless otherwise indicated. Replace existing anchors with new anchors matching existing configuration.
 - 1. Tool exposed mortar joints in repaired areas to match joints of surrounding existing stonework.
 - 2. Rake out mortar used for laying stone before mortar sets according to Section 040343 "Historic Stone Masonry Repointing. Point at same time as repointing of surrounding area.
 - 3. When mortar is sufficiently hard to support units, remove shims and other devices interfering with pointing of joints.
- K. Curing: Cure mortar by maintaining in thoroughly damp condition for at least 72 consecutive hours, including weekends and holidays.
 - 1. Hairline cracking within the mortar or mortar separation at edge of a joint is unacceptable. Completely remove such mortar and repoint.

3.5 BACKUP MASONRY REMOVAL AND REPLACEMENT

- A. Where backup masonry is fractured or unstable and at locations indicated, remove mortar and masonry units that are broken or deteriorated and rebuild with whole, new brick or whole salvaged units. Carefully remove entire units from joint to joint, without damaging surrounding masonry, in a manner that permits replacement with full-size units.
- B. Support and protect remaining masonry that surrounds removal area.
- C. Maintain flashing, reinforcement, anchors, lintels, and adjoining construction in an undamaged condition. Coordinate with new flashing, reinforcement, and lintels, which are specified in other Sections.

- D. Notify Architect of unforeseen detrimental conditions including voids, cracks, bulges, loose units beyond the removal area, rotted wood, rusted metal, and other deteriorated items.
- E. Remove in an undamaged condition as many whole bricks as possible.
 - 1. Remove mortar, loose particles, and soil from brick by cleaning with hand chisels, brushes, and water.
 - 2. Remove sealants by cutting close to brick with utility knife and cleaning with solvents.
 - 3. Store brick for reuse. Store off ground, on skids, and protected from weather.
 - 4. Deliver cleaned brick not required for reuse to Owner unless otherwise indicated.
- F. Clean masonry surrounding removal areas by removing mortar, dust, and loose particles in preparation for brick replacement.
- G. Replace removed damaged brick with salvaged backup brick in good condition. Do not use broken units unless they can be cut to usable size.
- H. Install replacement brick into bonding and coursing pattern of existing brick. If cutting is required, use a motor-driven saw designed to cut masonry with clean, sharp, unchipped edges.
- I. Lay replacement brick with rebuilding (setting) mortar and with completely filled bed, head, and collar joints. Butter ends with sufficient mortar to fill head joints and shove into place. Wet both replacement and surrounding bricks that have ASTM C 67 initial rates of absorption (suction) of more than 30 g/30 sq. in. per min.. Use wetting methods that ensure that units are nearly saturated but surface is dry when laid.
- J. Curing: Cure mortar by maintaining in thoroughly damp condition for at least 72 consecutive hours, including weekends and holidays.
 - 1. Hairline cracking within the mortar or mortar separation at edge of a joint is unacceptable. Completely remove such mortar and repoint.

3.6 PAINTING STEEL UNCOVERED DURING THE WORK

- A. Notify Architect if steel is exposed during stone removal. Where Architect determines that it is structural, or for other reasons cannot be totally removed, prepare and paint steel as follows:
 - 1. Surface Preparation: Remove paint, rust, and other contaminants according to SSPC-SP 3, "Power Tool Cleaning,", as applicable to comply with paint manufacturer's recommended preparation.
 - 2. Antirust Coating: Immediately paint exposed steel with two coats of antirust coating, following coating manufacturer's written instructions and without exceeding manufacturer's recommended rate of application (dry film thickness per coat).
- B. If on inspection and rust removal, the thickness of a steel member is found to be reduced from rust by more than 1/16 inch, notify Architect before proceeding.

3.7 STONE REPLACEMENT

A. For defective existing stone unit, carefully remove stone at nearest horizontal and vertical joints.

- B. Remove mortar from joints that abut the stone. Remove loose mortar particles and other debris from surfaces to be bonded and surfaces of adjacent stone units that will receive mortar by cleaning with stiff-fiber brush.
- C. Concealed Pinning: Before setting, prepare for concealed mechanical anchorage consisting of 1/4-inch- diameter, plain stainless-steel pins set into 1/4-inch- diameter holes drilled into stone located as per original stone.

3.8 STONE-FRAGMENT REPAIR

- A. Carefully remove cracked or fallen stone fragment indicated to be repaired. Reuse only stone fragment that is in sound condition.
- B. Remove soil, loose particles, mortar, and other debris or foreign material, from fragment surfaces to be bonded and from parent stone where fragment had broken off, by cleaning with stiff-fiber brush.
- C. Concealed Pinning: Before applying adhesive, prepare for concealed mechanical anchorage consisting of 1/4-inch- diameter, plain stainless-steel pins set into 1/4-inch- diameter holes drilled into parent stone and into, but not through, the fragment. Center and space pins 3 to 5 inches apart and at least 2 inches from any edge. Insert pins at least 2 inches in parent stone and 2 inches in fragment, but no closer than 3/4 inch from exposed face of fragment.
- D. Apply stone-to-stone adhesive according to adhesive manufacturer's written instructions. Coat bonding surfaces of fragment and parent stone, completely filling all crevices and voids.
- E. Fit stone fragment onto parent stone while adhesive is still tacky and hold fragment securely in place until adhesive has cured. Use shims, clamps, wedges, or other devices as necessary to align face of fragment with face of parent stone.
- F. Clean adhesive residue from exposed surfaces and patch chipped areas.

3.9 CRACK INJECTION

- A. General: Comply with cementitious crack-filler manufacturer's written instructions.
- B. Drill 1/4-inch- diameter injection holes as follows:
 - 1. Transverse Cracks Less Than 3/8 inch Wide: Drill holes through center of crack at 12 to 18 inches o.c.
 - 2. Transverse Cracks More Than 3/8 inch Wide: Drill holes through center of crack at 18 to 36 inches o.c.
 - 3. Delaminations: Drill holes at approximately 18 inches o.c., both vertically and horizontally.
 - 4. Drill holes 2 inches deep.
- C. Clean out drill holes and cracks with compressed air and water. Remove dirt and organic matter, loose material, sealants, and failed crack repair materials.

- D. Place plastic injection ports in drilled holes and seal face of cracks between injection ports with clay or other nonstaining, removable plugging material. Leave openings at upper ends of cracks for air release.
- E. Inject cementitious crack filler through ports sequentially, beginning at one end of area and working to opposite end; where possible, begin at lower end of injection area and work upward. Inject filler until it extrudes from adjacent ports. After port has been injected, plug with clay or other suitable material and begin injecting filler at adjacent port, repeating process until all ports have been injected.
- F. Clean cementitious crack filler from face of stone before it sets by scrubbing with water.
- G. After cementitious crack filler has set, remove injection ports, plugging material, and excess filler. Patch injection holes and surface of cracks as specified in "Stone Patching" Article.

3.10 STONE PATCHING

- A. Patch the following stone units unless another type of repair or replacement is indicated:
 - 1. Units indicated to be patched.
 - 2. Units with holes.
 - 3. Units with chipped edges or corners. Patch chipped edges or corners measuring over 3/4 inch in least dimension.
 - 4. Units with small areas of deep deterioration. Patch deep deteriorations measuring over 3/4 inch in least dimension and over 1/4 inch deep.
- B. Remove and replace existing patches unless otherwise indicated or approved by Architect.
- C. Remove deteriorated material and remove adjacent material that has begun to deteriorate. Carefully remove additional material so patch does not have feathered edges but has square or slightly undercut edges on area to be patched and is at least 1/4 inch thick, but not less than as recommended in writing by patching compound manufacturer.
- D. Mask adjacent mortar joint or rake out for repointing if patch extends to edge of stone unit.
- E. Mix patching compound in individual batches to match each stone unit being patched. Combine one or more colors of patching compound, as needed, to produce exact match.
- F. Brush-coat stone surfaces with slurry coat of patching compound according to manufacturer's written instructions.
- G. Place patching compound in layers as recommended in writing by patching compound manufacturer, but not less than 1/4 inch or more than 2 inches thick. Roughen surface of each layer to provide a key for next layer.
 - 1. Simple Details: Trowel, scrape, or carve surface of patch to match texture and surrounding surface plane or contour of the stone. Shape and finish surface before or after curing, as determined by testing, to best match existing stone.
 - 2. Carved Details: Build patch up 1/4 inch above surrounding stone and carve surface to match adjoining stone after patching compound has hardened.
- H. Keep each layer damp for 72 hours or until patching compound has set.

I. Remove and replace patches with hairline cracks or that show separation from stone at edges, and those that do not match adjoining stone in color or texture.

3.11 FINAL CLEANING

- A. After mortar has fully hardened, thoroughly clean exposed stone surfaces of excess mortar and foreign matter; use wood scrapers, stiff-nylon or -fiber brushes, and clean water applied by low-pressure spray.
 - 1. Do not use metal scrapers or brushes.
 - 2. Do not use acidic or alkaline cleaners.
- B. Clean adjacent nonstone surfaces. Use detergent and soft brushes or cloths.
- C. Clean mortar and debris from roof; remove debris from gutters and downspouts. Rinse off roof and flush gutters and downspouts.
- D. Remove masking materials, leaving no residues that could trap dirt.
- E. Sweep and rake adjacent pavement and grounds to remove mortar and debris. Where necessary, pressure wash pavement surfaces to remove mortar, dust, dirt, and stains.

3.12 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage qualified testing agencies to perform tests and inspections. Allow inspectors use of lift devices and scaffolding, as needed, to perform inspections
- B. Notify testing agency and Architect's Project representatives in advance of times when lift devices and scaffolding will be relocated. Do not relocate lift devices and scaffolding until inspectors have had reasonable opportunity to make inspections and observations of work areas at lift device or scaffold location.

3.13 STONE-WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess stone materials are Contractor's property.
- B. Stone Waste: Remove stone waste and legally dispose of off Owner's property.

END OF SECTION 040342

SECTION 042000 - 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. Sound absorbing concrete masonry units.
 - 3. Clay face brick.
 - 4. Mortar and grout.
 - 5. Steel reinforcing bars.
 - 6. Masonry-joint reinforcement.
 - 7. Ties and anchors.
 - 8. Embedded flashing.
 - 9. Miscellaneous masonry accessories.
- B. Products Installed but not Furnished under This Section:
 - 1. Cast-stone trim in unit masonry.
 - 2. Steel lintels in unit masonry.
 - 3. Steel shelf angles for supporting unit masonry.
 - 4. Cavity wall insulation.

C. Related Requirements:

- 1. Section 033000 "Cast-in-Place Concrete" for installing dovetail slots for masonry anchors.
- 2. Section 044200 "Exterior Stone Cladding" for stone trim secured with stone anchors.
- 3. Section 051200 "Structural Steel Framing" for installing anchor sections of adjustable masonry anchors for connecting to structural steel frame.
- 4. Section 072100 "Thermal Insulation" for cavity wall insulation.
- 5. Section 076200 "Sheet Metal Flashing and Trim" for exposed sheet metal flashing and for furnishing manufactured reglets installed in masonry joints.
- 6. Section 321400 "Unit Paving" for exterior unit masonry paving.

1.3 DEFINITIONS

- A. CMU(s): Concrete masonry unit(s).
- B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 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.
- C. Shop Drawings: For the following:
 - 1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
 - 2. Stone Trim Units: Show sizes, profiles, and locations of each stone trim unit required.
 - 3. Reinforcing Steel: Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315.
 - 4. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.
- D. Samples for Initial Selection:
 - 1. Clay face brick, in the form of straps of five or more bricks.
 - 2. Stone trim.
 - 3. Colored mortar.
 - 4. Weep holes/cavity vents.

1.6 INFORMATIONAL SUBMITTALS

- A. 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. Receipt of list does not constitute approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and approved in writing.
- B. Qualification Data: For testing agency.
- C. Material Certificates: For each type and size of the following:
 - 1. Masonry units.
 - a. Include material test reports substantiating compliance with requirements.
 - b. For brick, include size-variation data verifying that actual range of sizes falls within specified tolerances.
 - c. For exposed brick, include test report for efflorescence according to ASTM C 67.
 - d. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.
 - 2. Cementitious materials. Include name of manufacturer, brand name, and type.
 - 3. Mortar admixtures.

- 4. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
- 5. Grout mixes. Include description of type and proportions of ingredients.
- 6. Reinforcing bars.
- 7. Joint reinforcement.
- 8. Anchors, ties, and metal accessories.
- D. 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/C 91M for air content.
 - 2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.
- E. 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 TMS 602/ACI 530.1/ASCE 6.
- F. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.7 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM C 1093 for testing indicated.
- B. Sample Panels: Build sample panels to verify selections made under Sample submittals and to demonstrate aesthetic effects. Comply with requirements in Section 014000 "Quality Requirements" for mockups.
 - 1. Build sample panels for typical exterior wall in sizes approximately 48 inches long by 48 inches high by full thickness.
 - 2. Build sample panels facing south.
 - 3. Where masonry is to match existing, build panels adjacent and parallel to existing surface.
 - 4. Clean exposed faces of panels with masonry cleaner indicated.
 - 5. Protect approved sample panels from the elements with weather-resistant membrane.
 - 6. Approval of sample panels is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by Architect in writing.
 - a. Approval of sample panels does not constitute approval of deviations from the Contract Documents contained in sample panels unless Architect specifically approves such deviations in writing.
- C. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 - 1. Build mockups for typical exterior wall in sizes approximately 72 inches long by 72 inches high by full thickness, including face and backup wythes and accessories.
 - a. Include a sealant-filled joint at least 16 inches long in each exterior wall mockup.

- b. Include lower corner of window opening, framed with stone trim, at upper corner of exterior wall mockup. Make opening approximately 12 inches wide by 16 inches high.
- c. Include through-wall flashing installed for a 24-inch length in corner of exterior wall mockup approximately 16 inches down from top of mockup, with a 12-inch length of flashing left exposed to view (omit masonry above half of flashing).
- d. Include CMU backup, insulation, air barrier, veneer anchors, flashing, cavity drainage material, and weep holes in exterior masonry-veneer wall mockup.
- 2. Where masonry is to match existing, erect mockups adjacent and parallel to existing surface.
- 3. Clean one-half of exposed faces of mockups with masonry cleaner as indicated.
- 4. Protect accepted mockups from the elements with weather-resistant membrane.
- 5. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.
 - a. Approval of mockups is also for other material and construction qualities specifically approved by Architect 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.

1.8 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. Store preblended, dry mortar mix in delivery containers on elevated platforms 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.

1.9 FIELD 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 TMS 602/ACI 530.1/ASCE 6.
 - 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 TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. 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.
- B. 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.

2.2 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 TMS 602/ACI 530.1/ASCE 6.
- 2. Determine net-area compressive strength of masonry by testing masonry prisms according to ASTM C 1314.

2.3 UNIT MASONRY, GENERAL

- A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6, except as modified by requirements in the Contract Documents.
- B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work and will be within 20 feet vertically and horizontally of a walking surface.
- C. Fire-Resistance Ratings: Comply with requirements for fire-resistance-rated assembly designs indicated.
 - 1. Where fire-resistance-rated construction is indicated, units shall be listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction.

2.4 CONCRETE MASONRY UNITS

- A. Regional Materials: CMUs shall be 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. Regional Materials: CMUs shall be manufactured within 500 miles of Project site.
- C. 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.
- D. CMUs: ASTM C 90.
 - 1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2800 psi unless otherwise indicated.
 - 2. Density Classification: Lightweight unless otherwise indicated.
 - 3. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.
 - 4. Exposed Faces: Provide color and texture matching the range represented by Architect's sample.
 - 5. 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. SOUND ABSORBING CMUs: ASTM C 90.
 - 1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2800 psi unless otherwise indicated.

- 2. Density Classification: Normal weight unless otherwise indicated.
- 3. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.
- 4. Exposed Faces: Provide color and texture matching the range represented by Architect's sample.
- 5. Faces to Receive Plaster: Where units are indicated to receive a direct application of plaster, provide textured-face units made with gap-graded aggregates.
- 6. Manufactured using molds furnished or approved by the Proudfoot Company
- 7. Type: RSC/RF.
 - a. Size to match adjacent units.
 - b. Sound absorption coefficients: 1.02 at 500Hz, 0.72 at 1000 Hz, 0.80 at 2000 Hz.
 - c. Two exposed slots.
 - d. Filler elements installed by manufacturer.
- F. Concrete Building Brick: ASTM C 55.
 - 1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2800 psi.
 - 2. Density Classification: Normal weight.
 - 3. Size (Actual Dimensions): 3-5/8 inches wide by 2-1/4 inches high by 7-5/8 inches long.

2.5 CONCRETE LINTELS

- A. General: Provide one of the following:
- B. Concrete Lintels: ASTM C 1623, matching CMUs in color, texture, and density classification; and with reinforcing bars indicated. Provide lintels with net-area compressive strength not less than that of CMUs.
- C. Concrete Lintels: Precast or formed-in-place concrete lintels complying with requirements in Section 033000 "Cast-in-Place Concrete," and with reinforcing bars indicated.
- D. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs matching adjacent CMUs in color, texture, and density classification, 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.

2.6 BRICK

- A. Regional Materials: Brick 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.
- B. Regional Materials: Brick shall be manufactured within 500 miles of Project site.
- C. General: Provide shapes indicated and as follows, with exposed surfaces matching finish and color of exposed faces of adjacent units:
 - 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.
- D. Clay Face Brick: Facing brick complying with ASTM C 216.
 - 1. Grade: SW.
 - 2. Type: FBA.
 - 3. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 3350 psi.
 - 4. Initial Rate of Absorption: Less than 30 g/30 sq. in. per minute when tested according to ASTM C 67.
 - 5. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."
 - 6. Size (Actual Dimensions): 3-5/8 inches wide by 2-1/4 inches high by 7-5/8 inches long.
 - 7. Application: Use where brick is exposed unless otherwise indicated.
 - 8. Where shown to "match existing," provide face brick matching color range, texture, and size of existing adjacent brickwork.
 - 9. Color and Texture: As selected by Architect.

2.7 MORTAR AND GROUT MATERIALS

- A. Regional Materials: Aggregate for mortar and grout, cement, and lime 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.
- B. Regional Materials: Aggregate for mortar and grout, cement, and lime shall be manufactured within 500 miles of Project site.
- C. Portland Cement: ASTM C 150/C 150M, Type I or II, except Type III may be used for coldweather construction. Provide natural color or white cement as required to produce mortar color indicated.
 - 1. Alkali content shall not be more than 0.1 percent when tested according to ASTM C 114.
- D. Hydrated Lime: ASTM C 207, Type S.
- E. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
- 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.
- G. Colored Cement Products: Packaged blend made from portland cement and hydrated lime and mortar pigments, all complying with specified requirements, and containing no other ingredients.
 - 1. Colored Portland Cement-Lime Mix:

- 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.
- 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 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.
- I. Aggregate for Grout: ASTM C 404.
- J. 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.
- K. Water: Potable.

2.8 REINFORCEMENT

- A. Uncoated-Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60.
- B. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and to 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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Dur-O-Wal; a Hohmann & Barnard company.
 - b. Heckmann Building Products, Inc.
 - c. Hohmann & Barnard, Inc.
- C. Masonry-Joint Reinforcement, General: ASTM A 951/A 951M.
 - 1. Interior Walls: Hot-dip galvanized carbon steel.
 - 2. Exterior Walls: Hot-dip galvanized carbon steel.
 - 3. Wire Size for Side Rods: 0.148-inch diameter.
 - 4. Wire Size for Cross Rods: 0.148-inch diameter.
 - 5. Wire Size for Veneer Ties: 0.148-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.
- D. Masonry-Joint Reinforcement for Single-Wythe Masonry: Ladder or truss type with single pair of side rods.

2.9 TIES AND ANCHORS

- A. General: Ties and anchors shall extend at least 1-1/2 inches into veneer but with at least a 5/8-inch cover on outside face.
- B. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:
 - 1. Mill-Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M, with ASTM A 641/A 641M, Class 1 coating.
 - 2. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M, with ASTM A 153/A 153M, Class B-2 coating.
 - 3. Stainless-Steel Wire: ASTM A 580/A 580M, Type 304.
 - 4. Galvanized-Steel Sheet: ASTM A 653/A 653M, Commercial Steel, G60 zinc coating.
 - 5. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, with ASTM A 153/A 153M, Class B coating.
 - 6. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304.
 - 7. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
 - 8. Stainless-Steel Bars: ASTM A 276 or ASTM A 666, Type 304.
- C. Corrugated-Metal Ties: Metal strips not less than 7/8 inch wide with corrugations having a wavelength of 0.3 to 0.5 inch and an amplitude of 0.06 to 0.10 inch made from 0.062-inch-thick, stainless-steel sheet.
- D. Individual Wire Ties: Rectangular units with closed ends and not less than 4 inches wide.
 - 1. Z-shaped ties with ends bent 90 degrees to provide hooks not less than 2 inches long may be used for masonry constructed from solid units.
 - 2. Where wythes do not align, use adjustable ties with pintle-and-eye connections having a maximum adjustment of 1-1/4 inches.
 - 3. Wire: Fabricate from 3/16-inch- diameter, hot-dip galvanized steel wire.
- E. Adjustable Anchors for Connecting to Structural Steel Framing: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
 - 1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch- diameter, hot-dip galvanized steel wire. Mill-galvanized wire may be used at interior walls unless otherwise indicated.
 - 2. Tie Section: Triangular-shaped wire tie made from 0.25-inch- diameter, hot-dip galvanized steel wire. Mill-galvanized wire may be used at interior walls unless otherwise indicated.
- F. 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 dovetail slots in concrete and attached to tie section; formed from 0.105-inch- thick steel sheet, galvanized after fabrication.
 - 2. Tie Section: Triangular-shaped wire tie made from 0.187-inch- diameter, hot-dip galvanized steel wire. Mill-galvanized wire may be used at interior walls unless otherwise indicated.

- G. Partition Top Anchors: 0.105-inch- thick metal plate with a 3/8-inch- diameter metal rod 6 inches long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-dip galvanized after fabrication.
- H. Rigid Anchors: Fabricate from steel bars 1-1/2 inches wide by 1/4 inch thick by 24 inches long, with ends turned up 2 inches or with cross pins unless otherwise indicated bent to configuration indicated.
 - 1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A 153/A 153M.
- I. Adjustable Masonry-Veneer Anchors:
 - 1. General: Provide anchors that allow vertical adjustment but resist a 100-lbf load in both tension and compression perpendicular to plane of wall without deforming or developing play in excess of 1/16 inch.
 - 2. Fabricate sheet metal anchor sections and other sheet metal parts from 0.109-inch- thick, stainless-steel sheet.
 - 3. Fabricate wire ties from 0.187-inch- diameter, stainless-steel wire unless otherwise indicated.
 - 4. Contractor's Option: Unless otherwise indicated, provide any of the adjustable masonryveneer anchors specified.
 - 5. Screw-Attached, Masonry-Veneer Anchors: Wire tie and a rib-stiffened, sheet metal anchor section with screw holes top and bottom, with projecting tabs having holes for inserting vertical legs of wire tie formed to fit anchor section.
 - 6. Screw-Attached, Masonry-Veneer Anchors: Wire tie and a sheet metal anchor section, 1-1/4 inches wide by 6 inches long, with screw holes top and bottom and with raised ribstiffened strap, 5/8 inch wide by 3-5/8 inches long, stamped into center to provide a slot between strap and base for inserting wire tie.
 - 7. Polymer-Coated, Steel Drill Screws for Steel Studs: ASTM C 954 except manufactured with hex washer head and neoprene or EPDM washer, No. 10 diameter by length required to penetrate steel stud flange with not less than three exposed threads, and with organic polymer coating with salt-spray resistance to red rust of more than 800 hours according to ASTM B 117.
 - 8. Stainless-Steel Drill Screws for Steel Studs: ASTM C 954 except manufactured with hex washer head and neoprene or EPDM washer, No. 10 diameter by length required to penetrate steel stud flange with not less than three exposed threads; either made from Type 410 stainless steel or made with a carbon-steel drill point and 300 Series stainless-steel shank.

2.10 EMBEDDED FLASHING MATERIALS

- A. Metal Flashing: Provide metal flashing complying with SMACNA's "Architectural Sheet Metal Manual" Section 076200 "Sheet Metal Flashing and Trim" and as follows:
 - 1. Stainless Steel: ASTM A 240/A 240M or ASTM A 666, 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.
 - 4. Fabricate through-wall flashing with snaplock receiver on exterior face where indicated to receive counterflashing.

- 5. Fabricate through-wall flashing with drip edge unless otherwise indicated. Fabricate by extending flashing 1/2 inch out from wall, with outer edge bent down 30 degrees and hemmed.
- 6. 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 sheds water.
- 7. Fabricate metal drip edges 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.
- 8. Fabricate metal sealant stops 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.
- 9. Fabricate metal expansion-joint strips from stainless steel to shapes indicated.
- 10. Solder metal items at corners.
- B. Flexible Flashing: Use one of the following unless otherwise indicated:
 - 1. Copper-Laminated Flashing: 7-oz./sq. ft. copper sheet bonded between two layers of glass-fiber cloth. Use only where flashing is fully concealed in masonry.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Advanced Building Products Inc.
 - 2) Hohmann & Barnard, Inc.
 - 3) York Manufacturing, Inc.
- C. 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 or flexible flashing with a metal drip edge.
 - 4. Where flashing is fully concealed, use metal flashing or flexible flashing.
- D. Solder and Sealants for Sheet Metal Flashings:
 - 1. Solder for Stainless Steel: ASTM B 32, Grade Sn96, with acid flux of type recommended by stainless-steel sheet manufacturer.
 - 2. Solder for Copper: ASTM B 32, with maximum lead content of 0.2 percent.
- E. 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.
- F. Termination Bars for Flexible Flashing: Stainless steel bars 1/8 inch by 1 inch.

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 or PVC, complying with ASTM D 2287, Type PVC-65406 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 felt complying with ASTM D 226/D 226M, Type I (No. 15 asphalt felt).
- D. Weep/Cavity 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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Advanced Building Products Inc.
 - 2) CavClear/Archovations, Inc.
 - 3) Keene Building Products.
 - 4) Mortar Net Solutions.
- E. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Advanced Building Products Inc.
 - b. Heckmann Building Products, Inc.
 - c. Hohmann & Barnard, Inc.
 - d. Mortar Net Solutions.
 - 2. Configuration: Provide one of the following:
 - a. Strips, full depth of cavity and 10 inches high, with dovetail-shaped notches 7 inches deep that prevent clogging with mortar droppings.
 - b. Strips, not less than 1-1/2 inches thick and 10 inches high, with dimpled surface designed to catch mortar droppings and prevent weep holes from clogging with mortar.
 - c. Sheets or strips, full depth of cavity and installed to full height of cavity.
 - d. Sheets or strips not less than 1 inch thick and installed to full height of cavity, with additional strips 4 inches high at weep holes and thick enough to fill entire depth of cavity and prevent weep holes from clogging with mortar.

2.12 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.; a division of Sandell Construction Solutions.
 - b. EaCo Chem, Inc.
 - c. PROSOCO, Inc.

2.13 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. For exterior masonry, use portland cement-lime mortar.
 - 4. For reinforced masonry, use portland cement-lime mortar.
 - 5. 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, Proportion 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 or Type N.
 - 4. For exterior, above-grade, load-bearing and nonload-bearing walls and parapet walls; for interior load-bearing walls; for interior nonload-bearing partitions; and for other applications where another type is not indicated, use Type N.
 - 5. For interior nonload-bearing partitions, Type O may be used instead of Type N.
- D. Pigmented Mortar: Use colored cement product.
 - 1. Pigments shall not exceed 10 percent of portland cement by weight.
 - 2. Mix to match Architect's sample.
 - 3. Application: Use pigmented mortar for exposed mortar joints with the following units:
 - a. Clay face brick.
 - b. Stone trim units.
 - c. Cast-stone trim units.
- E. 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 TMS 602/ACI 530.1/ASCE 6 for dimensions of grout spaces and pour height.
 - 2. Proportion grout in accordance with ASTM C 476, Table 1 but not less than 2000 psi.

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 the Work.
- 2. Verify that foundations are within tolerances specified.
- 3. Verify that reinforcing dowels are properly placed.
- 4. Verify that substrates are free of substances that impair mortar bond.
- 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 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. Mix units from several pallets or cubes as they are placed.
- F. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.
- G. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested according to ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

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 Flemish 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 2 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 stepping 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 nonload-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 nonload-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 Section 078443 "Joint Firestopping."

3.5 SOUND ABSORBING CMU

- A. Perform all necessary cutting on the job site with power tools to provide straight and true edges. Do not use chipped or broken blocks.
- B. Lay units in running bond with the open ends of the cavities facing downward, and seat in a full horizontal bed of mortar.
- C. Expose the slots to the area where the sound absorption is desired (interior of the building) as indicated on the plans. Care shall be taken to ensure that the slots are kept free of mortar or debris above the mortar joints.
- D. Lines shall be straight and true.

3.6 MORTAR BEDDING AND JOINTING

- A. Lay hollow brick and CMUs as follows:
 - 1. Bed face shells in mortar and make head joints of depth equal to bed joints.
 - 2. Bed webs in mortar in all courses of piers, columns, and pilasters.
 - 3. Bed webs in mortar in grouted masonry, including starting course on footings.
 - 4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.

- 5. Fully bed units and fill cells with mortar at anchors and ties as needed to fully embed anchors and ties in mortar.
- B. Lay solid masonry units and hollow brick 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. Set stone and cast-stone trim units in full bed of mortar with full vertical joints. Fill dowel, anchor, and similar holes.
 - 1. Clean soiled surfaces with fiber brush and soap powder and rinse thoroughly with clear water.
 - 2. Allow cleaned surfaces to dry before setting.
 - 3. Wet joint surfaces thoroughly before applying mortar.
 - 4. Rake out mortar joints for pointing with sealant.
- 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.
- F. Cut joints flush where indicated to receive waterproofing cavity wall insulation or air barriers unless otherwise indicated.

3.7 COMPOSITE MASONRY

- A. Bond wythes of composite masonry together as follows:
 - 1. Masonry-Joint Reinforcement: Installed in horizontal mortar joints.
 - a. Where bed joints of both wythes align, use ladder-type reinforcement extending across both wythes.
 - b. Where bed joints of wythes do not align, use adjustable-type (two-piece-type) reinforcement with continuous horizontal wire in facing wythe attached to ties.
- 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. 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.
- E. 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.

3.8 CAVITY WALLS

- A. Bond wythes of cavity walls together as follows:
 - 1. Masonry-Joint Reinforcement: Installed in horizontal mortar joints.
 - a. Where bed joints of both wythes align, use ladder-type reinforcement extending across both wythes.
 - b. Where bed joints of wythes do not align, use adjustable-type (two-piece-type) reinforcement with continuous horizontal wire in facing wythe attached to ties.
 - c. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable-type (two-piece-type) reinforcement with continuous horizontal wire in facing wythe attached to ties to allow for differential movement regardless of whether bed joints align.
 - 2. Masonry-Veneer Anchors: Comply with requirements for anchoring masonry veneers.
- B. 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.
- C. Installing Cavity Wall Insulation: Place small dabs of adhesive, spaced approximately 12 inches o.c. both ways, on inside face of insulation boards, or attach with plastic fasteners designed for this purpose. 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.
 - 1. Fill cracks and open gaps in insulation with crack sealer compatible with insulation and masonry.

3.9 ANCHORED MASONRY VENEERS

- A. Anchor masonry veneers to wall framing with masonry-veneer anchors to comply with the following requirements:
 - 1. Fasten screw-attached anchors with metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener.
 - 2. Embed tie sections in masonry joints.
 - 3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
 - 4. Space anchors as indicated, but not more than 18 inches o.c. vertically and 24 inches o.c. horizontally, with not less than one anchor for each 2 sq. ft. of wall area. Install additional anchors within 12 inches of openings and at intervals, not exceeding 8 inches, around perimeter.
 - 5. Space anchors as indicated, but not more than 16 inches o.c. vertically and 25 inches o.c. horizontally, with not less than one 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.
 - 6. Space anchors as indicated, but not more than 18 inches o.c. vertically and horizontally. Install additional anchors within 12 inches of openings and at intervals, not exceeding 24 inches, around perimeter.
- B. Provide not less than 2 inches of airspace between back of masonry veneer and face of insulation.

1. Keep airspace clean of mortar droppings and other materials during construction. Bevel beds away from airspace, to minimize mortar protrusions into airspace. Do not attempt to trowel or remove mortar fins protruding into airspace.

3.10 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.
- E. Cut and bend reinforcing units as directed by manufacturer for continuity at corners, returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.11 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.

3.12 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 inplane 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. Form expansion joints in brick as follows:
 - 1. Build flanges of factory-fabricated, expansion-joint units into masonry.
 - 2. Build in compressible joint fillers where indicated.
 - 3. Form open joint full depth of brick wythe and of width indicated, but not less than 1/2 inch for installation of sealant and backer rod specified in Section 079200 "Joint Sealants."
- D. Provide horizontal, pressure-relieving joints by either leaving an airspace or inserting a compressible filler of width required for installing sealant and backer rod specified in Section 079200 "Joint Sealants," but not less than 3/8 inch.
 - 1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

3.13 LINTELS

- A. Install steel lintels where indicated.
- B. Provide concrete 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.

3.14 FLASHING, WEEP HOLES, AND CAVITY 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 cavity 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 multiwythe masonry walls, including cavity walls, extend flashing through outer wythe, turned up a minimum of 4 inches, and 1-1/2 inches into the inner wythe. Form 1/4-inch hook in edge of flashing embedded in inner wythe.
 - 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. Install metal drip edges with ribbed sheet metal flashing by interlocking hemmed edges to form hooked seam. Seal seam with elastomeric sealant complying with requirements in Section 079200 "Joint Sealants" for application indicated.

- 5. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall, and adhere flexible flashing to top of metal drip edge.
- 6. Cut flexible flashing off flush with face of wall after masonry wall construction is completed.
- 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 exterior wythes and veneers in head joints of first course of masonry immediately above embedded flashing.
 - 1. Use specified weep/cavity vent products to form weep holes.
 - 2. Space weep holes 24 inches o.c. unless otherwise indicated.
- E. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in "Miscellaneous Masonry Accessories" Article.
- F. Install cavity vents in head joints in exterior wythes at spacing indicated. Use specified weep/cavity vent products to form cavity vents.
 - 1. Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing and weep holes above horizontal blocking.

3.15 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 that of other loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements in TMS 602/ACI 530.1/ASCE 6.
- 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 TMS 602/ACI 530.1/ASCE 6 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.

3.16 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will 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: Special inspections according to Level B in TMS 402/ACI 530/ASCE 5.
 - 1. Begin masonry construction only after inspectors have verified proportions of siteprepared 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. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.
- E. Clay Masonry Unit Test: For each type of unit provided, according to ASTM C 67 for compressive strength.
- F. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.
- G. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.
- H. Mortar Test (Property Specification): For each mix provided, according to ASTM C 780. Test mortar for mortar air content and compressive strength.
- I. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.
- J. Prism Test: For each type of construction provided, according to ASTM C 1314 at 7 days and at 28 days.

3.17 PARGING

- A. Parge exterior faces of below-grade masonry walls, where indicated, in two uniform coats to a total thickness of 3/4 inch. Dampen wall before applying first coat, and scarify first coat to ensure full bond to subsequent coat.
- B. Use a steel-trowel finish to produce a smooth, flat, dense surface with a maximum surface variation of 1/8 inch per foot. Form a wash at top of parging and a cove at bottom.
- C. Damp-cure parging for at least 24 hours and protect parging until cured.

3.18 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 brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
 - 6. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.
 - 7. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
 - 8. Clean stone trim to comply with stone supplier's written instructions.
 - 9. Clean limestone units to comply with recommendations in ILI's "Indiana Limestone Handbook."

3.19 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 soilcontaminated 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 Section 312000 "Earth Moving."
 - 3. Do not dispose of masonry waste as fill within 18 inches of finished grade.
- C. Masonry Waste Recycling: Return broken CMUs not used as fill to manufacturer for recycling.
- D. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above or recycled, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 042000

SECTION 044200 - EXTERIOR STONE 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. New construction: stone trim units, including copings, bands, sills, etc., and all transition pieces and required special shapes.
 - 2. Existing construction: replacement of existing cast stone pieces including, coping, water table, bands, sills, embrasure, etc. as indicated on the drawings and as required to restore integrity of existing stonework.
- B. Related Requirements:
 - 1. Section 012100 "Allowances" for allowances to be included in the Contract in connection with the execution of the work of this specification section.
 - 2. Section 033000 "Cast-in-Place Concrete" for installing inserts in concrete for anchoring stone trim.
 - 3. Section 040340 "Historic Unit Masonry Repair" for cleaning, repointing and repairing existing cast stone pieces
 - 4. Section 042000 "Unit Masonry" for coordination of stone trim in unit masonry walls.
 - 5. Section 079200 "Joint Sealants" for sealant joints in stone trim with elastomeric sealants.

1.3 ALLOWANCES

- A. Provide a dollar allowance of \$10,000 (ten thousand dollars) for replacement of deteriorated or damaged cast stone elements beyond the work specifically noted on the drawings. The work shall be differentiated as follows;
 - 1. For the reuse of salvaged cast stone materials the contractor shall be reimbursed for the labor of setting the stone and any costs associated with fabricating the salvaged stone for installation fit in the new location.
 - 2. For newly fabricated limestone as replacement the contractor shall be reimbursed for all costs associated with fabrication and installation of the stone.

1.4 DEFINITIONS

- A. Definitions contained in ASTM C 119 apply to this Section.
- B. IBC: International Building Code.

1.5 ACTION SUBMITTALS

- A. Product Data: For each variety of stone, stone accessory, and manufactured 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.
- C. Shop Drawings: Show fabrication and installation details for stone trim assembly, including dimensions and profiles of stone units.
 - 1. Show locations and details of joints both within stone trim assembly and between stone trim assembly and other construction.
 - 2. Include details of mortar joints and sealant joints.
 - 3. Show locations and details of anchors.
 - 4. Show direction of veining, grain, or other directional pattern.
 - 5. Indicate finished surfaces.
 - 6. Include large-scale shaded elevations showing setting locations and details of decorative surfaces and inscriptions.
 - 7. Number and locate each individual stone on the setting drawings and provide the corresponding number on a concealed surface of each stone.
- D. Stone Samples for Verification: Sets for each variety, color, and finish of stone required; not less than 12 inches square.
 - 1. Sets shall consist of at least three Samples, exhibiting extremes of the full range of color and other visual characteristics expected and will establish the standard by which stone will be judged.
- E. Colored Pointing Mortar Samples for Verification: For each color required. Make Samples using same sand and mortar ingredients to be used on Project.
- F. Sealant Samples for Verification: For each type and color of joint sealant required.
- G. Masonry Mock-Up: Coordinate with stone trim requirements for inclusion in exterior masonry wall mock-ups specified in Specification Section 042000, Unit Masonry.

1.6 INFORMATIONAL SUBMITTALS

- A. Material Test Reports:
 - 1. Stone Test Reports: For each stone variety proposed for use on Project, by a qualified testing agency, indicating compliance with required physical properties, other than abrasion resistance, according to referenced ASTM standards. Base reports on testing done within previous five years.
 - 2. Sealant Compatibility and Adhesion Test Report: From sealant manufacturer complying with requirements in Section 079200 "Joint Sealants" and indicating that sealants will not stain or damage stone. Include interpretation of test results and recommendations for primers and substrate preparation needed for adhesion.
- B. Preconstruction test reports.

- C. Source quality-control reports.
- D. Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with cold-weather requirements.

1.7 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate stone trim similar to that required for this Project and whose products have a record of successful inservice performance.
- B. Installer Qualifications: A firm or individual with a minimum of 10 years of experience in installing stone trim similar in material, design, and extent to that indicated for this Project and whose work has a record of successful in-service performance.
- C. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store and handle stone and related materials to prevent deterioration or damage due to moisture, temperature changes, contaminants, corrosion, breaking, chipping, and other causes.
 - 1. Lift stone with wide-belt slings; do not use wire rope or ropes that might cause staining. Move stone, if required, using dollies with cushioned wood supports.
 - 2. Store stone on wood skids or pallets with non-staining, waterproof covers. Arrange to distribute weight evenly and to prevent damage to stone. Ventilate under covers to prevent condensation.
- B. Mark stone units, on surface that will be concealed after installation, with designations used on Shop Drawings to identify individual stone units. Orient markings on vertical panels so that they are right side up when units are installed.
- C. Deliver sealants to Project site in original unopened containers labeled with manufacturer's name, product name and designation, color, expiration period, pot life, curing time, and mixing instructions for multicomponent materials.
- D. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- E. Store aggregates in locations where grading and other required characteristics can be maintained and where contamination can be avoided.

1.9 FIELD CONDITIONS

- A. Protect stone trim during erection by doing the following:
 - 1. Cover tops of stone trim installation with nonstaining, waterproof sheeting at end of each day's work. Cover partially completed structures when work is not in progress. Extend cover a minimum of 24 inches down both sides and hold securely in place.

- 2. Prevent staining of stone from mortar, grout, sealants, and other sources. Immediately remove such materials without damaging stone.
- 3. Protect trim from rain-splashed mud and mortar splatter by coverings spread on ground and over wall surface.
- 4. Protect sills, ledges, and projections from mortar and sealant droppings.
- B. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Remove and replace stone damaged by frost or freezing conditions. Comply with coldweather construction and protection requirements for masonry contained in TMS 602/ACI 530.1/ASCE 6.
- C. Hot-Weather Requirements: Comply with hot-weather construction and protection requirements for masonry contained in TMS 602/ACI 530.1/ASCE 6.
- D. Environmental Limitations for Sealants: Do not install sealants when ambient and substrate temperatures are outside limits permitted by sealant manufacturer or below 40 deg F or when joint substrates are wet.

1.10 COORDINATION

- A. Coordinate installation of inserts that are to be embedded in concrete or masonry, flashing reglets, and similar items to be used by stone trim Installer for anchoring, supporting, and flashing of stone trim assembly. Furnish setting drawings, templates, and directions for installing such items and deliver to Project site in time for installation.
- B. Time delivery and installation of stone cladding to avoid extended on-site storage and to coordinate with work adjacent to stone cladding.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Stone: Obtain stone from single quarry with resources to provide materials of consistent quality in appearance and physical properties. Demonstrate that both the fabricator and the quarry have sufficient capacity to quarry, cut, and deliver quality and quantities required to maintain the project construction schedule.
- B. Source Limitations for Mortar Materials: Obtain mortar ingredients of uniform quality for each cementitious component from single manufacturer and each aggregate from single source or producer.
- C. Source Limitations for Other Materials: Obtain each type of stone accessory, sealant, and other material from single manufacturer for each product.

2.2 PERFORMANCE REQUIREMENTS

- A. General: Design stone anchors and anchoring systems according to ASTM C 1242.
 - 1. Stone anchors shall withstand not less than two times the weight of the stone trim in both compression and tension.
- B. Seismic Performance: Stone trim shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 - 1. Component Importance Factor: 1.0.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
 - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
- D. Horizontal Building Movement (Interstory Drift): Allow for maximum horizontal building movement equal to quotient resulting from dividing floor-to-floor height at any floor by 400.
- E. Design stone anchors to withstand loads indicated without exceeding allowable working stresses established by the following:
 - 1. For Cast-in-Place and Postinstalled Fasteners in Concrete: One-fourth of tested capacity when installed in concrete with compressive strength indicated.
 - 2. For Postinstalled Fasteners in Masonry: One-sixth of tested capacity when installed in masonry units indicated.
- F. Limit deflection in each prefabricated assembly caused by indicated loads and thermal movements, acting singly or in combination with one another, to not more than 1/720 of assembly's clear span or the following, whichever is smaller:
 - 1. 1/16 inch, measured in plane of wall.
 - 2. 1/4 inch, measured perpendicular to wall.
- G. Provisions for Fabrication and Erection Tolerances: Allow for fabrication and erection tolerances of building's structural system.
- H. Provision for Deflection of Building Structure:
 - 1. Deflection Due to Weight of Stone Trim: Allow for 1/4-inch vertical deflection in 20-foot span of structural members supporting stone trim.
 - 2. Live Load Deflection: Allow for 1/4-inch vertical deflection, in 20-foot span of structural members supporting stone cladding assembly, due to live loads imposed on building's structural frame after stone installation.
- I. Corrosion and Staining Control: Prevent galvanic and other forms of corrosion as well as staining by isolating metals and other materials from direct contact with incompatible materials. Materials shall not stain exposed surfaces of stone and joint materials.

2.3 LIMESTONE

A. Material Standard: Comply with ASTM C 568/C 568M.
1. Classification: III High-Density.

- B. Regional Materials: Stone shall be fabricated within 500 miles of Project site from materials that have been extracted, harvested, or recovered within 500 miles of Project site.
- C. Regional Materials: Stone shall be fabricated within 500 miles of Project site.
- D. Cut stone from one block or contiguous, matched blocks in which natural markings occur.
- E. Finish: shot sawed.

2.4 ANCHORS AND FASTENERS

- A. Fabricate anchors from stainless steel, ASTM A 240/A 240M or ASTM A 666, Type 304; temper as required to support loads imposed without exceeding allowable design stresses. Fabricate dowels and pins for anchors from stainless steel, ASTM A 276, Type 304.
- B. Cast-in-Place Concrete Inserts: Either threaded 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, with capability to sustain, without failure, a load equal to 4 times the loads imposed as determined by testing per ASTM E 488/E 488M, conducted by a qualified independent testing agency. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.
- C. Postinstalled Anchor Bolts for Concrete and Masonry: Chemical anchors made from stainlesssteel components complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 for bolts and nuts; ASTM A 240/A 240M, ASTM A 276, or ASTM A 666, Type 304 or 316, for anchors, with capability to sustain, without failure, a load equal to 4 times the loads imposed, for concrete, or 6 times the load imposed, for masonry, as determined by testing per ASTM E 488/E 488M, conducted by a qualified independent testing agency.
- D. Threaded Fasteners: Heavy hexagon structural bolts, heavy hexagon nuts, and hardened washers.
 - 1. For stainless steel, use annealed stainless-steel bolts, nuts, and washers; for bolts, ASTM F 593; and for nuts, ASTM F 594, Alloy Group 1.

2.5 MORTAR MATERIALS

- A. Portland Cement: ASTM C 150/C 150M, Type I or Type II, except Type III may be used for cold-weather construction, natural color or white as required to produce mortar color indicated.
 - 1. Low-Alkali Cement: Portland cement for use with limestone shall contain no more than 0.60 percent total alkali when tested according to ASTM C 114.
- B. Hydrated Lime: ASTM C 207.
- C. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C 979/C 979M. Pigments shall have a record of satisfactory performance in mortar.
- D. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime.
- E. Colored Portland Cement-Lime Mix: Packaged blend of portland cement, hydrated lime, and mortar pigments. Mix shall produce color indicated or, if not indicated, as selected from manufacturer's standard colors. Pigments shall not exceed 10 percent of portland cement by weight.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Holcim (US) Inc.
 - b. Lafarge North America Inc.
 - c. Lehigh Hanson; HeidelbergCement Group.
- F. Aggregate: ASTM C 144; except for joints narrower than 1/4 inch and pointing mortar, 100 percent shall pass No. 16 sieve.
 - 1. White Aggregates: Natural white sand or ground white stone.
 - 2. Colored Aggregates: Natural-colored sand or ground marble, granite, or other durable stone; of color necessary to produce required mortar color.
- G. Water: Potable.

2.6 STONE ACCESSORIES

- A. Setting Shims: Strips of resilient plastic, nonstaining to stone, of thickness needed to prevent point loading of stone on anchors and of depths to suit anchors without intruding into required depths of pointing materials.
- B. Setting Buttons: Resilient plastic buttons, nonstaining to stone, sized to suit joint thicknesses and bed depths of stone units without intruding into required depths of pointing materials.
- C. Concealed Sheet Metal Flashing: Fabricated from stainless steel in thicknesses indicated, but not less than 0.0156 inch thick, and complying with Section 076200 "Sheet Metal Flashing and Trim."
- D. Cementitious Dampproofing for Limestone: Cementitious formulation recommended by ILI and nonstaining to stone; compatible with joint sealants and noncorrosive to anchors and attachments.
- E. Mesh Weep/Vent: Free-draining mesh; made from polyethylene strands, of length required to extend from exterior face of stone to cavity behind, in color selected from manufacturer's standard.
- F. Sealants for Joints in Stone Cladding: Manufacturer's standard chemically curing, elastomeric sealants of base polymer and characteristics indicated below that comply with applicable requirements in Section 079200 "Joint Sealants" and do not stain stone:

2.7 STONE FABRICATION

- A. General: Fabricate stone units in sizes and shapes required to comply with requirements indicated.
 - 1. For limestone, comply with recommendations in ILI's "Indiana Limestone Handbook."

- B. Control depth of stone and back check to maintain minimum clearance of 1 inch between backs of stone units and surfaces or projections of structural members, fireproofing (if any), backup walls, and other work behind stone.
- C. Dress joints (bed and vertical) straight and at right angle to face unless otherwise indicated. Shape beds to fit supports.
- D. Cut and drill sinkages and holes in stone for anchors, fasteners, supports, and lifting devices as indicated or needed to set stone securely in place.
- E. Finish exposed faces and edges of stone to comply with requirements indicated for finish and to match approved samples.
- F. Quirk-miter corners unless otherwise indicated; provide for cramp anchorage in top and bottom bed joints of corner pieces.
- G. Cut stone to produce uniform joints 3/8 inch wide and in locations indicated.
- H. Contiguous Work: Provide chases, reveals, reglets, openings, and similar features as required to accommodate contiguous work.
- I. Fabricate molded work, including washes and drips, to produce stone shapes with a uniform profile throughout entire unit length, with precisely formed arris slightly eased to prevent snipping, and with matching profile at joints between units.
 - 1. Produce moldings and molded edges with machines that use abrasive shaping wheels made to reverse contour of molding shape.
- J. Clean backs of stone to remove rust stains, iron particles, and stone dust.
- K. Inspect finished stone units at fabrication plant for compliance with requirements for appearance, material, and fabrication. Replace defective units.
 - 1. Grade and mark stone for overall uniform appearance when assembled in place. Natural variations in appearance are acceptable if installed stone units match range of colors and other appearance characteristics represented in approved samples and mockups.

2.8 MORTAR MIXES

- A. General: Comply with referenced standards and with manufacturers' written instructions for mix proportions, mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures needed to produce mortar of uniform quality and with optimum performance characteristics.
 - 1. Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated. Do not use calcium chloride.
 - 2. Combine and thoroughly mix cementitious materials, water, and aggregates in a mechanical batch mixer unless otherwise indicated. Discard mortar when it has reached initial set.

- B. Portland Cement-Lime Setting Mortar: Comply with ASTM C 270, Proportion Specification, Type N.
- C. Pointing Mortar: Comply with ASTM C 270, Proportion Specification, Type N. Provide pointing mortar mixed to match Architect's sample and complying with the following:
 - 1. Pigmented Pointing Mortar: Select and proportion pigments with other ingredients to produce color required. Do not exceed pigment-to-cement ratio of 1:10, by weight.
 - 2. Packaged Portland Cement-Lime Mix Mortar: Use portland cement-lime mix of selected color.
 - 3. Colored-Aggregate Pointing Mortar: Produce color required by combining colored aggregates with portland cement of selected color.

2.9 SOURCE QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform source quality-control testing.
 - 1. Retesting of materials that fail to meet specified requirements shall be done at Contractor's expense.
 - 2. Furnish test specimens selected by testing agency from same blocks as actual materials proposed for incorporation into the Work.
 - 3. Flexural Strength Tests: ASTM C 880/C 880M, performed on specimens of same thickness, orientation of cut, and finish as installed stone. One set of test specimens is required to be tested for every 5000 sq. ft., but not fewer than two sets for each stone variety.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces to receive stone trim and conditions under which stone trim will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of stone cladding.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of stone trim.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SETTING STONE TRIM, GENERAL

- A. Before setting stone, clean surfaces that are dirty or stained by removing soil, stains, and foreign materials. Clean stone by thoroughly scrubbing with fiber brushes and then drenching with clear water. Use only mild cleaning compounds that contain no caustic or harsh materials or abrasives.
- B. Coat limestone with dampproofing to extent indicated below:

- 1. Stone at Grade: Beds, joints, and back surfaces to at least 12 inches above finish-grade elevations.
- 2. Stone Extending Below Grade: Beds, joints, back surfaces, and face surfaces below grade.
- 3. Allow dampproofing to cure before setting dampproofed stone. Do not damage or remove dampproofing while handling and setting stone.
- C. Execute stone trim installation by skilled mechanics and employ skilled stone fitters at Project site to do necessary field cutting as stone is set.
 - 1. Use power saws with diamond blades to cut stone. Produce lines cut straight and true, with edges eased slightly to prevent snipping.
- D. Contiguous Work: Provide reveals, reglets, and openings as required to accommodate contiguous work.
- E. Set stone to comply with requirements indicated. Install anchors, supports, fasteners, and other attachments indicated or necessary to secure stone cladding in place. Shim and adjust anchors, supports, and accessories to set stone accurately in locations indicated, with uniform joints of widths indicated, and with edges and faces aligned according to established relationships and indicated tolerances.
- F. Provide expansion, control, and pressure-relieving joints of widths and at locations indicated.
 - 1. Sealing expansion and other joints is specified in Section 079200 "Joint Sealants."
 - 2. Keep expansion joints free of mortar and other rigid materials.
- G. Install concealed flashing at continuous shelf angles, lintels, ledges, and similar obstructions to downward flow of water, to divert water to building exterior. Extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.
- H. Keep cavities open where unfilled space is indicated between back of stone units and backup wall; do not fill cavities with mortar or grout.
 - 1. Place weep holes in joints where moisture may accumulate, including at base of cavity walls and above shelf angles and flashing. Locate weep holes at intervals not exceeding 24 inches. Use plastic weep hole/vents.

3.3 SETTING STONE TRIM WITH MORTAR

- A. Set stone trim with mortar and mechanical anchors unless otherwise indicated.
- B. Set stone in full bed of mortar with head joints filled unless otherwise indicated.
 - 1. Use setting buttons of adequate size, in sufficient quantity, and of thickness required to maintain uniform joint width and to prevent mortar from extruding. Hold buttons back from face of stone a distance at least equal to width of joint, but not less than depth of pointing materials.
 - 2. Do not set heavy units or projecting courses until mortar in courses below has hardened enough to resist being squeezed out of joint.
 - 3. Support and brace projecting stones until wall above is in place and mortar has set.

- 4. Provide compressible filler in ends of dowel holes and bottoms of kerfs to prevent end bearing of dowels and anchor tabs on stone. Fill remainder of anchor holes and kerfs with mortar.
- C. Fill space between back of stone units and backup wall solidly with mortar or grout.
- D. Embed ends of sills in mortar; leave remainder of joint open until final pointing.
- E. Rake out joints for pointing with mortar to depths of not less than 1/2 inch. Rake joints to uniform depths with square bottoms and clean sides.
- F. Prepare stone-joint surfaces for pointing with mortar by removing dust and mortar particles. Where setting mortar was removed to depths greater than surrounding areas, apply first layer of pointing mortar in layers not more than 3/8 inch until a uniform depth is formed.
- G. Point stone joints by placing pointing mortar in layers not more than 3/8 inch. Compact each layer thoroughly and allow to become thumbprint hard before applying next layer.
- H. Tool joints with a round jointer having a diameter 1/8 inch larger than width of joint, when pointing mortar is thumbprint hard.
- I. Rake out mortar from sealant-pointed joints to depths required for sealant and sealant backing, but not less than 1/2 inch. Rake joints to uniform depths with square bottoms and clean sides.
- J. Set the following stone trim with unfilled head joints for installing joint sealants:
 - 1. Cornices.
 - 2. Copings.
 - 3. Sills.
 - 4. Belt and other projecting courses.

3.4 JOINT-SEALANT INSTALLATION

A. Prepare joints and apply sealants of type and at locations indicated to comply with applicable requirements in Section 079200 "Joint Sealants."

3.5 INSTALLATION TOLERANCES

- A. Variation from Plumb: For vertical lines and surfaces of walls, do not exceed 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch in 40 feet or more. For external corners, corners and jambs within 20 feet of an entrance, expansion joints, and other conspicuous lines, do not exceed 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 3/8 inch in 40 feet or more.
- B. Variation from Level: For lintels, sills, water tables, parapets, horizontal bands, horizontal grooves, and other conspicuous lines, do not exceed 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 3/8 inch maximum.
- C. Variation of Linear Building Line: For positions shown in plan and related portions of walls and partitions, do not exceed 1/4 inch in 20 feet or 1/2 inch in 40 feet or more.

- D. Variation in Cross-Sectional Dimensions: For thickness of walls from dimensions indicated, do not exceed plus or minus 1/4 inch.
- E. Variation in Joint Width: Do not vary from average joint width more than plus or minus 1/8 inch or a quarter of nominal joint width, whichever is less. For joints within 60 inches of each other, do not vary more than 1/8 inch or a quarter of nominal joint width, whichever is less from one to the other.
- F. Variation in Plane between Adjacent Stone Units (Lipping): Do not exceed 1/16-inch difference between planes of adjacent units.

3.6 ADJUSTING AND CLEANING

- A. Remove and replace broken, chipped, stained, or otherwise damaged stone, defective joints, and stone trim that does not match approved samples. Damaged stone may be repaired if Architect approves methods and results.
- B. Replace damaged or defective work in a manner that results in stone trim's matching approved samples, complying with other requirements, and showing no evidence of replacement.
- C. In-Progress Cleaning: Clean stone trim as work progresses. Remove mortar fins and smears before tooling joints. Remove excess sealant and smears as sealant is installed.
- D. Final Cleaning: Clean stone trim no fewer than six days after completion of pointing and sealing, using clean water and stiff-bristle fiber brushes. Do not use wire brushes, acid-type cleaning agents, cleaning agents containing caustic compounds or abrasives, or other materials or methods that could damage stone.

END OF SECTION 044200

SECTION 047200 - 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 trim including the following:
 - a. Window sills.
 - b. Lintels.
 - c. Coping.
 - d. Wall caps.
 - e. Belt courses.
 - f. Column covers.
- B. Related Sections:
 - 1. Section 042000 "Unit Masonry" for installing cast-stone units in unit masonry.

1.3 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. 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.
- C. Shop Drawings: Show fabrication and installation details for cast-stone units. Include dimensions, details of reinforcement and anchorages if any, and indication of finished faces.
 - 1. Include building elevations showing layout of units and locations of joints and anchors.
- D. Samples for Initial Selection: For colored mortar.
- E. Samples for Verification:
 - 1. For each color and texture of cast stone required, 10 inches square in size.
 - 2. For each trim shape required, 10 inches in length.
 - 3. For colored mortar, make Samples using same sand and mortar ingredients to be used on Project. Label Samples to indicate types and amounts of pigments used.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer.
 - 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.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer 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.
- B. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
- C. Mockups: Furnish cast stone for installation in mockups specified in Section 042000 "Unit Masonry."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Coordinate delivery of cast stone to avoid delaying the Work.
- 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.

1.7 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 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.

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 waterreducing 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. Add to mixes for units exposed to the exterior at manufacturer's prescribed rate to result in an air content of 4 to 6 percent, except do not add to zero-slump concrete mixes.
 - 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. Use galvanized or epoxy-coated reinforcement when covered with less than 1-1/2 inches of cast-stone material.

- 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.

2.3 CAST-STONE UNITS

- A. Subject to conformance with the specification requirements, provide material by one of the following:
 - 1. Continental Cast Stone
 - 2. Corinthian Cast Stone
 - 3. American Artstone Company
 - 4. Arban Precast Stone
 - 5. Faddis Concrete Products
- B. Regional Materials: Cast stone units shall be 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.
- C. Regional Materials: Cast stone units shall be manufactured within 500 miles of Project site.
- D. Cast-Stone Units: Comply with ASTM C 1364.
 - 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.
- E. 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.
- F. Fabrication Tolerances:
 - 1. Variation in Cross Section: Do not vary from indicated dimensions by more than 1/8 inch.
 - 2. Variation in Length: Do not vary from indicated dimensions by more than 1/360 of the length of unit or 1/8 inch, whichever is greater, but in no case by more than 1/4 inch.
 - 3. Warp, Bow, and Twist: Not to exceed 1/360 of the length of unit or 1/8 inch, 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 on formed surfaces of units and 3/8 inch on unformed surfaces.
- G. 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 for 12 hours or 70 deg F 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 or above.

- b. No fewer than six days at mean daily temperature of 60 deg F or above.
- c. No fewer than seven days at mean daily temperature of 50 deg F or above.
- d. No fewer than eight days at mean daily temperature of 45 deg F or above.
- H. Acid etch units after curing to remove cement film from surfaces to be exposed to view.
- I. Colors and Textures: As selected by Architect from manufacturer's full range.
- J. Colors and Textures: Provide units with fine-grained texture and buff color resembling sandrubbed Indiana limestone.

2.4 ACCESSORIES

- A. Anchors: Type and size indicated, fabricated from Type 304 stainless steel complying with ASTM A 240/A 240M, ASTM A 276, or ASTM A 666.
- B. Dowels: 1/2-inch- diameter round bars, 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.

2.5 MORTAR MIXES

- A. Comply with requirements in Section 042000 "Unit Masonry" for mortar mixes.
- B. Do not use admixtures including pigments, air-entraining agents, accelerators, retarders, waterrepellent 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.
- C. Comply with ASTM C 270, Proportion Specification.
 - 1. For setting mortar, use Type N.
 - 2. For pointing mortar, use Type N.
- D. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.
 - 1. Pigments shall not exceed 10 percent of portland cement by weight.
 - 2. Mix to match Architect's sample.
 - 3. Application: Use pigmented mortar for exposed mortar joints.

2.6 SOURCE QUALITY CONTROL

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. Set units with joints 3/8 to 1/2 inch wide unless otherwise indicated.
 - 2. Build anchors and ties into mortar joints as units are set.
 - 3. Fill dowel holes and anchor slots with mortar.
 - 4. Fill collar joints solid as units are set.
 - 5. Build concealed flashing into mortar joints as units are set.
 - 6. Keep head joints in copings and between other units with exposed horizontal surfaces open to receive sealant.
 - 7. 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. 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. 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. 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. Form joint of width indicated, but not less than 3/8 inch.
 - 4. Prime cast-stone surfaces to receive sealant and install compressible backer rod in joints before applying sealant unless otherwise indicated.
 - 5. 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.
 - 1. Form open joint of width indicated, but not less than 3/8 inch.
- 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, 1/4 inch in 20 feet, or 1/2 inch maximum.
- B. Variation from Level: Do not exceed 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
- C. Variation in Joint Width: Do not vary joint thickness more than 1/8 inch in 36 inches 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, except where variation is due to warpage of units within tolerances specified.

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 047200

SECTION 050371 - HISTORIC DECORATIVE METAL CLEANING AND REPAIR

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 historic treatment of decorative metal in the form of cleaning and painting as follows:
 - 1. Carefully cleaning all the copper metal including louvers on the A Building cupola and the B Building cupola with detergent and water only to remove atmospheric dirt with minimal damage to the existing patina.
 - 2. Cleaning, mechanically preparing and painting the steel finials atop both cupolas.
 - 3. Straightening and re-forming damaged copper louvers.
 - 4. Re-soldering any loose or open copper to copper joints.
 - 5. Replacement of cracked or eroded copper panels.
 - 6. Carefully cleaning all the existing bronze grilles to remain with detergent and water only to remove atmospheric dirt with minimal damage to the existing patina.
- B. Related Requirements:
 - 1. Section 013591 HISTORIC TREATMENT PROCEDURES for general historic treatment requirements.
 - 2. Section 050374 HISTORIC DECORATIVE METAL REPLICATION for replicating and installing historic decorative metal.

1.3 DEFINITIONS

A. Low-Pressure Spray: 100 to 400 psi; 4 to 6 gpm.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to historic treatment of decorative metal including, but not limited to, the following:
 - a. Verify historic treatment specialist's personnel, equipment, and facilities needed to make progress and avoid delays.
 - b. Materials, material application, and sequencing.
 - c. Fire-protection plan.
 - d. Decorative metal historic treatment program.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include recommendations for product application and use.
 - 2. Include test data substantiating that products comply with requirements.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For historic treatment Contractor.
- B. Decorative Metal Historic Treatment Program: For cleaning historic decorative metalwork.

1.7 QUALITY ASSURANCE

- A. Historic Treatment Contractor Qualifications: A qualified historic decorative metal cleaning specialist. Cleaning specialist shall be experienced in using mechanical and chemical methods on the types of metal surfaces indicated.
- B. Decorative Metal Historic Treatment Program: Prepare a written, detailed description of materials, methods, equipment, and sequence of operations to be used for historic treatment work, including each process or phase of cleaning decorative metal, related work, and the protection of surrounding materials and Project site.

1.8 FIELD CONDITIONS

A. Weather Limitations: Proceed with historic treatment of decorative metal only when existing and forecasted weather conditions are within the environmental limits set by each manufacturer's written instructions and specified requirements.

PART 2 - PRODUCTS

2.1 CLEANING MATERIALS

- A. Water: Potable.
- B. Hot Water: Water heated to a temperature of 140 to 160 deg F.
- C. Detergent Solution, Job Mixed: Solution prepared by mixing 2 cups of tetrasodium pyrophosphate (TSPP), 1/2 cup of laundry detergent, and 20 quarts of hot water for every 5 gal. of solution required.

2.2 MISCELLANEOUS MATERIALS

A. Liquid Strippable Masking Agent: Manufacturer's standard liquid, film-forming, strippable masking material for protecting glass, metal, glazed masonry, and polished stone surfaces from damaging effects of cleaners.

- B. Masking Tape: Nonstaining, nonabsorbent material; compatible with chemical solutions being used and substrate surfaces; and that will easily come off entirely, including adhesive.
- C. Copper Repair Materials:
 - 1. Sheet copper minimum weight of 20 oz.
 - 2. Solder

2.3 FERROUS METAL PRIMERS

- A. Repair Primer: Manufacturer's standard, rust-inhibiting, fast-curing, lead- and chromate-free, universal primer, compatible with applied finish. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry-film thickness.
- B. Finish Primer: Primer complying with applicable requirements in 099600 HIGH PERFORMANCE COATINGS for finish painting of primed historic metal.

PART 3 - EXECUTION

3.1 PROTECTION

- A. Comply with each manufacturer's written instructions for protecting building and other surfaces against damage from exposure to its products. Prevent chemical solutions from coming into contact with people, motor vehicles, landscaping, buildings, and other surfaces that could be harmed by such contact.
 - 1. Cover adjacent surfaces with materials that are proven to resist chemical solutions being used unless products being used will not damage adjacent surfaces. Use protective materials that are waterproof and UV resistant. Apply masking agents to comply with manufacturer's written instructions. Do not apply liquid masking agent to painted or porous surfaces. When no longer needed, promptly remove masking to prevent adhesive staining.
 - 2. Do not apply chemical solutions during winds of sufficient force to spread them to unprotected surfaces.
 - 3. Neutralize alkaline and acid wastes before disposal.
 - 4. Dispose of runoff from operations by legal means and in a manner that prevents soil erosion, undermining of paving and foundations, damage to landscaping, and water penetration into building interiors.

3.2 HISTORIC DECORATIVE METAL CLEANING, GENERAL

- A. Execution of the Work: In cleaning historic items, disturb them as minimally as possible and as follows:
 - 1. Remove deteriorated coatings and corrosion.
 - 2. Sequence work to minimize time before protective coatings are reapplied.
 - 3. Clean items in place unless otherwise indicated.
- B. Mechanical Coating Removal: Use only the most gentle mechanical methods that will not abrade metal substrate. Do not use abrasive methods such as sanding or power tools except as indicated as part of the historic treatment program and specifically approved by Architect.
- C. Repaint: Where indicated, prepare painted decorative metal by cleaning surface, removing less than firmly adhered existing paint, sanding edges smooth, and priming for painting as specified.

3.3 HISTORIC DECORATIVE METAL REPAIR, GENERAL

- A. Repair appearance Standard: Repaired surfaces are to have a uniform appearance as viewed from 10 feet away by Architect.
- B. Execution of the Work: In repairing historic items, disturb remaining existing work as minimally as possible and as follows;
 - 1. Stabilize decorative metal to reestablish structural integrity and weather resistance while maintaining the existing form of each item.
 - 2. Repair items in place unless otherwise indicated and retain as much original material as possible.
 - 3. Make historic treatment of materials reversible whenever possible.
- C. Repairing Decorative Metal Items: Match existing materials and features, retaining as much original material as possible to complete the repair.
 - 1. Unless otherwise indicated, repair decorative metals by patching, filling, piecing-in, splicing, or otherwise reinforcing metals with new material matching existing.
 - 2. Where indicated, repair decorative metal by limited replacement to the extent indicated, matching existing metal.
- D. Replacing Decorative Metal Components: Where indicated or required, duplicate and replace items with new metal matching existing metal.
 - 1. Replace heavily deteriorated or missing parts or features of decorative metal with compatible materials, using surviving prototypes to create patterns or molds for duplicate replacements.
 - 2. Do not use substitute materials match existing materials.

3.4 CLEANING

- A. General: Use only those methods indicated for each type of decorative metal and its location.
 - 1. Brushes: If using wire brushes, use brushes of same base metal composition as metal being treated. Use brushes that are resistant to chemicals being used.
 - 2. Uniformity: Perform each cleaning method indicated in a manner that results in uniform coverage of all surfaces, including corners, contours, and interstices, and that produces an even effect without streaks or damaging surfaces.
 - 3. Protection: After cleaning is complete, remove protection no longer required. Remove tape and adhesive marks.
- B. Detergent Cleaning:
 - 1. Wet surface with warm water applied by low-pressure spray.
 - 2. Scrub surface with detergent solution and natural-fiber bristle brush until soil is thoroughly dislodged and can be removed by rinsing. Use small brushes to remove soil from joints and crevices. Dip brush in solution often to ensure that adequate fresh detergent is used and that surface remains wet.
 - 3. Rinse with water applied by warm low-pressure spray to remove detergent solution and soil.
 - 4. Repeat cleaning procedure where required to produce cleaning effect established by mockup.
- C. Mechanical Rust and Paint Removal:
 - 1. Remove rust with approved abrasives for ferrous metal cleaning.
 - 2. Wipe off residue with mineral spirits and either steel wool or soft rags.
 - 3. Dry immediately with clean, soft cloths. Follow direction of grain in metal.
 - 4. Prime immediately to prevent rust. Do not touch cleaned metal surface until primed.

3.5 DISMANTLING, REPAIR, AND INSTALLATION

- A. Repair decorative metal in place insofar as practicable, unless otherwise indicated. Where necessary, dismantle components from their substrate and repair and reinstall according to approved historic treatment program.
- B. Installation:
 - 1. Locate and place decorative metal items level and plumb and in alignment with adjacent construction.
 - 2. Use concealed anchorages where possible, unless otherwise indicated.
 - 3. Form tight joints with exposed connections accurately fitted together.
 - 4. Install concealed joint fillers, sealants, and flashings, as the Work progresses, to make exterior items weatherproof.
 - 5. Corrosion Protection: Apply bituminous paint or other permanent separation materials on concealed surfaces where metals would otherwise be in direct contact with substrate materials that are incompatible or could result in corrosion or deterioration of either material or finish.
 - 6. Touch-Up: At completion of installation, touch up and restore damaged or defaced finish surfaces and fastener heads.
- C. Sealant: Clean and prepare joint surfaces and apply and cure sealant according to Section 079200, Joint Sealants.
 - 1. Keep joints to receive sealant dry and free of debris.
 - 2. Fill sealant joints with specified joint sealant as recommended in writing by sealant manufacturer.

3.6 PAINTING STEEL UNCOVERED DURING THE WORK

- A. Notify Architect if steel is exposed during metal removal. Where Architect determines that the steel is structural, or for other reasons cannot be totally removed, prepare and paint as follows;
 - 1. Surface Preparation: Remove paint, rust, and other contaminants according to SSPC-SP 3, Power Tool Cleaning, as applicable to comply with paint manufacturer's recommended preparation.
 - 2. Antirust Coating: Immediately paint exposed steel with two coats of antirust coating, following coating manufacturer's written instructions and without exceeding manufacturer's recommended rate of application.
- B. If on in section and rust removal the thickness of a steel member is found to be reduced from rust by more than 1/16 inch, notify Architect before proceeding.

3.7 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections. Allow inspectors use of lift devices and scaffolding, as needed, to perform inspections.
- B. Notify testing agency in advance of times when lift devices and scaffolding will be relocated. Do not relocate lift devices and scaffolding until inspectors have had reasonable opportunity to inspect work areas at locations of lift devices or scaffolding.
- C. Manufacturer's Field Service: Engage chemical-cleaner and paint-remover manufacturers' factoryauthorized service representatives for consultation and Project-site inspection, to perform preconstruction product testing, and to provide on-site assistance when requested by Architect.

3.8 PRIMING

- A. Repair Primer: Apply immediately after completing a repair.
- B. Finish Primer: Apply as soon after cleaning as possible.

END OF SECTION 050371

SECTION 050374 - HISTORIC DECORATIVE METAL REPLICATION

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 historic treatment of B Building decorative metal in the form of replicating and installing historic decorative grille items. Field verify all existing openings and required numbers prior to fabrication:
 - 1. Replicate 33 units of Type A decorative grille for installation under existing narrow window units as indicated on the drawings (approximately 2'-0" x 1'-4"). Use 1 existing salvaged grille for pattern. Refer to building elevation drawings.
 - 2. Replicate 3 units of Type B decorative grille for installation under existing bricked-in window units at the east and west ends of B Building as indicated on the drawings (approximately 3'-0" x 1'-4"). Use 1 existing (of 5 total) salvaged grille for pattern. Refer to building elevation drawings.
 - 3. Replicate 3 units of Type C decorative grille for installation at second floor line at existing window units above B Building main entrance as indicated on the drawings (approximately 2'-0" x 3'-0"). No existing grille remains. Refer to building elevation drawings for approximate drawing of original grille.
 - 4. Remove existing decorative grilles noted above (1 type A and 5 type B), clean and repair per Historic Decorative Metal Cleaning and Repair and reinstall in specific locations as directed by the architect.
- B. Related Requirements:
 - 1. Section 013591 HISTORIC TREATMENT PROCEDURES for general historic treatment requirements.
 - 2. Section 050371 HISTORIC DECORATIVE METAL CLEANING AND REPAIR for cleaning and repairing historic decorative metalwork.

1.3 PRE-INSTALLATION MEETINGS

- A. Pre-installation Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to historic treatment of decorative metal including, but not limited to, the following:
 - a. Historic treatment specialist's personnel, equipment, and facilities needed to make progress and avoid delays.
 - b. Materials, material application, sequencing, tolerances, and required clearances.
 - c. Fire-protection plan.
 - d. Decorative metal historic treatment program.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings:
 - 1. Include plans, elevations, and sections showing locations and extent of replication work, with enlarged details of replacement parts indicating materials, profiles, methods of attachment, accessory items, and finishes.
 - 2. Include field-verified dimensions and the following:
 - a. Full-size patterns with complete dimensions for new decorative metal items and their jointing, showing relation of existing to new items.
 - b. Templates and directions for installing anchor bolts and other anchorages.
 - c. Type of exposed finish prepared on metal of the same alloy to be used for the Work of this Section; 6 inches long in least dimension.
 - d. Identification of each new metal item and component and its location on the structure in annotated plans and elevations.
- C. Samples for Initial Selection: For the following:
 - 1. Each type of decorative metal item and component.
- D. Samples for Verification:
 - 1. Each type of new material to be used for replacing existing or missing decorative metal.
 - a. Patterns for Casting: Before casting items, submit the actual patterns from which molds will be made for casting. Package and ship to prevent loss or damage, or make patterns available for inspection by Architect at fabrication plant.
 - b. Casting Samples: For castings, provide one suitable and ready for installation. Make this submittal after acceptance of patterns for casting.
 - 2. Fittings and brackets.
 - 3. Accessories: Each type of anchor, accessory, and miscellaneous support in required finishes.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For historic treatment specialist.
- B. Decorative Metal Historic Treatment Program: For replicating historic decorative metalwork.

1.6 QUALITY ASSURANCE

- A. Historic Treatment Specialist Qualifications: A qualified historic decorative metal fabrication and installation specialist. Experience installing and finishing new decorative metalwork is insufficient experience for decorative metal historic treatment work.
- B. Decorative Metal Historic Treatment Program: Prepare a written, detailed description of materials, methods, equipment, and sequence of operations to be used for historic treatment work, including each process or phase of replicating decorative metal, related work, and the protection of surrounding materials and Project site.

- 1. If materials and methods other than those indicated are proposed for any phase of historic treatment work, add a written description of such materials and methods, including evidence of successful use on comparable projects, and demonstrations to show their effectiveness for this Project.
- C. Mockups: Demonstrate mockup of historic treatment replication and installation process utilizing casting sample and existing decorative grille recess to demonstrate aesthetic effects and to set quality standards for materials and execution and for fabrication and installation.
 - 1. Cast-Metal Items: Submit patterns, models, or plaster castings made from existing decorative metal for each replacement casting required.
 - 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.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Pack, deliver, and store decorative metal items in suitable packs, heavy-duty cartons, or wooden crates; surround with sufficient packing material to ensure that products are not deformed, cracked, or otherwise damaged.
- B. Store decorative metal inside a well-ventilated area, away from uncured concrete and masonry and protected from weather, moisture, soiling, abrasion, extreme temperatures, and humidity.
- C. Protect strippable protective covering on decorative metal from exposure to sunlight and high humidity, except to the extent necessary for the period of decorative metal installation.

1.8 FIELD CONDITIONS

A. Weather Limitations: Proceed with historic treatment of decorative metal only when existing and forecasted weather conditions are within the environmental limits set by each manufacturer's written instructions and specified requirements.

PART 2 - PRODUCTS

2.1 METAL MATERIALS

- A. General: Provide decorative metal materials made of the alloys, forms, and types that match existing metals and have the ability to receive finishes matching existing finishes unless otherwise indicated. Exposed-to-view surfaces exhibiting imperfections inconsistent with existing materials are unacceptable.
- B. Source Limitation for Replacement Cast Materials: Obtain castings for historic treatment of decorative metal from single source from single manufacturer with resources to provide materials of consistent quality in appearance and physical properties.
- C. Copper Alloys, Bronze: Copper alloy designated below for each form required:
 - 1. Sand Castings: ASTM B 584, Alloy UNS No. C86500 (No. 1 manganese bronze; 58 percent copper, 39 percent zinc, 1 percent manganese, and small amounts of other metals).

D. Wrought Iron: mild steel; ASTM A 29/A 29M, Grade 1010; hand worked or machine forged to the form indicated.

2.2 MISCELLANEOUS MATERIALS

- A. Brazing Rods for Copper-Alloy Components: Type and alloy as recommended in writing by producer of metal to be brazed and as required for color match, strength, and compatibility in fabricated items.
- B. Fasteners: Fasteners of same basic metal as fastened metal unless otherwise indicated. Use metals that are noncorrosive and compatible with each metal joined.
 - 1. Match existing fasteners in material and in type of fastener unless otherwise indicated.
 - 2. Use concealed fasteners for interconnecting decorative metal components and for attaching them to other work unless exposed fasteners are the existing fastening method.
 - 3. Furnish exposed fasteners to match metal fastened unless otherwise indicated.
- C. Anchors: Adhesive type with bolt heads of same basic metal as fastened metal unless otherwise indicated. Use metals that are noncorrosive and compatible with each metal anchored.
 - 1. Strength: Capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to 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.
- D. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended in writing by manufacturer for interior and exterior applications.
- E. 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 in writing by manufacturer for exterior use.
- F. Other Products: Select materials and methods of use based on the following, subject to approval of a mockup:
 - 1. Previous effectiveness in performing the work involved.
 - 2. Little possibility of damaging exposed surfaces.
 - 3. Consistency of each application.
 - 4. Uniformity of the resulting overall appearance.
 - 5. Do not use products or tools that could do the following:
 - a. Remove, alter, or in any way harm the present condition or future preservation of existing surfaces, including surrounding surfaces not in the Contract.
 - b. Leave an unintended residue on surfaces.

2.3 METAL FABRICATION

- A. Fabricate decorative metal items and components in sizes and profiles to match existing decorative metal, with accurate curves, lines, and angles. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
- B. Provide uniform, neat seams with minimum exposure of welds, brazing, solder, and sealant.
- C. Provide rebates, lugs, and brackets necessary to assemble components and to attach to existing work. Drill and tap for fasteners. Use concealed fasteners where possible; use exposed fasteners to match existing work.
- D. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed joints of flux, and dress exposed and contact surfaces.
 - 1. Use materials and methods that match color of base metal, minimize distortion, and develop maximum strength and corrosion resistance.
 - 2. Remove flux immediately.
 - 3. At exposed connections, match contours of adjoining surfaces, and finish exposed surfaces smooth and blended so no roughness shows after finishing.
- E. Castings: Fabricate castings free of warp, cracks, blowholes, or other defects that impair strength or appearance. Grind, wire brush, sandblast, and buff castings to remove seams, gate marks, casting flash, and other casting marks.
 - 1. Finish castings to match existing decorative metalwork.
- F. Date Identification: Emboss on a concealed, interior surface of the metal body of each new component, in easily read characters, "MADE 2016." Manufacturer's name may also be embossed. For malleable metals, stamp identification with an imprinting tool.

2.4 FINISHES, GENERAL

- A. Protect mechanical 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.

2.5 COPPER-ALLOY FINISHES

- A. General: Finish designations for copper alloys comply with the system defined in NAAMM/NOMMA's "Metal Finishes Manual for Architectural and Metal Products (AMP 500-06)."
- B. Satin Hand-Rubbed Finish: M32-M34 (directionally textured, medium satin and hand-rubbed mechanical finishes).

PART 3 - EXECUTION

3.1 HISTORIC DECORATIVE METAL REPLICATION, GENERAL

- A. Replication Appearance Standard: Replicated surfaces are to have a uniform appearance as viewed from 10 feet away by Architect.
- B. Execution of the Work: In replicating historic items, disturb remaining existing work as minimally as possible and as follows:
 - 1. Sequence work to minimize time before protective coatings are applied.
 - 2. Replace or reproduce historic items where indicated or scheduled.
 - 3. Make installation of replicated items reversible whenever possible.
- C. Replicate Decorative Metal Item: Where indicated, duplicate existing items with new materials matching existing materials and features.
 - 1. Use surviving prototypes to create patterns or molds for duplicating.
 - 2. Do not use substitute materials unless otherwise indicated.

3.2 INSTALLATION

- A. Installing Sealant:
 - 1. After metal installation, keep joints to receive sealant dry and free of debris.
 - Clean and prepare joint surfaces according to Section 079200 "Joint Sealants." Prime joint surfaces unless sealant manufacturer recommends against priming. Do not allow primer to spill or migrate onto adjoining surfaces.
 - 3. Fill sealant joints with specified joint sealant as recommended in writing by sealant manufacturer and according to Section 079200 "Joint Sealants" and the following:
 - a. Install sealant using only proved installation methods that ensure sealant is deposited in a uniform, continuous ribbon, without gaps or air pockets, and with complete wetting of the joint bond surfaces equally on both sides. Fill joint flush with surrounding metal.
 - b. Do not allow sealant to overflow or spill onto adjoining surfaces or to migrate into the voids of adjoining surfaces, particularly rough or sculptural textures. Promptly remove excess and spillage of sealant as the work progresses. Clean adjoining surfaces by means necessary to eliminate evidence of spillage, without damage to adjoining surfaces or finishes, as demonstrated in an approved mockup.
 - 4. Cure sealant according to Section 079200 "Joint Sealants."

END OF SECTION 050374

SECTION 051200 - 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. Prefabricated building columns.
 - 3. Field-installed shear connectors.
 - 4. Grout.
- B. Related Requirements:
 - 1. Section 053100 "Steel Decking" for field installation of shear connectors through deck.
 - 2. Section 055000 "Metal Fabrications" for steel lintels and shelf angles not attached to structural-steel frame miscellaneous steel fabrications and other steel items not defined as structural steel.
 - 3. Section 099113 "Exterior Painting" and Section 099123 "Interior Painting" for surfacepreparation and priming requirements.

1.3 DEFINITIONS

A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

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 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.

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: Show fabrication of structural-steel components.
 - 1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
 - 2. Include embedment Drawings.
 - 3. 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.
 - 4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections.
- D. 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 qualified by testing, including the following:
 - 1. Power source (constant current or constant voltage).
 - 2. Electrode manufacturer and trade name, for demand critical welds.
- E. Delegated-Design Submittal: For structural-steel connections indicated to comply with design loads, include analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer fabricator shop-painting applicators 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.
- G. Field quality-control and special inspection reports.

1.7 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, or is accredited by the IAS Fabricator Inspection Program for Structural Steel (AC 172).
- B. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category CSE.
- C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code Steel."

1.8 DELIVERY, STORAGE, AND HANDLING

- A. 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.
- B. 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.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Connections: Provide details of simple shear connections required by the Contract Documents to be selected or completed by structural-steel fabricator, including comprehensive engineering analysis by a qualified professional engineer, to withstand loads indicated and comply with other information and restrictions indicated.
 - 1. Select and complete connections using schematic details indicated and AISC 360
 - 2. Use Load and Resistance Factor Design; data are given at factored-load level
- B. Moment Connections: Type FR, fully restrained.

2.2 STRUCTURAL-STEEL MATERIALS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 50 percent.

- B. W-Shapes: ASTM A 992/A 992M
- C. Channels, Angles: ASTM A 36/A 36M
- D. Plate and Bar: ASTM A 36/A 36M
- E. Cold-Formed Hollow Structural Sections: ASTM A 500/A 500M, Grade B structural tubing.
- F. Steel Pipe: ASTM A 53/A 53M, Type E or Type S, Grade B.
- G. Welding Electrodes: Comply with AWS requirements.

2.3 BOLTS, CONNECTORS, AND ANCHORS

- A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers; all with plain finish.
 - 1. Direct-Tension Indicators: ASTM F 959, Type 325, compressible-washer type with plain finish.
- B. Zinc-Coated High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade DH heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers.
 - 1. Finish: Hot-dip zinc coating
 - 2. Direct-Tension Indicators: ASTM F 959, Type 325, compressible-washer type with mechanically deposited zinc coating 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. Unheaded Anchor Rods: ASTM F 1554, Grade 36
 - 1. Configuration: Straight
 - 2. Nuts: ASTM A 563 heavy-hex carbon steel.
 - 3. Plate Washers: ASTM A 36/A 36M carbon steel.
 - 4. Washers: ASTM F 436, Type 1, hardened carbon steel.
 - 5. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C
- E. Threaded Rods: ASTM A 36/A 36M
 - 1. Nuts: ASTM A 563 heavy-hex carbon steel.
 - 2. Washers: ASTM F 436, Type 1, hardened
 - 3. Finish: Plain

2.4 PRIMER

- A. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.
- B. Galvanizing Repair Paint: MPI#18, MPI#19, or SSPC-Paint 20 ASTM A 780/A 780M.

2.5 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.6 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," and to AISC 360.
 - 1. Camber structural-steel members where indicated.
 - 2. Fabricate beams with rolling camber up.
 - 3. Identify high-strength structural steel according to ASTM A 6/A 6M and maintain markings until structural steel has been erected.
 - 4. Mark and match-mark materials for field assembly.
 - 5. Complete structural-steel assemblies, including welding of units, before starting shoppriming 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, mechanically thermal cut, or punch standard bolt holes perpendicular to metal surfaces.
- D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.
- E. 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.

2.7 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: As indicated
- B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

2.8 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.

- 2. Surfaces to be field welded.
- 3. Surfaces of high-strength bolted, slip-critical connections.
- 4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
- 5. Galvanized surfaces.
- 6. Surfaces enclosed in interior construction.
- 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 11, "Power Tool Cleaning to Bare Metal."
- 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. 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.
- 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.

2.9 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 are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.
 - 2. Galvanize lintels and shelf angles located in exterior walls and all exposed structural steel members.

2.10 SOURCE QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform shop tests and inspections.
 - 1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
- B. Bolted Connections: Inspect and test shop-bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- C. Welded Connections: Visually inspect shop-welded connections 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 are not accepted.
 - 3. Ultrasonic Inspection: ASTM E 164.
 - 4. Radiographic Inspection: ASTM E 94.

- D. In addition to visual inspection, test and inspect shop-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 according to requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors already tested.
- E. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
- 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-inplace concrete has attained its design compressive strength.

3.3 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.
- B. Baseplates Bearing Plates 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 plates for structural members on wedges, shims, or setting nuts as required.
 - 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 303, "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 are 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: As indicated
- B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

3.5 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
 - 1. Verify structural-steel materials and inspect steel frame joint details.
 - 2. Verify weld materials and inspect welds.
 - 3. Verify connection materials and inspect high-strength bolted connections.
- B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- C. Bolted Connections: Inspect and test bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- D. Welded Connections: Visually inspect field welds according to AWS D1.1/D1.1M.

- 1. In addition to visual inspection, test and inspect field welds 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 are not accepted.
 - c. Ultrasonic Inspection: ASTM E 164.
 - d. Radiographic Inspection: ASTM E 94.
- 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 according to requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors already tested.

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/A 780M.
- 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 099113 "Exterior Painting" and Section 099123 "Interior Painting."

END OF SECTION 051200

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SECTION 053100 - 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. Composite floor deck.
- B. Related Requirements:
 - 1. Section 033000 "Cast-in-Place Concrete" for normal-weight and lightweight structural concrete fill over steel deck.
 - 2. Section 051200 "Structural Steel Framing" for shop- and field-welded shear connectors.
 - 3. Section 055000 "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.
 - 4. Section 099113 "Exterior Painting" for repair painting of primed deck and finish painting of deck.
 - 5. Section 099123 "Interior Painting" for repair painting of primed deck and finish painting of deck.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of deck, accessory, and product indicated.
- B. Sustainable Design Submittals:
 - 1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
- 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.

1.4 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Product Certificates: For each type of steel deck.

- C. Product Test Reports: For 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, from ICC-ES.
- E. Field quality-control reports.

1.5 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/D1.3M, "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.
- 1.6 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. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

2.2 ROOF DECK

- A. 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-Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33 G60 zinc coating.
 - 2. Deck Profile: As indicated

- 3. Profile Depth: As indicated
- 4. Design Uncoated-Steel Thickness: As indicated
- 5. Span Condition: As indicated
- 6. Side Laps: As indicated

2.3 ACOUSTICAL ROOF DECK

- A. 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-Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33 G60 zinc coating.
 - 2. Span Condition: As indicated
 - 3. Side Laps: As indicated
 - 4. Acoustical Perforations: Deck units with manufacturer's standard perforated vertical webs.
 - 5. Sound-Absorbing Insulation: Manufacturer's standard premolded roll or strip of glass or mineral fiber..
 - 6. Acoustical Performance: NRC 0.65, tested according to ASTM C 423.

2.4 COMPOSITE FLOOR DECK

- A. 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, G60 zinc coating.
 - 2. Profile Depth: As indicated.
 - 3. Design Uncoated-Steel Thickness: As indicated.
 - 4. Span Condition: As indicated

2.5 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 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, not less than 0.0359-inch 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, 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. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, 0.0598 inch thick, with factorypunched hole of 3/8-inch minimum diameter.
- I. Galvanizing Repair Paint: ASTM A 780/A 780M

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 of the Work.
- 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.
- 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. 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 long, and as follows:
 - 1. Weld Diameter: as indicated.
 - 2. Weld Spacing: as indicated.
 - 3. Weld Washers: Install weld washers at each weld location.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports as indicated.
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:
 - 1. End Joints: Lapped 2 inches minimum
- D. 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.
- E. Sound-Absorbing Insulation: Installation into topside ribs of deck.

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: as indicated.
 - 2. Weld Spacing: Space and locate welds as indicated.
 - 3. Weld Washers: Install weld washers at each weld location.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports indicated.
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:
 - 1. End Joints: Lapped
- 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.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Field welds will be subject to inspection.
- C. Prepare test and inspection reports.

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/A 780M and manufacturer's written instructions.

END OF SECTION 053100

SECTION 054000 - 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. Load-bearing wall framing.
 - 2. Roof rafter framing.
- B. Related Requirements:
 - 1. Section 055000 "Metal Fabrications" for masonry shelf angles and connections.
 - 2. Section 092216 "Non-Structural Metal Framing" for interior non-load-bearing, metalstud framing and ceiling-suspension assemblies.

1.3 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.

1.4 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.

- 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.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
- B. Product Tests: Mill certificates or data from a qualified independent testing agency, or in-house testing with calibrated test equipment indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.
- C. 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."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed steel framing from corrosion, moisture staining, deformation, and other damage during delivery, storage, and handling.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. ClarkDietrich Building Systems.
 - 2. Marino\WARE.
 - 3. Nuconsteel, A Nucor Company.
 - 4. United Steel Deck, Inc.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design cold-formed steel framing.

- B. Structural Performance: Provide cold-formed steel framing capable of withstanding design loads within limits and under conditions indicated.
 - 1. Design Loads: As indicated
 - 2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
 - a. Exterior Load-Bearing Wall Framing: Horizontal deflection of 1/360 of the wall height.
 - b. Interior Load-Bearing Wall Framing: Horizontal deflection of 1/360 of the wall height under a horizontal load of 5 lbf/sq. ft..
 - c. Floor Joist Framing: Vertical deflection of 1/360for live loads and 1/240 for total loads of the span.
 - d. Roof Rafter Framing: Vertical deflection of 1/360 of the horizontally projected span for live loads.
 - e. Ceiling Joist Framing: Vertical deflection of 1/360 of the span for live loads and 1/240 for total loads of the span.
 - 3. Design framing systems to provide for movement of framing members located outside the insulated building envelope without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.
 - 4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as indicated.
 - 5. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.
- C. Cold-Formed Steel Framing Design Standards:
 - 1. Floor and Roof Systems: AISI S210.
 - 2. Wall Studs: AISI S211.
 - 3. Headers: AISI S212.
 - 4. Lateral Design: AISI S213.
- D. AISI Specifications and Standards: Unless more stringent requirements are indicated, comply with AISI S100 and AISI S200.
- 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.

2.3 COLD-FORMED STEEL FRAMING, GENERAL

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content 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: G60, A60, AZ50, or GF30

- C. Steel Sheet for Vertical Deflection Drift 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: G60

2.4 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: 0.0329 inch
 - 2. Flange Width: 1-5/8 inches
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: Matching steel studs.
 - 2. Minimum Flange Width: 1-1/4 inches
- C. Steel Box or Back-to-Back Headers: Manufacturer's standard C-shapes used to form header beams, of web depths indicated, unpunched, with stiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: 0.0329 inch
 - 2. Flange Width: 1-5/8 inches
- D. Steel Single- or Double-L Headers: Manufacturer's standard L-shapes used to form header beams, of web depths indicated, and as follows:
 - 1. Minimum Base-Metal Thickness: 0.0329 inch
 - 2. Top Flange Width: 1-5/8 inches

2.5 FLOOR JOIST FRAMING

- A. Steel Joists: Manufacturer's standard C-shaped steel joists, of web depths indicated, punched, with stiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: 0.0329 inch
 - 2. Flange Width: 1-5/8 inches
- B. Steel Joist Track: Manufacturer's standard U-shaped steel joist track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: Matching steel joists.
 - 2. Flange Width: 1-1/2 inches

2.6 ROOF-RAFTER FRAMING

- A. Steel Rafters: Manufacturer's standard C-shaped steel sections, of web depths indicated, with stiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: 0.0329 inch
 - 2. Flange Width: 1-5/8 inches

2.7 CEILING JOIST FRAMING

- A. Steel Ceiling Joists: Manufacturer's standard C-shaped steel sections, of web depths indicated, punched with standard holes, with stiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: 0.0329 inch
 - 2. Flange Width: 1-5/8 inches

2.8 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 and knee braces.
 - 9. Joist hangers and end closures.
 - 10. Hole reinforcing plates.
 - 11. Backer plates.

2.9 ANCHORS, CLIPS, AND FASTENERS

- A. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing per ASTM E 488 conducted by a qualified testing agency.
- B. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.
- C. 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.
- D. Welding Electrodes: Comply with AWS standards.

2.10 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: ASTM A 780.

COLD-FORMED METAL FRAMING

- B. 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/C 1107M, with fluid consistency and 30-minute working time.
- C. Shims: Load bearing, high-density multimonomer plastic, and nonleaching; or of cold-formed steel of same grade and coating as framing members supported by shims.
- D. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

2.11 FABRICATION

- A. Fabricate cold-formed steel 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 steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3/D1.3M 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 no fewer than three exposed screw threads.
 - 4. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, 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 and as follows:
 - 1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
 - 2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch.

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 of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

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 load-bearing wall bottom track and the top of foundation wall or slab at locations with a gap larger than 1/4 inch to ensure a uniform bearing surface on supporting concrete or masonry construction.
- D. Install sealer gaskets at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

3.3 INSTALLATION, GENERAL

- A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install cold-formed steel framing according to AISI S200 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.
- D. Install cold-formed steel 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 steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3/D1.3M 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 joints with cold-formed steel framing. Independently frame both sides of joints.
- H. Install insulation, specified in Section 072100 "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 approved or standard punched openings.
- J. Erection Tolerances: Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
 - 1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 LOAD-BEARING WALL INSTALLATION

- A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at spacings as follows:
 - 1. Anchor Spacing: As shown on Shop Drawings.
- B. Squarely seat studs against top and bottom tracks with gap not exceeding of 1/8 inch between the end of wall framing member and the web of track. Fasten both flanges of studs to top and bottom tracks. Space studs as follows:
 - 1. Stud Spacing: 16 inches
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar configurations.
- D. Align studs vertically where floor framing interrupts wall-framing continuity. Where studs cannot be aligned, continuously reinforce track to transfer loads.
- E. Align floor and roof framing over studs according to AISI S200, Section C1. Where framing cannot be aligned, continuously reinforce track to transfer loads.
- F. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure as indicated.
- G. Install headers over wall openings wider than stud spacing. Locate headers above openings as indicated. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.
 - 1. Frame wall openings with not less than a double stud at each jamb of frame as indicated on Shop Drawings. Fasten jamb members together to uniformly distribute loads.
 - 2. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs.

- H. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.
 - 1. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.
- I. Install horizontal bridging in stud system, spaced vertically as indicated on Shop Drawings. Fasten at each stud intersection.
 - 1. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs with a minimum of two screws into each flange of the clip angle for framing members up to 6 inches deep.
 - 2. 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.
 - 3. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.
- J. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.5 JOIST INSTALLATION

- A. Install perimeter joist track sized to match joists. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated on Shop Drawings.
- B. Install joists bearing on supporting frame, level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten joists to both flanges of joist track.
 - 1. Install joists over supporting frame with a minimum end bearing of 1-1/2 inches.
 - 2. Reinforce ends and bearing points of joists with web stiffeners, end clips, joist hangers, steel clip angles, or steel-stud sections as indicated on Shop Drawings.
- C. Space joists not more than 2 inches from abutting walls, and as follows:
 1. Joist Spacing: 16 inches
- D. Frame openings with built-up joist headers consisting of joist and joist track, or another combination of connected joists if indicated.
- E. Install joist reinforcement at interior supports with single, short length of joist section located directly over interior support, with lapped joists of equal length to joist reinforcement, or as indicated on Shop Drawings.
 - 1. Install web stiffeners to transfer axial loads of walls above.
- F. Install bridging at intervals indicated on Shop Drawings. Fasten bridging at each joist intersection as follows:
 - 1. Bridging: Joist-track solid blocking of width and thickness indicated, secured to joist webs.

- 2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and joist-track solid blocking of width and thickness indicated. Fasten flat straps to bottom flange of joists and secure solid blocking to joist webs.
- G. Secure joists to load-bearing interior walls to prevent lateral movement of bottom flange.
- H. Install miscellaneous joist framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable joist-framing assembly.

3.6 FIELD QUALITY CONTROL

- A. Testing: Owner will 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.

3.7 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel 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 steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 054000

SECTION 055000 - 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 side coiling doors.
 - 2. Steel framing and supports for countertops.
 - 3. Steel tube reinforcement for low partitions.
 - 4. Steel framing and supports for mechanical and electrical equipment.
 - 5. Steel framing and supports for applications where framing and supports are not specified in other Sections.
 - 6. Elevator machine beams, hoist beams.
 - 7. Steel shapes for supporting elevator door sills.
 - 8. Shelf angles.
 - 9. Metal ladders.
 - 10. Ladder safety cages.
 - 11. Alternating tread devices.
 - 12. Elevator pit sump covers.
 - 13. Metal bollards.
 - 14. Metal downspout boots.
 - 15. 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. Section 051200 "Structural Steel Framing."
 - 4. Section 129300 "Site Furnishings" for bicycle racks.
 - 5. Section 329300 "Plants" for tree grates.

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 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Metal nosings and treads.
 - 2. Paint products.
 - 3. Grout.
- B. Sustainable Design Submittals:
 - 1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
- C. Shop Drawings: Show fabrication and installation details. Provide Shop Drawings for the following:
 - 1. Steel framing and supports for coiling doors.
 - 2. Steel framing and supports for countertops.
 - 3. Steel tube reinforcement for low partitions.
 - 4. Steel framing and supports for mechanical and electrical equipment.
 - 5. Steel framing and supports for applications where framing and supports are not specified in other Sections.
 - 6. Elevator machine beams, hoist beams,
 - 7. Steel shapes for supporting elevator door sills.
 - 8. Shelf angles.
 - 9. Metal ladders.
 - 10. Ladder safety cages.
 - 11. Alternating tread devices.
 - 12. Elevator pit sump covers.
 - 13. Metal bollards.
 - 14. Metal downspout boots.
 - 15. Loose steel lintels.
- D. Delegated-Design Submittal: For ladders and alternating tread devices, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 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.
- E. Research/Evaluation Reports: For post-installed anchors, from ICC-ES.

1.6 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."

1.7 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: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design ladders and alternating tread devices.
- B. Structural Performance of Alternating Tread Devices: Alternating tread devices 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..
 - 2. Concentrated Load: 300 lbf applied on an area of 4 sq. in..
 - 3. Uniform and concentrated loads need not be assumed to act concurrently.
 - 4. Alternating Tread Device Framing: Capable of withstanding stresses resulting from railing loads in addition to loads specified above.
- C. 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.

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. Steel Tubing: ASTM A 500/A 500M, cold-formed steel tubing.
- I. Steel Pipe: ASTM A 53/A 53M, Standard Weight (Schedule 40) unless otherwise indicated.
- J. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.
 - 1. Size of Channels: 1-5/8 by 1-5/8 inchesor As indicated.
 - 2. Material: Galvanized steel, ASTM A 653/A 653M, structural steel, Grade 33, with G90 coating; 0.108-inch nominal thickness.
- K. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.

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.
 - 2. Provide stainless-steel fasteners for fastening stainless steel.
- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.
- C. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F 593; with hex nuts, ASTM F 594; and, where indicated, flat washers; Alloy Group 1.
- D. 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.
- E. 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/E 488M, conducted by a qualified independent testing agency.
- F. 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.
- G. 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.
- H. 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 with Section 099113 "Exterior Painting," Section 099123 Interior Painting," and 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. 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.
- F. Concrete: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normalweight, air-entrained, concrete with a minimum 28-day compressive strength of 3000 psi.

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 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 and contour of welded surface matches that of adjacent surface.
- 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, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches 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. Galvanize miscellaneous framing and supports where indicated.
- D. Prime miscellaneous framing and supports with 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 bolts, spaced not more than 6 inches from ends and 24 inches 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 larger than expansion or control joint.
- B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete.
- C. Galvanize shelf angles located in exterior walls.
- D. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-inplace 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 16 inches apart unless otherwise indicated.
- 2. Siderails: Continuous, 3/8-by-2-1/2-inch steel flat bars, with eased edges.
- 3. Rungs: 3/4-inch- 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 aluminumoxide granules set in epoxy-resin adhesive or by using a type of manufactured rung filled with aluminum-oxide grout.
- 6. Provide platforms as indicated fabricated from welded or pressure-locked steel bar grating, supported by steel angles. Limit openings in gratings to no more than 3/4 inch in least dimension.
- 7. Support each ladder at top and bottom and not more than 60 inches o.c. with welded or bolted steel brackets.
- 8. Galvanize exterior ladders, including brackets.

2.9 LADDER SAFETY CAGES

- A. General:
 - 1. Fabricate ladder safety cages to comply with ANSI A14.3. Assemble by welding or with stainless-steel fasteners.
 - 2. Provide primary hoops at tops and bottoms of cages and spaced not more than 20 feet o.c. Provide secondary intermediate hoops spaced not more than 48 inches o.c. between primary hoops.
 - 3. Fasten assembled safety cage to ladder rails and adjacent construction by welding or with stainless-steel fasteners unless otherwise indicated.
- B. Steel Ladder Safety Cages:
 - 1. Primary Hoops: 1/4-by-4-inch flat bar hoops.
 - 2. Secondary Intermediate Hoops: 1/4-by-2-inch flat bar hoops.
 - 3. Vertical Bars: 3/16-by-1-1/2-inch flat bars secured to each hoop.
 - 4. Galvanize and prime ladder safety cages, including brackets and fasteners.

2.10 ALTERNATING TREAD DEVICES

- A. Alternating Tread Devices: Fabricate alternating tread devices of open-type construction with channel or plate stringers and pipe and tube railings unless otherwise indicated. Provide brackets and fittings for installation.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Lapeyre Stair Inc.
 - b. Schmidt Structural Products, Inc.
 - 2. Tread depth shall be not less than 5 inches exclusive of nosing or less than 8-1/2 inches including the nosing, tread width shall be not less than 7 inches, and riser height shall be not more than 9-1/2 inches.
 - 3. Tread depth shall be not less than 8-1/2 inches exclusive of nosing or less than 10-1/2 inches including the nosing, tread width shall be not less than 7 inches, and riser height shall be not more than 8 inches.
 - 4. Fabricate from steel and assemble by welding or with stainless-steel fasteners.
 - 5. Comply with applicable railing requirements in Section 055213 "Pipe and Tube Railings."
- B. Galvanize exterior steel alternating tread devices, including treads, railings, brackets, and fasteners.

2.11 ELEVATOR PIT SUMP COVERS

- A. Fabricate from welded or pressure-locked steel bar grating Limit openings in gratings to no more than 3/4 inch in least dimension.
- B. Provide steel angle supports as indicated.

2.12 METAL BOLLARDS

- A. Fabricate metal bollards from Schedule 40 steel pipe.
 - 1. Cap bollards with 1/4-inch- thick steel plate.
 - 2. Where bollards are indicated to receive controls for door operators, provide cutouts for controls and holes for wire.
 - 3. Where bollards are indicated to receive light fixtures, provide cutouts for fixtures and holes for wire.
- B. Fabricate bollards with 3/8-inch- thick steel baseplates for bolting to concrete slab. Drill baseplates at all four corners for 3/4-inch anchor bolts.
 - 1. Where bollards are to be anchored to sloping concrete slabs, angle baseplates for plumb alignment of bollards.
- C. Prime bollards with zinc-rich primer.

2.13 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.

2.14 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 unless otherwise indicated.
- C. Galvanize loose steel lintels located in exterior walls.

2.15 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.

2.16 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.

2.17 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.
 - 1. Shop prime with universal shop primer unless indicated.
- D. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:
 - 1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 3. Items Indicated to Receive Primers Specified in Section 099600 "High-Performance Coatings": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 4. Other Items: SSPC-SP 3, "Power Tool Cleaning."
- E. 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.

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 overhead doors 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 METAL BOLLARDS

- A. Fill metal-capped bollards solidly with concrete and allow concrete to cure seven days before installing.
 - 1. Do not fill removable bollards with concrete.
- B. Anchor bollards in concrete in formed or core-drilled holes not less than 8 inches deep and 3/4 inch larger than OD of bollard. Fill annular space around bollard solidly with nonshrink grout; mixed and placed to comply with grout manufacturer's written instructions. Slope grout up approximately 1/8 inch toward bollard.
- C. Fill bollards solidly with concrete, mounding top surface to shed water.

3.4 INSTALLING NOSINGS, TREADS, AND THRESHOLDS

A. Center nosings on tread widths unless otherwise indicated.

- B. For nosings embedded in concrete steps or curbs, align nosings flush with riser faces and level with tread surfaces.
- C. Seal thresholds exposed to exterior with elastomeric sealant complying with Section 079200 "Joint Sealants" to provide a watertight installation.

3.5 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.

3.6 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 dry film thickness.
- B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099113 "Exterior Painting."
- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

END OF SECTION 055000

SECTION 055113 - 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.
- B. Related Requirements:
 - 1. Section 033000 "Cast-in-Place Concrete" for concrete fill for stair treads and platforms.
 - 2. Section 057313 "Glazed Decorative Metal Railings" for pipe and tube railings.

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 ACTION SUBMITTALS

- A. Product Data: For metal pan stairs and the following:1. Prefilled metal-pan-stair treads.
- B. Sustainable Design Submittals:
 - 1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
- C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
- D. Delegated-Design Submittal: For stairs and railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 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.

1.6 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 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..
 - 2. Concentrated Load: 300 lbf applied on an area of 4 sq. in..
 - 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, whichever is less.
- C. 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. applied in any direction.
 - b. Concentrated load of 200 lbf 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 applied horizontally on an area of 1 sq. ft..
 - b. Infill load and other loads need not be assumed to act concurrently.

2.2 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, 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, unless another grade is required by design loads.
- H. Perforated Metal: Cold-rolled steel sheet, ASTM A 1008/A 1008M, or hot-rolled steel sheet, ASTM A 1011/A 1011M, commercial steel Type B, 0.060 inch thick, with 1/4-inch holes 3/8 inch o.c. in staggered rows.

2.3 FASTENERS

- A. General: Provide zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, 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; with hex nuts, ASTM A 563; and, where indicated, flat washers.
- C. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.

2.4 MISCELLANEOUS MATERIALS

- A. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
 - 1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- B. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

- C. 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 unless otherwise indicated.
- D. Welded Wire Reinforcement: ASTM A 185/A 185M, 6 by 6 inches, W1.4 by W1.4, unless otherwise indicated.

2.5 FABRICATION, GENERAL

- A. Provide complete stair assemblies, including metal framing, hangers, struts, railings, 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 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 4 welds: good quality, uniform undressed weld with minimal splatter.
- 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.

2.6 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 channels.
 - a. Provide closures for exposed ends of channel stringers.
 - 2. Construct platforms of steel 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 stairs are enclosed by gypsum board assemblies, provide hanger rods or struts to support landings from floor construction above or below. Locate hanger rods and struts where they do not encroach on required stair width and are within the fire-resistance-rated stair enclosure.
 - 5. 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. Steel Sheet: Uncoated cold-rolled steel sheet unless otherwise indicated.
 - 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. Provide subplatforms of configuration indicated or, if not indicated, the same as subtreads. Weld subplatforms to platform framing.

2.7 STAIR RAILINGS

- A. Comply with applicable requirements in Section 057300 "Decorative Metal Railings."
 - 1. 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: 1-5/8-inch- diameter top and bottom rails and 1-1/2-inch- square posts.
 - 2. Perforated-Metal Infill: Perforated-metal panels edged with U-shaped channels made from metal sheet, of same metal as perforated metal, and not less than 0.043 inch thick. Orient perforated metal with pattern parallel to top rail.
 - 3. Intermediate Rails Infill: 1-5/8-inch- diameter intermediate rails spaced less than 21 inches 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 1 welds: no evidence of a welded joint as shown in NAAMM AMP 521.
- D. Form changes in direction of railings as follows:
 - 1. As detailed.

- 2. By bending or by inserting prefabricated elbow fittings.
- 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 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 clearance from inside face of handrail to finished wall surface.
- J. Fillers: Provide fillers made from steel plate, or other suitably crush-resistant material, where needed to transfer wall bracket loads through wall finishes to structural supports. Size fillers to suit wall finish thicknesses and to produce adequate bearing area to prevent bracket rotation and overstressing of substrate.

2.8 FINISHES

- A. Finish metal stairs after assembly.
- B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 3, "Power Tool 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.
- H. Install precast concrete treads with adhesive supplied by manufacturer.

3.2 INSTALLING RAILINGS

- A. Adjust railing systems before anchoring to ensure matching alignment at abutting joints. Space posts at spacing indicated or, if not indicated, as required by design loads. Plumb posts in each direction. Secure posts and rail ends to building construction as follows:
 - 1. Anchor posts to steel by welding to steel supporting members.
 - 2. Anchor handrail ends to concrete and masonry with steel round flanges welded to rail ends and anchored with postinstalled anchors and bolts.
- B. Attach handrails to wall with wall brackets. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads. Secure wall brackets to building construction as required to comply with performance requirements. 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. For steel-framed partitions, use hanger or lag bolts set into fire-retardant-treated wood backing between studs. Coordinate with stud installation to locate backing members.

3.3 ADJUSTING AND CLEANING

- 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.
 - 1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

- B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

END OF SECTION 055113
SECTION 055213 - 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 railings.
 - 2. Aluminum tube railings.
- B. Related Requirements:
 1. Section 055112 "Metal Pan Stairs" for steel tube railings associated with metal pan stairs.

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 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.

1.4 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. Sustainable Design Submittals:
 - 1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
- C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

- D. 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.
- E. Delegated-Design Submittal: For railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 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.
- F. Evaluation Reports: For post-installed anchors, from ICC-ES.

1.6 QUALITY ASSURANCE

- A. 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."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

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: 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. applied in any direction.
 - b. Concentrated load of 200 lbf 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 applied horizontally on an area of 1 sq. ft..
 - 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, ambient; 180 deg F.

2.2 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 clearance from inside face of handrail to finished wall surface.

2.3 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.
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- 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.

2.4 ALUMINUM

- A. Aluminum, General: Provide alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of alloy and temper designated below for each aluminum form required.
- B. Extruded Tubing: ASTM B 221, Alloy 6063-T5/T52.
- C. Extruded Structural Round Tubing: ASTM B 429/B 429M, Alloy 6063-T6.
 1. Provide Standard Weight (Schedule 40) pipe unless otherwise indicated.
- D. Drawn Seamless Tubing: ASTM B 210, Alloy 6063-T832.
- E. Plate and Sheet: ASTM B 209, Alloy 6061-T6.
- F. Die and Hand Forgings: ASTM B 247, Alloy 6061-T6.
- G. Castings: ASTM B 26/B 26M, Alloy A356.0-T6.

2.5 FASTENERS

- A. General: Provide the following:
 - 1. Ungalvanized-Steel Railings: Plated steel fasteners complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5 for zinc coating.
 - 2. 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.
 - 3. Aluminum Railings: Type 304 stainless-steel fasteners.
 - 4. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.
- 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: 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, Class Fe/Zn 5, unless otherwise indicated.
- 2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 2 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

2.6 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
 - 1. For aluminum 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. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
 - 1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.
- F. 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.
- G. 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 and where indicated 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 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 either welded or nonwelded 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. Welded Connections for Aluminum Pipe: Fabricate railings to interconnect members with concealed internal welds that eliminate surface grinding, using manufacturer's standard system of sleeve and socket fittings.
- J. Nonwelded Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
 - 1. Fabricate splice joints for field connection using an epoxy structural adhesive if this is manufacturer's standard splicing method.
- K. Form Changes in Direction as Follows:
 - 1. As detailed.
 - 2. By bending or by inserting prefabricated elbow fittings.
- L. 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.
- M. Close exposed ends of railing members with prefabricated end fittings.
- N. 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 or less.
- O. 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 plaster or gypsum board partitions, provide crushresistant fillers or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.

- P. 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.
- Q. For railing posts set in concrete, provide steel sleeves not less than 6 inches long with inside dimensions not less than 1/2 inch greater than outside dimensions of post, with metal plate forming bottom closure.

2.8 STEEL AND IRON FINISHES

- A. Galvanized Railings:
 - 1. Hot-dip galvanize exterior steel railings, including hardware, after fabrication.
 - 2. Comply with ASTM A 123/A 123M for hot-dip galvanized railings.
 - 3. Comply with ASTM A 153/A 153M for hot-dip galvanized hardware.
 - 4. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
 - 5. 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. For nongalvanized-steel railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves; however, galvanize anchors to be embedded in exterior concrete or masonry.
- D. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 3, "Power Tool Cleaning."
- E. 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. Do not apply primer to galvanized surfaces.

2.9 ALUMINUM FINISHES

- A. 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 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.
- B. Clear Anodic Finish: AAMA 611, AA-M12C22A31.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine plaster and gypsum board 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.
 - 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.
- 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. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of railings.
- B. 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.
- C. 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 beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches of post.

3.4 ANCHORING POSTS

A. Form or core-drill holes not less than 5 inches deep and 3/4 inch larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions.

- B. Leave anchorage joint exposed with 1/8-inch 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.

3.5 ATTACHING RAILINGS

- A. Anchor railing ends at walls with round flanges anchored to wall construction and connected to railing ends using nonwelded connections.
- B. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces and connected to railing ends using nonwelded connections.
- C. Attach railings to wall with wall brackets. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
 - 1. Attach aluminum handrails with stainless steel brackets at walls.
- D. 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. For steel-framed partitions, use hanger or lag bolts set into fire-retardant-treated wood backing between studs. Coordinate with stud installation to locate backing members.

3.6 ADJUSTING AND CLEANING

- A. Clean aluminum 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 dry film thickness.
- C. 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 055213

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SECTION 055813 - COLUMN COVERS

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 spackled-seam metal column covers.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product, including finishing materials.
- B. Shop Drawings: Show fabrication and installation details for column covers.
- C. Samples for Initial Selection: For products involving selection of color, texture, or design, including mechanical finishes.

1.4 QUALITY ASSURANCE

- A. Fabricator Qualifications: A firm experienced in producing column covers similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
 - 1. Build mockups of typical column covers.
 - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver column covers wrapped in protective coverings and strapped together in suitable packs or in heavy-duty cartons. Remove protective coverings before they stain or bond to finished surfaces.

PART 2 - PRODUCTS

2.1 SPACKLED-SEAM COLUMN COVERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Fry Reglet Corporation.
 - 2. MM Systems Corporation.
 - 3. Pittcon Industries.
- B. Form column covers from 0.125-inch aluminum sheet complying with ASTM B 209, with not less than strength and durability properties of Alloy 5005-H32; rolled to radii indicated. Taper edges of adjoining pieces of column covers, for taping and spackling, to 0.094-inch thickness in approximately 1 inch of width. Punch tapered edges for gypsum board screws at 1/2 inch o.c., and mill grooves in tapered edge to improve bond with joint compound.
 - 1. Support Framing: At vertical joints, provide 1-1/2-by-3-5/8-inch steel channel support posts formed from 0.040-inch galvanized steel.
 - 2. Joint Treatment Materials: Provide joint treatment compounds and reinforcing tape complying with requirements in Section 092900 "Gypsum Board."

2.2 MISCELLANEOUS MATERIALS

- A. Fasteners: Fabricated from same basic metal and alloy as fastened metal unless otherwise indicated. Do not use metals that are incompatible with materials joined.
 - 1. Provide concealed fasteners for interconnecting column covers and for attaching them to other work.
- B. Sound-Deadening Materials:
 - 1. Insulation: Unfaced, mineral-fiber blanket insulation complying with ASTM C 665, Type I, and passing ASTM E 136 test.
 - 2. Mastic: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.
- C. Backing Materials: Provided or recommended by column cover manufacturer.

2.3 FABRICATION, GENERAL

- A. Coordinate dimensions and attachment methods of column covers with those of adjoining construction to produce integrated assemblies with closely fitting joints and with edges and surfaces aligned unless otherwise indicated.
- B. Form metal to profiles indicated, in maximum lengths to minimize joints. Produce flat, flush surfaces without cracking or grain separation at bends.

2.4 GENERAL FINISH REQUIREMENTS

A. 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.

2.5 ALUMINUM FINISHES

A. Factory Primed Finish: Manufacturer's standard primer; with a dry film thickness of not less than 0.2 mil for primer.

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 column covers.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Locate and place column covers plumb and in alignment with adjacent construction. Perform cutting, drilling, and fitting required to install column covers.
 - 1. Do not cut or abrade finishes that cannot be completely restored in the field. Return items with such finishes to the shop for required alterations, followed by complete refinishing, or provide new units as required.
- B. Use concealed anchorages where possible.
- C. Form tight joints with exposed connections accurately fitted together. Provide reveals and openings for sealants and joint fillers as indicated.
- D. Corrosion Protection: Apply bituminous paint or other permanent separation materials on concealed surfaces where metals would otherwise be in direct contact with substrate materials that are incompatible or could result in corrosion or deterioration of either material or finish.
- E. Apply joint treatment at joints of spackled-seam metal column covers. Comply with requirements in Section 092900 "Gypsum Board."

3.3 ADJUSTING AND CLEANING

A. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit or provide new units.

3.4 **PROTECTION**

A. Protect finishes from damage during construction period. Remove temporary protective coverings at time of Substantial Completion.

END OF SECTION 055813

SECTION 061000 - 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 and grounds.
 - 4. Wood sleepers.
 - 5. Plywood backing panels.

1.3 DEFINITIONS

- A. Boards or Strips: Lumber of less than 2 inches nominal size in least dimension.
- B. Dimension Lumber: Lumber of 2 inches nominal size or greater but less than 5 inches nominal size in least dimension.
- C. Exposed Framing: Framing not concealed by other construction.
- D. OSB: Oriented strand board.

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 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.

- 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 composite wood products, indicating that product contains no urea formaldehyde.
 - 5. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.
 - 6. Product Data: For installation adhesives, indicating VOC content.
 - 7. Laboratory Test Reports: For installation adhesives, indicating compliance with requirements for low-emitting materials.
- C. Fastener Patterns: Full-size templates for fasteners in exposed framing.

1.5 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For the following, from ICC-ES:
 - 1. Wood-preservative-treated wood.
 - 2. Fire-retardant-treated wood.
 - 3. Power-driven fasteners.
 - 4. Post-installed anchors.
 - 5. Metal framing anchors.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: For testing agency providing classification marking for fireretardant 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.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Stack wood products flat with spacers beneath and between each bundle to provide air circulation. Protect wood products 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

- Regional Materials: The following wood 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 of Project site.
 - 1. Dimension lumber, except treated materials.
 - 2. Laminated-veneer lumber.
 - 3. Parallel-strand lumber.
- B. Certified Wood: The following wood products shall be certified as "FSC Pure" or "FSC Mixed Credit" according to FSC STD-01-00 and FSC STD-40-004.
 - 1. Dimension lumber, except treated materials.
 - 2. Laminated-veneer lumber.
 - 3. Parallel-strand lumber.
- C. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber 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.
 - 2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece or omit grade stamp and provide certificates of grade compliance issued by grading agency.
 - 3. Dress lumber, S4S, unless otherwise indicated.
- D. Maximum Moisture Content of Lumber: 15 percent for 2-inch nominal thickness or less; no limit for more than 2-inch nominal thickness unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

- 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.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that 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.
 - 1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece or omit marking and provide certificates of treatment compliance issued by inspection agency.
- 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 sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
- 3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
- 4. Wood framing members that are less than 18 inches above the ground in crawlspaces or unexcavated areas.
- 5. 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 beyond the centerline of the burners at any time during the test.
 - 1. Treatment shall not promote corrosion of metal fasteners.
 - 2. Exterior Type: Treated materials shall comply with requirements specified above for fireretardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
 - 3. 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.
 - 4. Design Value Adjustment Factors: Treated lumber shall be tested according to ASTM D 5664 and design value adjustment factors shall be calculated according to ASTM D 6841.
- C. Kiln-dry lumber after treatment to maximum moisture content of 19 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 or omit marking and provide certificates of treatment compliance issued by testing agency.
- E. For exposed items indicated to receive a stained or natural finish, chemical formulations shall not bleed through, contain colorants, or otherwise adversely affect finishes.
- F. Application: Treat items indicated on Drawings, and the following:
 - 1. Concealed blocking.
 - 2. Roof construction.
 - 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: Construction or No. 2 grade lumber of any of the following species: 1. Hem-fir (north); NLGA.
 - Hem-fir (north); NLGA.
 Mixed southern pine or southern pine; SPIB.
 - 3. Spruce-pine-fir; NLGA.
 - Spruce-pine-in; NLGA.
 Hem-fir; WCLIB or WWPA.
 - Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
 - Western woods; WCLIB or WWPA.
 - 7. Northern species; NLGA.
 - 8. Eastern softwoods; NeLMA.
- C. Concealed Boards: 19 percent maximum moisture content and any of the following species and grades:
 - 1. Mixed southern pine or southern pine; No. 2 grade; SPIB.
 - 2. Hem-fir or hem-fir (north); Construction or No. 2 Common grade; NLGA, WCLIB, or WWPA.
 - 3. Spruce-pine-fir (south) or spruce-pine-fir; Construction or No. 2 Common grade; NeLMA, NLGA, WCLIB, or WWPA.
 - 4. Eastern softwoods; No. 2 Common grade; NeLMA.
 - 5. Northern species; No. 2 Common grade; NLGA.
 - 6. Western woods; Construction or No. 2 Common grade; WCLIB or WWPA.
- D. 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.
- E. 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.
- F. 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, C-C Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.

2.6 FASTENERS

- A. General: Fasteners shall be of size and type indicated and shall comply with requirements specified in this article for material and manufacture.
 - 1. Where rough 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. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- D. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01 as appropriate for the substrate.
 - 1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
 - 2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.

2.7 MISCELLANEOUS MATERIALS

- A. Adhesives for Gluing Furring and Sleepers 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.
 - 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."
- B. Water-Repellent Preservative: NWWDA-tested and -accepted formulation containing 3-iodo-2propynyl butyl carbamate, combined with an insecticide containing chloropyrifos as its active ingredient.

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. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.
- C. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.

- D. 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.
- E. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.
- F. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
- G. 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.
- H. 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.
- I. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
- J. Securely attach rough 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 (IBC).
 - 2. ICC-ES evaluation report for fastener.
- K. 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.
- L. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.
 - 1. Comply with indicated fastener patterns where applicable. Before fastening, mark fastener locations, using a template made of sheet metal, plastic, or cardboard.
 - 2. Use finishing nails unless otherwise indicated. Countersink nail heads and fill holes with wood filler.

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 **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 rough carpentry from weather. If, despite protection, rough carpentry becomes wet enough that moisture content exceeds that specified, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061000

SECTION 061063 - EXTERIOR 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. Wood seat blocks.
 - 2. Wood planter boxes.
- B. Related Requirements:
 - 1. Section 129300 "Site Furnishings."

1.3 DEFINITIONS

- A. Boards: Lumber of less than 2 inches nominal in thickness and 2 inches nominal or greater in width.
- B. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.
- C. Timber: Lumber of 5 inches nominal or greater in least dimension.
- D. Lumber grading agencies, and the abbreviations used to reference them, include the following:
 - 1. NeLMA: Northeastern Lumber Manufacturers' Association.
 - 2. NLGA: National Lumber Grades Authority.
 - 3. RIS: Redwood Inspection Service.
 - 4. SPIB: The Southern Pine Inspection Bureau.
 - 5. WCLIB: West Coast Lumber Inspection Bureau.
 - 6. WWPA: Western Wood Products Association.

1.4 ACTION SUBMITTALS

A. Product Data: For preservative-treated wood products. Include chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.

- 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.

1.5 INFORMATIONAL SUBMITTALS

- A. Material Certificates:
 - 1. For preservative-treated wood products. Indicate type of preservative used and net amount of preservative retained. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
- B. Certificates of Inspection: Issued by lumber grading agency for exposed wood products not marked with grade stamp.
- C. Evaluation Reports: For preservative-treated wood products, from ICC-ES.

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. Store materials under cover and protected from weather and contact with damp or wet surfaces. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 LUMBER, GENERAL

- A. Comply with DOC PS 20 and with grading rules of lumber grading agencies certified by ALSC's Board of Review as applicable. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by ALSC's Board of Review.
 - 1. Factory mark each item with grade stamp of grading agency.

- 2. For items that are exposed to view in the completed Work, mark grade stamp on end or back of each piece.
- 3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry wood products.
- 4. Provide dressed lumber, S4S, unless otherwise indicated.
- 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.
- D. Maximum Moisture Content:
 - 1. Boards: 15 percent.
 - 2. Dimension Lumber: 15 percent.

2.2 LUMBER

- A. Dimension Lumber: No. 1 grade and any of the following species:
 - 1. Sassafras
 - 2. Black Walnut
 - 3. White Oak
 - 4. Atlantic White Cedar
 - 5. Cedar.
 - 6. Redwood; RIS.
- B. Boards: Any of the following species and grades:
 - 1. Redwood, Heart Clear Heart B or Select Heart; RIS.
 - 2. Western red cedar, Grade A; NLGA, WCLIB, or WWPA.
 - 3. Northern white cedar, No. 1 Common; NeLMA or NLGA.

2.3 POSTS

- A. Dimension Lumber Posts: Construction or No. 2 grade and any of the following species:
 - 1. Hem-fir or hem-fir (North); NLGA, WCLIB, or WWPA.
 - 2. Douglas fir-larch, Douglas fir-larch (North), or Douglas fir-south; NLGA, WCLIB, or WWPA.
 - 3. Mixed southern pine; SPIB.
 - 4. Spruce-pine-fir or spruce-pine-fir (South); NeLMA, NLGA, WCLIB, or WWPA.
 - 5. Northern species; NLGA.
 - 6. Eastern softwoods; NeLMA.
 - 7. Western woods; WCLIB or WWPA.

2.4 FASTENERS

- A. General: Provide fasteners of size and type indicated, acceptable to authorities having jurisdiction, and that comply with requirements specified in this article for material and manufacture. Provide nails or screws, in sufficient length, to penetrate not less than 1-1/2 inches into wood substrate.
 - 1. Use stainless steel unless otherwise indicated.
 - 2. For redwood, use stainless-steel fasteners.
- B. Nails: ASTM F 1667.
- C. Power-Driven Fasteners: ICC-ES AC70.
- D. Wood Screws and Lag Screws: ASME B18.2.1, ASME B18.6.1, or ICC-ES AC233.
- E. Carbon-Steel Bolts: ASTM A 307 with ASTM A 563 hex nuts and, where indicated, flat washers all hot-dip zinc coated.
- F. Stainless-Steel Bolts: ASTM F 593, Alloy Group 1 or 2; with ASTM F 594, Alloy Group 1 or 2 hex nuts and, where indicated, flat washers.

2.5 METAL ACCESSORIES

- 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. Cleveland Steel Specialty Co.
 - 2. KC Metals Products, Inc.
 - 3. Phoenix Metal Products, Inc.
 - 4. R. H. Tamlyn & Sons LP.
 - 5. Simpson Strong-Tie Co., Inc.
 - 6. USP Structural Connectors.
- B. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G90 coating designation.
- C. Stainless-Steel Sheet: ASTM A 666, Type 316.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Set work to required levels and lines, with members plumb, true to line, cut, and fitted. Fit work to other construction; scribe and cope as needed for accurate fit.
- B. Framing Standard: Comply with AF&PA WCD1 unless otherwise indicated.

- C. Install metal framing anchors to comply with manufacturer's written instructions.
- D. Do not splice structural members between supports unless otherwise indicated.
- E. 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 members or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- F. Securely attach exterior rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. ICC-ES AC70 for power-driven fasteners.
 - 2. "Fastening Schedule" in ICC's International Building Code.
 - 3. "Fastener Schedule for Structural Members" and "Alternate Attachments" in ICC's International Residential Code for One- and Two-Family Dwellings.
- G. Use corrosion and stain resistant screw fasteners unless otherwise indicated. Select fasteners of size that do not fully penetrate members where opposite side is exposed to view. Make tight connections between members. Install fasteners without splitting wood; do not countersink nail heads unless otherwise indicated.

END OF SECTION 061063

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SECTION 062023 - INTERIOR FINISH 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. Interior plywood paneling, shelving, and clothes rods.
- B. Related Requirements:
 - 1. Section 061000 "Rough Carpentry" for furring, blocking, and other carpentry work not exposed to view.
 - 2. Section 099123 "Interior Painting" for priming and backpriming of interior finish carpentry.

1.3 DEFINITIONS

A. MDO: Plywood with a medium-density overlay on the face.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colors 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. Include chemical-treatment manufacturer's written instructions for finishing treated material.
 - 2. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.
 - 3. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced before shipment to Project site to levels specified.
- 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 composite wood products, indicating that product contains no urea formaldehyde.
- 5. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.
- 6. Product Data: For installation adhesives, indicating VOC content.
- 7. Laboratory Test Reports: For installation adhesives, indicating compliance with requirements for low-emitting materials.
- C. Samples for Initial Selection: For each type of product involving selection of colors, profiles, or textures.

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 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber, plywood, and other panels flat with spacers between each bundle to provide air circulation. Protect materials from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.
- B. Deliver interior finish carpentry materials only when environmental conditions comply with requirements specified for installation areas. If interior finish carpentry materials must be stored in other than installation areas, store only where environmental conditions comply with requirements specified for installation areas.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install interior finish carpentry materials until building is enclosed and weatherproof, wet work in space is completed and nominally dry, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.
 - 1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Regional Materials: The following 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.
 - 1. Interior plywood paneling.
 - 2. Shelving and clothes rods.
- B. Certified Wood: The following wood products shall be certified as "FSC Pure" or "FSC Mixed Credit" according to FSC STD-01-00 and FSC STD-40-004.
 - 1. Interior plywood paneling.
 - 2. Shelving and clothes rods.
- C. Composite Wood Products: Products shall be made without urea formaldehyde.
- D. 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."
- E. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the American Lumber Standard Committee's Board of Review. Grade lumber by an agency certified by the American Lumber Standard Committee's 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.
 - 2. For exposed lumber, mark grade stamp on end or back of each piece.
- F. Softwood Plywood: DOC PS 1.

2.2 FIRE-RETARDANT-TREATED MATERIALS

- A. General: For applications indicated, use materials complying with requirements in this article that are acceptable to authorities having jurisdiction and comply with testing requirements; testing will be conducted 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, 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 beyond the centerline of the burners at any time during the test.
 - 1. Kiln dry lumber and plywood after treatment to a maximum moisture content of 19 and 15 percent, respectively.

- C. For exposed items indicated to receive a stained or natural finish, use[**organic resin**] chemical formulations that do not contain colorants, and provide materials that do not have marks from spacer sticks on exposed face.
- D. Do not use material that does not comply with requirements for untreated material or is warped or discolored.
- E. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. For exposed plywood indicated to receive a stained or natural finish, mark back of each piece.
- 2.3 Application: Plywood panelingPANELING
 - A. Hardwood Veneer Plywood Paneling: Manufacturer's stock hardwood plywood panels complying with HPVA HP-1.
 - 1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
 - 2. Face Veneer Species and Cut: Rotary cut maple.
 - 3. Veneer Matching: Selected for similar color and grain.
 - 4. Backing Veneer Species: Any hardwood compatible with face species.
 - 5. Construction: Veneer core.
 - 6. Thickness: 7/16 inch.
 - 7. Panel Size: [48 by 96 inches].
 - 8. Glue Bond: Type II (interior).
 - 9. Finish: As selected by Architect from manufacturer's full range.

2.4 SHELVING AND CLOTHES RODS

- A. Closet Shelving: Made from the following material, 3/4 inch thick.
 - 1. MDO softwood plywood with solid-wood edge.
 - 2. Wood boards as specified above for lumber trim for opaque finish.
 - 3. Softwood Boards: Kiln-dried Eastern white, Idaho white, lodgepole, ponderosa, radiata, or sugar pine, Finish or 1 Common (Colonial); NeLMA, NLGA, or WWPA.
 - 4. Softwood Boards: Kiln-dried Douglas fir-larch, Douglas fir south, or hem-fir, Superior or C & Btr finish; NLGA, WCLIB, or WWPA; or southern pine, finish; SPIB.
- B. Shelf Cleats: 3/4-by-3-1/2-inch boards, as specified above for shelving.
- C. Shelf Brackets with Rod Support: BHMA A156.16, B04051; prime-painted formed steel.
- D. Clothes Rods: 1-1/2-inch- diameter, clear, kiln-dried hardwood.
- E. Rod Flanges: Clear, kiln-dried, turnings.

2.5 MISCELLANEOUS MATERIALS

- A. Fasteners for Interior Finish Carpentry: Nails, screws, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible.
- B. Low-Emitting Materials: Adhesives 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. Glue: Aliphatic-resin, polyurethane, or resorcinol wood glue recommended by manufacturer for general carpentry use.
 - 1. 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."
 - 2. Adhesives shall have a VOC content of 30 g/L or less.
- D. Multipurpose Construction Adhesive: Formulation complying with ASTM D 3498 that is recommended for indicated use by adhesive manufacturer.
 - 1. Adhesives shall have a VOC content of 70 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."

2.6 FABRICATION

A. Ease edges of lumber less than 1 inch in nominal thickness to 1/16-inch radius and edges of lumber 1 inch or more in nominal thickness to 1/8-inch radius.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine finish carpentry materials before installation. Reject materials that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

B. Before installing interior finish carpentry, condition materials to average prevailing humidity in installation areas for a minimum of 24 hours.

3.3 INSTALLATION, GENERAL

- A. Do not use materials that are unsound; warped; improperly treated or finished; inadequately seasoned; too small to fabricate with proper jointing arrangements; or with defective surfaces, sizes, or patterns.
- B. Install interior finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.
 - 1. Scribe and cut interior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
 - 2. Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand unless otherwise indicated.
 - 3. Install to tolerance of 1/8 inch in 96 inches for level and plumb. Install adjoining interior finish carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.
 - 4. Coordinate interior finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate interior finish carpentry.

3.4 PANELING INSTALLATION

- A. Plywood Paneling: Select and arrange panels on each wall to minimize noticeable variations in grain character and color between adjacent panels. Leave 1/4-inch gap to be covered with trim at top, bottom, and openings. Install with uniform tight joints between panels.
 - 1. Attach panels to supports with manufacturer's recommended panel adhesive and fasteners. Space fasteners and adhesive as recommended by panel manufacturer.
 - 2. Conceal fasteners to greatest practical extent.
 - 3. Arrange panels with grooves and joints over supports. Fasten to supports with nails of type and at spacing recommended by panel manufacturer. Use fasteners with prefinished heads matching groove color.

3.5 SHELVING AND CLOTHES ROD INSTALLATION

- A. Cut shelf cleats at ends of shelves about 1/2 inch less than width of shelves and sand exposed ends smooth.
- B. Install shelf cleats by fastening to framing or backing with finish nails or trim screws, set below face and filled. Space fasteners not more than 16 inches o.c. Use two fasteners at each framing member or fastener location for cleats 4 inches nominal in width and wider.
 - 1. Apply a bead of multipurpose construction adhesive to back of shelf cleats before installing. Remove adhesive that is squeezed out after fastening shelf cleats in place.

- C. Install shelf brackets according to manufacturer's written instructions, spaced not more than 32 inches o.c. Fasten to framing members, blocking, or metal backing, or use toggle bolts or hollow wall anchors.
- D. Install standards for adjustable shelf supports according to manufacturer's written instructions. Fasten to framing members, blocking, or metal backing, or use toggle bolts or hollow wall anchors. Space fasteners not more than 12 inches o.c.
- E. Install standards for adjustable shelf brackets according to manufacturer's written instructions, spaced not more than 36 inches o.c. and within 6 inches of ends of shelves. Fasten to framing members, blocking, or metal backing, or use toggle bolts or hollow wall anchors.
- F. Cut shelves to neatly fit openings with only enough gap to allow shelves to be removed and reinstalled. Install shelves, fully seated on cleats, brackets, and supports.
 - 1. Fasten shelves to cleats with finish nails or trim screws, set flush.
 - 2. Fasten shelves to brackets to comply with bracket manufacturer's written instructions.
- G. Install rod flanges for rods as indicated. Fasten to shelf cleats, framing members, blocking, or metal backing, or use toggle bolts or hollow wall anchors. Install rods in rod flanges.

3.6 ADJUSTING

A. Replace interior finish carpentry that is damaged or does not comply with requirements. Interior finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing. Adjust joinery for uniform appearance.

3.7 CLEANING

A. Clean interior finish carpentry on exposed and semiexposed surfaces. Restore damaged or soiled areas and touch up factory-applied finishes if any.

3.8 PROTECTION

- A. Protect installed products from damage from weather and other causes during construction.
- B. Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.
 - 1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 062023

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SECTION 062530 – SLOTTED WALL PANEL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: T-Grooved wood composite 3/4" thick panels, pre-engineered and machined for use with retail display hardware.
 - 1. Attachment System:
 - a. Direct fastening of slotted wall panel to metal stud framing.
 - 2. Panels:
 - a. High Pressure Laminate adhered to wood fiber substrate and having a balancing backer sheet.
- B. Products Not Furnished or Installed under This Section:
 - 1. Display fixtures, hooks or brackets arms.
 - 2. Wood Veneer casework.
 - 3. Gypsum board backup.

1.2 RELATED SECTIONS

- A. Section 092216 Metal Stud Framing
- B. Section 092900 Gypsum Wallboard.

1.3 **REFERENCES**

- A. American Society for Testing and Materials: Standard Specifications (ASTM)
 - 1. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials.
- B. Architectural Woodwork Standards as published by the Architectural Woodwork Institute, and the Woodwork Institute.
 - 1. Architectural Woodwork Standards Edition 1.

1.4 SUBMITTALS

- A. Product Data: Submit sufficient manufacturer's data to indicate compliance with these specifications, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- B. Sustainable Design Submittals:

- 1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
- 2. Product Data: For adhesives, indicating that product contains no urea formaldehyde.
- 3. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
- 4. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.
- 5. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.
- C. Shop Drawings: Submit elevations of each wall showing location of paneling and trim members with respect to all discontinuities in the wall elevation.
- D. Selection Samples: Submit manufacturer's standard color and pattern selection samples representing manufacturer's full range of available colors and patterns.
- E. Maintenance Instructions.

1.5 QUALITY ASSURANCE

- A. Conform to building code requirements for interior finish for smoke and flame spread requirements as tested in accordance with:
 - 1. ASTM E 84 (Method of test for surface burning characteristics of building Materials)
 - 2. Required Rating Class A.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver panels and associated materials factory packaged on strong pallets and properly packaged or protected.
 - 1. Upon delivery carefully inspect all cartons, packages, pallets and protective wrap for damage or material shortage.
 - 2. Open and inspect suspect packages, cartons or wrapped pallets for damage.
 - 3. Contact shipper immediately to report any damaged or missing materials.
- B. Store products in manufacturer's unopened packaging until ready for installation.
 - 1. Maintain plastic or other protective wrap in place during on site handling until ready for installation.
 - 2. Keep panels clean and do not stack panels after removal of protection.
- C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.7 PROJECT CONDITIONS

A. Wood composite panels are subject to the effects of humidity and temperature. Do not use in kitchens, rest rooms, or other high humidity areas.

- B. Partition walls are to be finished and the building completely closed. Walls shall be thoroughly dry and concrete cured and dry before starting installation.
- C. HVAC system must be operable and installation area must be balanced to normal operating conditions.
- D. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. To ensure product performance, a temperature range of $60^{\circ}-80^{\circ}F$ and a humidity range of 35-55% must be maintained during storage, installation and product life cycle. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.8 COORDINATION AND SEQUENCING

- A. Locate trim members so that panel lines coordinate with doors, headers, jambs and other discontinuities in a wall.
- B. Vapor barrier shall be used on exterior walls behind backing to discourage warping.

1.9 WARRANTY

A. Standard Warranty: All products shall be warranted to be free from defects for a period of One Year after Substantial Completion.

PART 2 - PRODUCTS

2.1 ACCEPTABLE PRODUCTS

 A. Subject to conformance with the specification requirements provide products by: Marlite; Dover, OH 44622 or other manufacturer providing equivalent products.
 1. Marlite Slatwall Panel

2.2 PANEL

- A. Panel Configuration: Engineered groove machined into wood composite substrate.
 - 1. Panel thickness -3/4" thick with nominal 1/2" deep slotted grove.
 - 2. Panel face dimensions: 48" by 96".
 - 3. Panel grooves machined on 6" centers.
 - 4. Standard Slatwall, NAF
 - a. Medium density wood fiberboard conforming to ANSI A208.2, industrial-grade MDF and having No-Added Formaldehyde (NAF).
- B. Composite Wood Products: Products shall be made without urea formaldehyde.

2.3 PANEL FINISH

- A. High Pressure Laminate: Vertical grade 0 .030" thick high pressure plastic laminate adhered to wood fiber substrate by cold pressing polyvinyl acetate (PVA) type II, water resistant adhesives.
 - 1. Edges Square, and sealed, to provide a black edge.
 - 2. Balancing Backer: Kraft Paper that does not contribute to or pose an unusual additional fire hazard.
 - 3. Color and Pattern: As selected by Architect from manufacturer's standard selection.

2.4 GROOVE TREATMENT AND TRIMGroove Treatment:

- 1. Aluminum groove insert for light duty application feature merchandising and ¹/4" glass or acrylic shelving.
 - a. Marlite 1000 Series or equivalent.
- B. Panel Trim:
 - 1. Outside/Inside Corner 1" x 1" x 8'- 0" aluminum mill finish.
 - 2. Edge 1/2" x 3/4" x 8' 0" aluminum mill finish

2.5 INSTALLATION ACCESSORIES

- A. Phillips, bugle head, coarse threaded screws.
- B. Adhesives: Do not use adhesives that contain urea formaldehyde.
- C. Adhesives: Use adhesives that meet 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."

2.6 FABRICATION

- A. All framing, panels, hardware and accessories shall be factory finished and ready to install except for field fabrication required by perimeter and corner conditions.
- B. Refinish field cut panel edges in accordance with manufacturer's instruction before installation.
- C. Fabrication Tolerances for panels:
 - 1. Dimensional: ± 0.0625 "
 - 2. Square: ± 0.125 " across diagonals
 - 3. Thickness: ± 0.008 "
 - 4. Grooving:: ± 0.031 " (groove width and spacing between grooves)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Installer's Examination: Examine conditions under which construction activities of this section are to be performed. Submit written notification if such conditions are unacceptable. Beginning erection constitutes installer's acceptance of conditions.
 - 1. Verify that a vapor barrier has been provided on exterior walls behind backing to prevent warping.
 - 2. Verify backing panels are smooth, solid, and flat. All drywall joints are to be taped and finished.
 - 3. Verify that walls are primed before installation begins.
 - 4. Verify mechanical, electrical, and building service and/or items affecting work of this section are placed and ready to receive this work.
 - 5. Verify that stud spacing does not exceed 24" on-center.
- B. Structural walls are to be finished, with building completely closed. Walls shall be thoroughly dry before starting installation.

3.2 PREPARATION

- A. Conditioning: Panels must be allowed to acclimate to a balanced environment in the installation location for 72 hours prior to installation.
- B. Protect existing surfaces with drop cloths.
- C. Except as directed, before installing, examine panels and arrange to achieve best combination of color, pattern, texture and grain.

3.3 INSTALLATION

- A. Install all materials in strict accordance with the manufacturer's installation instructions with hardware straight, plumb, and level.
 - 1. Anchor units rigidly and securely in place.
 - 2. Cut sheets to meet existing supports.
- B. Fasten initial bottom panel to the wall with #6 or #7 bugle head drywall screws. Install a minimum of one screw every third slot (or 9") vertically and every stud horizontally, typically every 16" on centers horizontally (maximum 24" on centers horizontally). Each 4' x 8' panel shall have minimum of 42 screws secured to studs or furring.
 - 1. Where screws do not hit the studs, fasten with adhesive in accordance with the manufacturer's recommendations.
 - 2. Screws must be installed thru the panel grooves.
 - 3. Slatwall panels without inserts do not require pre-drilling.
 - 4. Slatwall panels with inserts require 5/32" pre-drilling of holes thru the insert and panel before fastening.

C. Avoid contamination of the panel faces with adhesives, solvents or cleaners during installation.

3.4 CLEANING AND PROTECTION

A. Clean and remove dust and other foreign matter from panel and framing surfaces. Clean finishes in accordance with manufacturer's instructions.

END OF SECTION 06 2530 (11 2130)

SECTION 064113 - WOOD-VENEER-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. Architectural wood cabinets.
 - 2. Wood furring, blocking, shims, and hanging strips for installing architectural wood cabinets unless concealed within other construction before cabinet installation.
 - 3. Shop finishing of architectural wood cabinets.
- B. Related Requirements:
 - 1. Section 061000 "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing cabinets and concealed within other construction before cabinet installation.

1.3 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. 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.
 - 3. Chain-of-Custody Certificates: For certified wood products. Include statement of costs.
 - 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: 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 and outlets and other items installed in architectural wood cabinets.
 - 4. Apply WI Certified Compliance Program label to Shop Drawings.
 - 5. Apply AWI Quality Certification Program label to Shop Drawings.
- D. Samples for Initial Selection:
 - 1. Shop-applied transparent finishes.
- E. Samples for Verification:
 - 1. Lumber for transparent finish, not less than 5 inches wide by 12 inches long, for each species and cut, finished on one side and one edge.
 - 2. Exposed cabinet hardware and accessories, one unit for each type and finish.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.
- B. Product Certificates: For each type of product.
 - 1. Composite wood and agrifiber products.
 - 2. Adhesives.
- C. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.
- D. Evaluation Reports: For fire-retardant-treated materials, from ICC-ES.

1.5 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 inservice performance. Shop is a certified participant in AWI's Quality Certification Program.

1.6 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.

1.7 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 between 60 and 90 deg F and relative humidity between 25 and 55 percent 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.

1.8 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that wood-veneer-faced architectural 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.

PART 2 - PRODUCTS

2.1 ARCHITECTURAL CABINET FABRICATORS

A. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production of architectural wood cabinets with sequence-matched wood veneers.

2.2 ARCHITECTURAL WOOD CABINETS, GENERAL

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of architectural wood cabinets indicated for construction, finishes, installation, and other requirements.
 - 1. Provide certificates from AWI certification program indicating that woodwork 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.

2.3 WOOD CABINETS FOR TRANSPARENT FINISH

- A. Grade: Custom.
- B. Regional Materials: Wood products shall be manufactured within 500 miles of Project site.
- C. 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.
- D. Type of Construction: Frameless.
- E. Cabinet and Door and Drawer Front Interface Style: Flush overlay.
- F. Reveal Dimension: 1/2 inch.
- G. Wood for Exposed Surfaces:
 - 1. Species: Maple.
 - 2. Cut: Rotary Cut.
 - 3. Grain Direction: Vertically for doors and fixed panels, horizontally for drawer fronts.
 - 4. Matching of Veneer Leaves: Book match.
- H. Semiexposed Surfaces: Provide surface materials indicated below:
 - 1. Surfaces Other Than Drawer Bodies: Same species and cut indicated for exposed surfaces.
 - 2. Drawer Subfronts, Backs, and Sides: Solid-hardwood lumber, stained to match species indicated for exposed surfaces.
 - 3. Drawer Bottoms: Hardwood plywood.
- I. Dust Panels: 1/4-inch plywood or tempered hardboard above compartments and drawers unless located directly under tops.
- J. 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.

2.4 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.
 - 1. Recycled Content of MDF: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- C. Composite Wood Products: Products shall be made without urea formaldehyde.

- D. 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. Medium-Density Fiberboard: ANSI A208.2, Grade 130.
 - 2. Softwood Plywood: DOC PS 1, medium-density overlay.
 - 3. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1.

2.5 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 (Descriptive Specification)."
- B. Butt Hinges: 2-3/4-inch, five-knuckle steel hinges made from 0.095-inch- thick metal, and as follows:

1. Semiconcealed Hinges for Flush Doors: BHMA A156.9, B01361.

- C. Wire Pulls: Back mounted, solid metal, 4 inches long, 5/16 inch in diameter.
- D. Catches: Magnetic catches, BHMA A156.9, B03141.
- E. Shelf Rests: BHMA A156.9, B04013; metal, two-pin type with shelf hold-down clip.
- F. Drawer Slides: BHMA A156.9.
 - 1. Grade 1 and Grade 2: Side mounted; full-extension type; zinc-plated steel with polymer rollers.
 - 2. Grade 1HD-100 and Grade 1HD-200: Side mounted; full-extension type; zinc-plated-steel ball-bearing slides.
 - 3. For drawers not more than 3 inches high and not more than 24 inches wide, provide Grade 1.
 - 4. For drawers more than 3 inches high but not more than 6 inches high and not more than 24 inches wide, provide Grade 1.
 - 5. For drawers more than 6 inches high or more than 24 inches wide, provide Grade 1HD-100.
 - 6. For computer keyboard shelves, provide Grade 1HD-100.
 - 7. For trash bins not more than 20 inches high and 16 inches wide, provide Grade 1HD-100.
- G. Door Locks: BHMA A156.11, E07121.
- H. Drawer Locks: BHMA A156.11, E07041.
- I. Door and Drawer Silencers: BHMA A156.16, L03011.
- J. 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.
- K. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.6 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 nonferrousmetal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.
- C. Do not use adhesives that contain urea formaldehyde.
- D. Adhesives: Use adhesives that meet 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."

2.7 FABRICATION

- A. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.
- B. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
 - 1. Corners of Cabinets: 1/16 inch unless otherwise indicated.
- C. Complete fabrication, including assembly, finishing, 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.
- D. 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.

2.8 SHOP FINISHING

A. General: Finish architectural wood cabinets at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.

- B. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural wood cabinets, as applicable to each unit of work.
 - 1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of cabinets.
- C. Transparent Finish:
 - 1. Grade: Premium.
 - 2. Finish: System 11, catalyzed polyurethane.
 - 3. Wash Coat for Closed-Grain Woods: Apply wash-coat sealer to cabinets made from closed-grain wood before staining and finishing.
 - 4. Staining: None required.
 - 5. Sheen: Satin, 31-45 gloss units measured on 60-degree gloss meter per ASTM D 523.

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, including removal of packing and backpriming.

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.
- 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. For shop finished items 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 sag, bow, or other variation from a straight line.

- 2. Maintain veneer sequence matching of cabinets with transparent finish.
- 3. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches o.c. with No. 10 wafer-head screws sized for not less than 1-1/2-inch penetration into wood framing, blocking, or hanging strips.
- G. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.
 - 1. Apply specified finish coats, including stains and paste fillers if any, to exposed surfaces where only sealer/prime coats are applied in shop.

3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective cabinets, 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 on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 064113

SECTION 070150.19 - PREPARATION FOR REROOFING

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. Full Roof Tear-Off of entire roof of existing A Building, B Building and connector.
- 2. Removal of base flashings.
- 3. Temporary roofing.
- B. Related Requirements:
 - 1. Section 011000 "Summary" for use of the premises and phasing requirements.
 - 2. Section 015000 "Temporary Facilities and Controls" for temporary construction and environmental-protection measures for reroofing preparation.

1.3 DEFINITIONS

- A. Roofing Terminology: Definitions in ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" apply to work of this Section.
- B. Full Roof Tear-Off: Removal of all existing roofing systems from deck.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include plans, sections, and details.
- C. Action Plan: Provide a written description of individual roofing/reroofing operations and a detailed schedule and sequence of operations including provisions for temporary protection.
- D. Temporary Roofing Submittal: Product data and description of temporary roofing system. If temporary roof remains in place, include surface preparation requirements needed to receive permanent roof, and submit a letter from roofing manufacturer, stating acceptance of the temporary roof and that its inclusion does not adversely affect the roofing system's resistance to fire and wind or its FM Global rating.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
 - 1. Include certificate that Installer is approved by warrantor of existing roofing system.
 - 2. Include certificate that Installer is licensed to perform asbestos abatement.
- B. Fastener pull-out test report.
- C. Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including exterior and interior finish surfaces that might be misconstrued as having been damaged by reroofing operations. Submit before Work begins.
- D. Landfill Records: Indicate receipt and acceptance of demolished roofing materials and hazardous wastes, such as asbestos-containing materials, by a landfill facility licensed to accept them.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Licensed to perform asbestos abatement in the state or jurisdiction where Project is located.
- B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning roofing removal. Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. Reroofing Conference: Conduct conference at Project site.
 - 1. Meet with Owner; Architect; Owner's insurer if applicable; testing and inspecting agency representative; roofing system manufacturer's representative; roofing Installer, including project manager, superintendent, and foreman; and installers whose work interfaces with or affects reroofing, including installers of roof deck, roof accessories, and roof-mounted equipment.
 - 2. Review methods and procedures related to roofing system tear-off and replacement, including, but not limited to, the following:
 - a. Reroofing preparation, including roofing system manufacturer's written instructions.
 - b. Temporary protection requirements for existing roofing system components that are to remain.
 - c. Existing roof drains and roof drainage during each stage of reroofing, and roofdrain plugging and plug removal.
 - d. Construction schedule and availability of materials, Installer's personnel, equipment, and facilities needed to avoid delays.
 - e. Existing roof deck conditions requiring notification of Architect.
 - f. Existing roof deck removal procedures and Owner notifications.
 - g. Condition and acceptance of existing roof deck and base flashing substrate for reuse.
 - h. Structural loading limitations of roof deck during reroofing.

- i. Base flashings, special roofing details, drainage, penetrations, equipment curbs, and condition of other construction that affect reroofing.
- j. HVAC shutdown and sealing of air intakes.
- k. Shutdown of fire-suppression, -protection, and -alarm and -detection systems.
- 1. Asbestos removal and discovery of asbestos-containing materials.
- m. Governing regulations and requirements for insurance and certificates if applicable.
- n. Existing conditions that may require notification of Architect before proceeding.

1.7 FIELD CONDITIONS

- A. Existing Roofing Systems: Built-up asphalt roofing, single ply membrane, shingles, metal and fabric flashing and mastic.
- B. Protect building to be reroofed, adjacent buildings, walkways, site improvements, exterior plantings, and landscaping from damage or soiling from reroofing operations.
- C. Conditions existing at time of inspection for bidding are maintained by Owner as far as practical.
- D. Limit construction loads on roof for rooftop equipment wheel loads and for uniformly distributed loads. Repair any damage done to existing roof deck.
- E. Weather Limitations: Proceed with reroofing preparation only when existing and forecasted weather conditions permit Work to proceed without water entering building.
 - 1. Remove only as much roofing in one day as can be made watertight in the same day.
- F. Hazardous Materials: 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 according to procedures specified elsewhere in the Contract Documents.
 - 3. Coordinate reroofing preparation with hazardous material remediation to prevent water from entering existing roofing system or building.

PART 2 - PRODUCTS

2.1 TEMPORARY PROTECTION MATERIALS

- A. Expanded Polystyrene (EPS) Insulation: ASTM C 578.
- B. Plywood: DOC PS1, Grade CD Exposure 1.
- C. OSB: DOC PS2, Exposure 1.

2.2 TEMPORARY ROOFING MATERIALS

A. Design and selection of materials for temporary roofing are Contractor's responsibilities.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Shut off rooftop utilities and service piping before beginning the Work.
- B. Test existing roof drains to verify that they are not blocked or restricted. Immediately notify Architect of any blockages or restrictions.
- C. Coordinate shut down air-intake equipment in the vicinity of the Work. Cover air-intake louvers before proceeding with reroofing work that could affect indoor air quality or activate smoke detectors in the ductwork.
- D. During removal operations, have sufficient and suitable materials on-site to facilitate rapid installation of temporary protection in the event of unexpected rain.
- E. Maintain roof drains in functioning condition to ensure roof drainage at end of each workday. Prevent debris from entering or blocking roof drains and conductors. Use roof-drain plugs specifically designed for this purpose. Remove roof-drain plugs at end of each workday, when no work is taking place, or when rain is forecast.
 - 1. If roof drains are temporarily blocked or unserviceable due to roofing system removal or partial installation of new roofing system, provide alternative drainage method to remove water and eliminate ponding. Do not permit water to enter into or under existing roofing system components that are to remain.

3.2 ROOF TEAR-OFF

- A. General: Notify Owner each day of extent of roof tear-off proposed for that day.
- B. Full Roof Tear-Off: Remove existing roofing and other roofing system components down to the deck or concrete fill.
 - 1. Remove substrate board vapor retarder roof insulation and cover board.
 - 2. Remove wood blocking, curbs, and nailers.
 - 3. Remove all layers of roofing membrane.
 - 4. Remove fasteners from deck.

3.3 DECK PREPARATION

- A. Inspect deck after tear-off of roofing system.
- B. Verify that concrete substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263 or by pouring 1 pint (0.5 L) of hot roofing asphalt on deck at start of each day's work and at start of each roof area or plane. Do not

proceed with roofing work if moisture condenses under plastic sheet or if asphalt test sample foams or can be easily and cleanly stripped after cooling.

- C. If broken or loose fasteners that secure deck panels to one another or to structure are observed, or if deck appears or feels inadequately attached, immediately notify Architect. Do not proceed with installation until directed by Architect.
- D. If deck surface is unsuitable for receiving new roofing or if structural integrity of deck is suspect, immediately notify Architect. Do not proceed with installation until directed by Architect.
- E. Provide additional deck securement as indicated on Drawings.

3.4 TEMPORARY ROOFING

- A. Install approved temporary roofing over area to be reroofed.
- B. Remove temporary roofing before installing new roofing.

3.5 BASE FLASHING REMOVAL

A. Remove existing base flashings. Clean substrates of contaminants, such as asphalt, sheet materials, dirt, and debris.

3.6 FASTENER PULL-OUT TESTING

- A. Retain independent testing and inspecting agency to conduct fastener pull-out tests according to SPRI FX-1, and submit test report to Architect and roofing manufacturer before installing new roofing system.
 - 1. Obtain roofing manufacturer's approval to proceed with specified fastening pattern. Roofing manufacturer may furnish revised fastening pattern commensurate with pull-out test results.

3.7 DISPOSAL

- A. Collect demolished materials and place in containers. Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.
 - 1. Storage or sale of demolished items or materials on-site is not permitted.
- B. Transport and legally dispose of demolished materials off Owner's property.

END OF SECTION 070150.19

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SECTION 071326 - 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.

1.3 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. 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.
- C. 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.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Sample Warranties: For special warranties.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by waterproofing manufacturer.

1.6 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.

1.7 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 Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Source Limitations for Waterproofing System: Obtain waterproofing materials from single source from single manufacturer.

2.2 MODIFIED BITUMINOUS SHEET WATERPROOFING

- A. Modified Bituminous Sheet: Minimum 60-mil nominal thickness, self-adhering sheet consisting of 56 mils of rubberized asphalt laminated on one side to a 4-mil- thick, polyethylene-film reinforcement, and with release liner on adhesive side; formulated for application with primer or surface conditioner that complies with VOC limits of authorities having jurisdiction.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Hydrotech, Inc.
 - b. Carlisle Coatings & Waterproofing Inc.
 - c. CETCO, a Minerals Technologies company.
 - d. Grace Construction Products; W.R. Grace & Co. -- Conn.
 - e. Polyguard Products, Inc.
 - f. W. R. Meadows, Inc.
 - 2. Physical Properties:
 - a. Tensile Strength, Membrane: 250 psi 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; ASTM D 1970.
 - d. Crack Cycling: Unaffected after 100 cycles of 1/8-inch movement; ASTM C 836.
 - e. Puncture Resistance: 40 lbf minimum; ASTM E 154.
 - f. Water Absorption: 0.2 percent weight-gain maximum after 48-hour immersion at 70 deg F; ASTM D 570.

- g. Water Vapor Permeance: 0.05 perms maximum; ASTM E 96/E 96M, Water Method.
- h. Hydrostatic-Head Resistance: 200 feet minimum; ASTM D 5385.
- 3. Sheet Strips: Self-adhering, rubberized-asphalt strips of same material and thickness as sheet waterproofing.

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 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 thick, predrilled at 9-inch centers.
- G. Protection Course: ASTM D 6506, semirigid sheets of fiberglass or mineral-reinforcedasphaltic core, pressure laminated between two asphalt-saturated fibrous liners and as follows:
 - 1. Thickness: 1/8 inch, nominal, for vertical applications; 1/4 inch, nominal, elsewhere.
 - 2. Adhesive: Rubber-based solvent type recommended by waterproofing manufacturer for protection course type.

2.4 MOLDED-SHEET DRAINAGE PANELS

- A. Molded-Sheet Drainage Panel: Comply with Section 334600 "Subdrainage."
- B. Nonwoven-Geotextile-Faced, Molded-Sheet Drainage Panel: Composite subsurface drainage panel consisting of a studded, nonbiodegradable, molded-plastic-sheet drainage core; with a nonwoven, needle-punched geotextile facing with an apparent opening size not exceeding No. 70 sieve laminated to one side of the core and a polymeric film bonded to the other side; and with a vertical flow rate of 9 to 15 gpm per ft.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Hydrotech, Inc.
 - b. Carlisle Coatings & Waterproofing Inc.
 - c. Grace Construction Products; W.R. Grace & Co. -- Conn.

2.5 INSULATION

- A. Insulation, General: Comply with Section 072100 "Thermal Insulation."
- B. Board Insulation: Extruded-polystyrene board insulation complying with ASTM C 578, square] or shiplap edged.

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. DiversiFoam Products.
 - b. Dow Chemical Company (The).
 - c. Kingspan Insulation.
 - d. Owens Corning.
- 2. Type IV, 25-psi minimum compressive strength.

2.6 PIPE PENETRATION ACCESSORIES

- A. Galvanized Steel Wall Sleeve
 - 1. Provide galvanized steel wall sleeve sized for specific pipe or conduit per manufacturer's recommendations.
 - 2. Provide sleeves with integral waterstop fin.
 - 3. Extend sleeve past wall face as indicated on detail.
 - 4. Provide sleeves similar to "Wall Sleeves" by Flexicraft.
- B. Hydro-Expansive Waterstop
 - 1. Provide a swellable polymer/butyl rubber waterstop strip installed on the wall sleeve at the waterstop fin as indicated on detail.
 - Provide waterstop similar to Adcor 500 by W. R. Grace.
- C. Pipe Penetration Mechanical Seal
 - 1. Provide a mechanically tightened, expanding permanent water seal in wall sleeve at each pipe or conduit through sheet waterproofing as indicated on detail.
 - 2. Seal shall be rated to withstand 20 PSI.
 - 3. Provide seal similar to Flexicraft "Pipeseal".

PART 3 - EXECUTION

2.

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.
 - 3. Verify that compacted subgrade is dry, smooth, sound, and ready to receive waterproofing sheet.
- 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.
- F. Bridge and cover isolation joints, expansion joints and discontinuous deck-to-wall and deck-todeck 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 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- 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, install selfadhering, 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.
- 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 beyond repaired areas in all directions.
- J. Immediately install protection course with butted joints over waterproofing membrane.
 - 1. Molded-sheet drainage panelsand Board insulation may be used in place of a separate protection course to vertical applications when approved by waterproofing manufacturer and installed immediately.

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 of projections and penetrations.
- B. On vertical surfaces, set insulation units in adhesive or tape applied according to manufacturer's written instructions.
- C. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

3.6 FIELD 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 reports to Architect.
- B. Prepare test and inspection reports.

3.7 PROTECTION, REPAIR, AND CLEANING

- A. Protect waterproofing from damage and wear during remainder of construction period.
- B. Protect installed board insulation and drainage panels from damage due to UV light, harmful weather exposures, physical abuse, and other causes. Provide temporary coverings where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.
- 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 071326

SECTION 07 2100 - 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. Extruded polystyrene foam-plastic board (masonry cavity wall insulation).
 - 2. Mineral-wool blanket (partition sound insulation).
 - 3. Mineral wool board insulation (spandrel glass)
 - 4. Nailable roof insulation (metal panel or asphalt shingle roofs)
- B. Related Requirements:
 - 1. Section 07 2119 "Foamed-in-Place Insulation" for spray-applied polyurethane foam insulation.
 - 2. Section 07 5423 "Thermoplastic Polyolefin (TPO) Roofing" for insulation specified as part of TPO roofing construction.

1.3 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. For adhesives, indicating VOC content.
 - 3. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
 - 4. Laboratory Test Reports: For Insulation, indicating compliance with requirements for low-emitting materials.

1.4 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.

1.5 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 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, Masonry Cavity Wall Insulation: ASTM C 578, Type IV, 25-psi minimum compressive strength; unfaced; maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E 84.
 - 1. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

2.2 NAILABLE ROOF INSULATION

- A. Thermally efficient non-structural composite insulation consisting of closed cell polyisocyanurate roof insulation board bonded to Oriented Strand Board (OSB) or plywood on the top face.
 - 1. ASTM C1289, Type V.
 - 2. UL Standard 1256 Classification: Construction No. 120, 123 & 458.
 - 3. UL Standard 790 (ASTM E108): For use with Class A, B or C Shingles, Metal or Tile Roof Coverings.
 - 4. UL Standard 263 (ASTM E119): Fire Resistance Classification.
 - 5. FM Standard 4450 & 4470 Approved (1-90, 1-105): Approved for Class 1 Insulated Roof Deck Construction.
 - 6. Title 25 Foam Flammability Criteria (T 1231).
 - 7. APA/TECO Rated OSB Nailing Surface.
 - 8. United States Voluntary Product Standard: PS 2 Compliant.
 - 9. Dimensional Stability (ASTM D2126): 730 psf (35 kPa).
 - 10. Compressive Strength (ASTM D1621): 25 psi (172 kPa).
 - 11. Water Absorption (ASTM C209): <1.5%.

- 12. Water Vapor Transmission (ASTM E96): <1.0 perm (57.5ng/(Pa•s•m2))
- 13. Product Density (ASTM D1622): Nominal 2.0 pcf (32.04 kg/m3).
- 14. Flame Spread (ASTM E84 10 min.): 40-60.
- 15. Smoke Development (ASTM E84 10 min.): 50-170.
- 16. Tensile Strength (ASTM D1623): >730 psf (35 kPa).
- 17. Panel Area: 4ft x 8ft
- Composite Panel Thickness: Composite calculations include polyiso layer and 7/16" OSB (R-0.55).
 - a. 4.0" (101.6mm): LTTR 21.1
- 19. Wood Layer Compatibility:
 - a. OSB
 - 1) 3/4" (19mm)
 - 2) Available certifications: FSC, Fire-Treated & Preservative-Treated
 - b. CDX
 - 1) 3/4" (19mm):
 - 2) Available Certifications: FSC, Fire-Treated & Preservative-Treated

2.3 MINERAL-WOOL BOARD

- 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. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 70 percent.
- C. Mineral-Wool Board, Types IA and IB, Faced: ASTM C 612, Types IA and IB; faced on one side with foil-scrim or foil-scrim-polyethylene vapor retarder; with maximum flame-spread and smoke-developed indexes of 15 and zero, respectively, per ASTM E 84. Nominal density of 4 lb/cu. ft..
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Industrial Insulation Group, LLC (IIG-LLC).
 - b. Thermafiber, Inc.; an Owens Corning company.

2.4 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. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 50 percent.
- C. Mineral-Wool Blanket, Unfaced, Partition Sound Insulation: 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. Fiberglass sound insulation batts are not acceptable.

2.5 INSULATION FASTENERS

- A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position with self-locking washer in place.
 - 1. Plate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
 - 2. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch in diameter; length to suit depth of insulation.
- B. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick galvanizedsteel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches square or in diameter.
- C. Insulation Standoff: Spacer fabricated from galvanized mild-steel sheet for fitting over spindle of insulation anchor to maintain air space of 2 inches between face of insulation and substrate to which anchor is attached.
- D. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates without damaging insulation, fasteners, or substrates.

2.6 ACCESSORIES

- A. Insulation for Miscellaneous Voids:
 - 1. Glass-Fiber Insulation: ASTM C 764, Type II, loose fill; with maximum flame-spread and smoke-developed indexes of 5, per ASTM E 84.

END OF SECTION 07 2100

SECTION 072119 - FOAMED-IN-PLACE 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. Closed-cell spray polyurethane foam.
- B. Related Requirements:
 1. Section 072100 "Thermal Insulation" for foam-plastic board insulation.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- C. Evaluation Reports: For spray-applied polyurethane foam-plastic insulation, from ICC-ES.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

PART 2 - PRODUCTS

2.1 CLOSED-CELL SPRAY POLYURETHANE FOAM

A. Closed-Cell Spray Polyurethane Foam: ASTM C 1029, Type II, minimum density of 2.0 lb/cu. ft. and minimum aged R-value at 1-inch thickness of 6.9 deg F x h x sq. ft./Btu at 75 deg F.

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. BASF Corporation, Walltite.
 - b. Henry Company, Permax 2.0X.
 - c. Icynene Inc, ProSeal.
 - d. Johns Manville; a Berkshire Hathaway company, Corobond III.
- 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.
 - A. Flame-Spread Index: 25 of less.
 - b. Smoke-Developed Index: 450 or less. Fire Propagation Characteristics: Passes NEPA 285 testin
- 3. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

2.2 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by insulation manufacturer where required for adhesion of insulation to substrates.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Verify that substrates are clean, dry, and free of substances that are harmful to insulation.
- B. Priming: Prime substrates where recommended by insulation manufacturer. Apply primer to comply with insulation manufacturer's written instructions. Confine primers to areas to be insulated; do not allow spillage or migration onto adjoining surfaces.

3.2 INSTALLATION

- A. Comply with insulation manufacturer's written instructions applicable to products and applications.
- B. Spray insulation to envelop entire area to be insulated and fill voids.
- C. Apply in multiple passes to not exceed maximum thicknesses recommended by manufacturer. Do not spray into rising foam.
- D. Cavity Walls: Install into cavities to thickness indicated on Drawings.
- E. Miscellaneous Voids: Apply according to manufacturer's written instructions.

3.3 **PROTECTION**

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes.

END OF SECTION 072119

SECTION 072600 - 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. Reinforced-polyethylene vapor retarders.
 - 3. 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 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 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- thick sheet, with maximum permeance rating of 0.1 perm.

2.2 REINFORCED-POLYETHYLENE VAPOR RETARDERS

A. Reinforced-Polyethylene Vapor Retarders: Sheet with outer layers of polyethylene film laminated to an inner reinforcing layer consisting of either nylon cord or polyester scrim and weighing not less than 20 lb/1000 sq. ft., with maximum permeance rating of 0.1 perm.

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 **PROTECTION**

A. Protect vapor retarders from damage until concealed by permanent construction.

END OF SECTION 072600

SECTION 072726 - 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 non-permeable, fluid-applied air barriers at all new exterior masonry wall construction:
 - 1. Supply labor, materials and equipment to complete the Work as shown on the drawings and as specified herein to bridge and seal the following air leakage pathways and gaps:
 - a. Connections of the walls to the roof air barrier.
 - b. Connection of the walls to the foundations.
 - c. Seismic and expansion joints.
 - d. Openings and penetrations of window and door frames, store front, curtain wall, etc.
 - e. Piping, conduit, duct and similar penetrations.
 - f. Masonry ties, screws, bolts and similar penetrations.
 - g. All other air leakage pathways in the building envelope.
 - 2. Materials and installation methods of the primary air/vapor barrier membrane system and accessories.
 - 3. Materials and installation methods of through-wall flashing membranes.
- B. Related Requirements:
 - 1. Section 042000, UNIT MASONRY
 - 2. Section 075423, THERMOPLASTIC POLYOLEFIN (TPO) ROOFING
 - 3. Section 076200, SHEET METAL FLASHING & TRIM
 - 4. Section 081113, HOLLOW METAL DOORS & FRAMES

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 accessories applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review air-barrier requirements and installation, special details, mockups, air-leakage and bond testing, air-barrier protection, and work scheduling that covers air barriers.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include manufacturer's written instructions for evaluating, preparing, and treating each substrate; technical data; dry film thickness; 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 lowemitting materials.
- C. Shop Drawings: For air-barrier assemblies.
 - 1. Submit manufacturer's current product data sheets for the air barrier membrane system.
 - 2. Show locations and extent of air-barrier materials, accessories, and assemblies specific to Project conditions.
 - 3. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
 - 4. 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 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. Submit documentation from an approved independent testing laboratory certifying the air leakage and vapor permeance rates of the air barrier membranes, including primary membrane and transition sheets, exceed the requirements of the Massachusetts Energy Code and in accordance with ASTM E 2178.
 - a. Test report submittals shall include test results on porous substrate and include sustained wind load and gust load air leakage results.
- D. Field quality-control reports.
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.
 - 2. Single source responsibility; obtain air barrier materials from a single manufacturer regularly engaged in manufacturing the product. Provide products which comply with all federal, state & local regulations controlling use of volatile organic compounds (VOCs).
- B. Mockups: Build mockups to set quality standards for materials and execution.
 - 1. Coordinate with Specification Section 042000 required mockups of exterior wall assembly, incorporating backup wall construction, 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. Include junction with roofing membrane and foundation wall intersection.
 - b. 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.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Remove and replace liquid materials that cannot be applied within their stated shelf life.
- B. Deliver materials to the job site in undamaged and original packaging indicating the name of the manufacturer and product.
- C. Protect stored materials from direct sunlight and at temperatures of 40 deg F and rising.
- D. Contractor to verify compliance for Volatile Organic Compounds (VOCs) limitations of products to comply with all federal, state and local regulations con trolling use of VOCs.

1.9 FIELD CONDITIONS

- A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended in writing 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.

1.10 WARRANTY

A. Provide manufacturer's standard 10-year material warranty.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Source Limitations: Obtain primary air-barrier materials and air-barrier accessories from single source from single manufacturer to ensure total system compatibility.
- B. VOC Content: 100 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. Air-Barrier Performance: Air-barrier assembly and seals with adjacent construction shall be capable of performing as a continuous 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.
- B. Air-Barrier Assembly Air Leakage: Maximum 0.00012 CFM/sq.ft. @ 1.6lbs/sq.ft., when tested according to ASTM E 2178 and ASTM E 283.

2.3 HIGH-BUILD AIR BARRIERS, VAPOR RETARDING

- A. High-Build, Vapor-Retarding Air Barrier: synthetic polymer membrane with an installed dry film thickness, according to manufacturer's written instructions, of 35 mils or thicker over smooth, void-free substrates.
 - 1. Synthetic Polymer Type: Products by one of the following manufacturer's will be considered pending compliance with these specifications;
 - a. Henry Company.
 - b. Grace Construction Products.
 - c. Carlisle Coatings and Waterproofing.
 - 2. Physical and Performance Properties:
 - a. Air Permeance: Maximum 0.00012 CFM/sq.ft. @ 1.6lbs/sq.ft. pressure difference; ASTM E 2178.
 - b. Vapor Permeance: Maximum 0.08 perms; ASTM E 96/E 96M, Desiccant Method.

2.4 ACCESSORY MATERIALS

A. Requirement: Provide primers, transition strips, termination strips, joint reinforcing fabric and strips, joint sealants, counterflashing strips, flashing sheets and metal termination bars,

termination mastic, substrate patching materials, adhesives, tapes, foam sealants, lap sealants, and other accessory materials that are recommended in writing by air-barrier manufacturer to produce a complete air-barrier assembly and that are compatible with primary air-barrier material and adjacent construction to which they may seal.

- 1. Window flashing Self adhering transition membrane.
- 2. Through-wall flashing Self adhering transition membrane.
- 3. Foundation wall damproofing Non-fibered asphalt emulsion.
- B. Primer: Liquid primer recommended for substrate by air-barrier material manufacturer.
- C. Stainless-Steel Drip Edge: Where through-wall flashing is indicated to terminate at wall face.

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 substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
 - 2. Verify that substrates have cured and aged for minimum time recommended in writing by air-barrier manufacturer.
 - 3. Verify that substrates are visibly dry and free of moisture.
 - 4. Do not proceed with application of air barrier membrane when rain is expected within 24 hours.
 - 5. Verify that masonry joints are flush and completely filled with mortar.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

- A. Clean, prepare, treat, fill, and seal substrate and joints and cracks in substrate according to manufacturer's written instructions and details. 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 material.
- 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.

H. Bridge expansion joints and discontinuous wall-to-wall, deck-to-wall, and deck-to-deck joints with air-barrier accessory material that accommodates joint movement according to manufacturer's written instructions and details.

3.3 ACCESSORIES INSTALLATION

- A. Install accessory materials according to air-barrier manufacturer's written instructions and details to form a seal with adjacent construction and ensure continuity of air and water 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 transition strip on roofing membrane or base flashing so that a minimum of 3 inches (75 mm) of coverage is achieved over each substrate.
 - 3. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.
 - 4. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by air-barrier material on same day. Reprime areas exposed for more than 24 hours.
- B. Connect and seal exterior wall air-barrier material 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.
- C. At end of each working day, seal top edge of strips and transition strips to substrate with termination mastic.
- D. 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.
- E. Wall Openings: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply transition strip so that a minimum of 3 inches (75 mm) of coverage is achieved over each substrate. 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. Transition Strip: Roll firmly to enhance adhesion.
- F. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air-barrier material with foam sealant.
- G. Seal strips and transition strips around masonry reinforcing or ties and penetrations with termination mastic.
- H. Seal top of through-wall flashings to air barrier with an additional 6-inch- (150-mm-) wide, transition strip.
- I. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.
- J. 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.

3.4 PRIMARY AIR-BARRIER MATERIAL INSTALLATION

- A. Apply air-barrier material to form a seal with strips and transition strips and to achieve a continuous air barrier according to air-barrier manufacturer's written instructions and details. Apply air-barrier material within manufacturer's recommended application temperature ranges.
 - 1. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.
 - 2. Limit priming to areas that will be covered by air-barrier material on same day. Reprime areas exposed for more than 24 hours.
 - 3. Where multiple prime coats are needed to achieve required bond, allow adequate drying time between coats.
- B. High-Build Air Barriers: Apply continuous unbroken air-barrier material to substrates according to the following thickness. Apply air-barrier material in full contact around protrusions such as masonry ties.
 - 1. Vapor-Retarding, High-Build Air Barrier: Total dry film thickness as recommended in writing by manufacturer to comply with performance requirements, but not less than 35 mils (0.9 mm), applied in one coat.
- C. Do not cover air barrier until it has been tested and inspected by testing agency.
- D. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air-barrier components.

3.5 FIELD QUALITY CONTROL

- A. ABAA Quality Assurance Program: Perform examinations, preparation, installation, testing, and inspections under ABAA's Quality Assurance Program.
- B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- C. Inspections: Air-barrier materials, accessories, 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. Air-barrier dry film thickness.
 - 3. Continuous structural support of air-barrier system has been provided.
 - 4. Masonry and concrete surfaces are smooth, clean, and free of cavities, protrusions, and mortar droppings.
 - 5. Site conditions for application temperature and dryness of substrates have been maintained.
 - 6. Maximum exposure time of materials to UV deterioration has not been exceeded.
 - 7. Surfaces have been primed, if applicable.
 - 8. 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.
 - 9. Termination mastic has been applied on cut edges.
 - 10. Strips and transition strips have been firmly adhered to substrate.
 - 11. Compatible materials have been used.
 - 12. Transitions at changes in direction and structural support at gaps have been provided.
 - 13. Connections between assemblies (air-barrier and sealants) have complied with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.
 - 14. All penetrations have been sealed.

- D. Tests: As determined by testing agency from among the following tests:
 - 1. Air-Leakage-Location Testing: Air-barrier assemblies will be tested for evidence of air leakage according to ASTM E 1186, chamber pressurization or depressurization with smoke tracers.
 - 2. Air-Leakage-Volume Testing: Air-barrier assemblies will be tested for air-leakage rate according to ASTM E 783.
 - 3. Adhesion Testing: Air-barrier assemblies will be tested for required adhesion to substrate according to ASTM D 4541 for each 600 sq. ft. (56 sq. m) of installed air barrier or part thereof.
- E. Air barriers will be considered defective if they do not pass tests and inspections.
 - 1. Apply additional air-barrier material, according to manufacturer's written instructions, where inspection results indicate insufficient thickness.
 - 2. Remove and replace deficient air-barrier components for retesting as specified above.
- F. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.
- G. Prepare test and inspection reports.

3.6 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 recommended in writing by manufacturer. If exposed to these conditions for longer than recommended, remove and replace air barrier or install additional, full-thickness, air-barrier application after repairing and preparing the overexposed materials according to air-barrier manufacturer's written instructions.
 - 2. Protect air barrier from contact with incompatible materials 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 in writing by manufacturer of affected construction.
- C. Remove masking materials after installation.

END OF SECTION 072726

SECTION 073113 - ASPHALT SHINGLES (ALTERNATE A-A4)

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. Asphalt shingles.
 - 2. Underlayment.
 - 3. Ridge vents.
 - 4. Metal flashing and trim.

1.3 DEFINITION

A. Roofing Terminology: See ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" for definitions of terms related to roofing work in this Section.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified.
 - 1. Asphalt Shingles: Full size.
 - 2. Ridge and Hip Cap Shingles: Full size.
 - 3. Ridge Vent: 12-inch- long Sample.
 - 4. Exposed Valley Lining: 12 inches square.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

- B. Product Test Reports: For each type of asphalt shingle and underlayment product indicated, for tests performed by a qualified testing agency.
- C. Sample Warranty: For manufacturer's warranty.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For asphalt shingles to include in maintenance manuals.

1.8 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. Asphalt Shingles: 100 sq. ft. of each type, in unbroken bundles.

1.9 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Store roofing materials in a dry, well-ventilated location protected from weather, sunlight, and moisture according to manufacturer's written instructions.
- B. Store underlayment rolls on end on pallets or other raised surfaces. Do not double stack rolls.
- C. Protect unused roofing materials from weather, sunlight, and moisture when left overnight or when roofing work is not in progress.
- D. Handle, store, and place roofing materials in a manner to prevent damage to roof deck or structural supporting members.

1.11 FIELD CONDITIONS

A. Environmental Limitations: Install self-adhering sheet underlayment within the range of ambient and substrate temperatures recommended in writing by manufacturer.

1.12 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace asphalt shingles that fail within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Manufacturing defects.

- 2. Material Warranty Period: 40 years from date of Substantial Completion, prorated, with first 10 years nonprorated.
- 3. Wind-Speed Warranty Period: Asphalt shingles will resist blow-off or damage caused by wind speeds of up to 110 mph for 10 years from date of Substantial Completion.
- 4. Algae-Resistance Warranty Period: Asphalt shingles will not discolor for 10 years from date of Substantial Completion.
- 5. Workmanship Warranty Period: 10 years from date of Substantial Completion.
- B. Roofing Installer's Warranty: On warranty form at end of this Section, signed by Installer, in which Installer agrees to repair or replace components of asphalt-shingle roofing that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Exterior Fire-Test Exposure: Provide asphalt shingles and related roofing materials identical to those of assemblies tested for Class A fire resistance according to ASTM E 108 or UL 790 by Underwriters Laboratories or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing agency.

2.2 LASS-FIBER-REINFORCED ASPHALT SHINGLES

- A. Laminated-Strip Asphalt Shingles: ASTM D 3462/D 3462M, laminated, multi-ply overlay construction, glass-fiber reinforced, mineral-granule surfaced, and self-sealing.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CertainTeed Corporation, Landmark.
 - b. GAF Materials Corporation, Timberline.
 - c. Tamko Building Products, Inc, Heritage AR.
 - 2. Butt Edge: Straight cut.
 - 3. Strip Size: Manufacturer's standard.
 - 4. Algae Resistance: Granules resist algae discoloration.
 - 5. Impact Resistance: UL 2218, Class 4.
 - 6. Color and Blends: As selected by Architect from manufacturer's full range.
- B. Hip and Ridge Shingles: Manufacturer's standard units to match asphalt shingles.

2.3 UNDERLAYMENT MATERIALS

- A. Felt: ASTM D 226/D 226M, asphalt-saturated organic felts, nonperforated.
 1. Type: Type I.
- B. Self-Adhering Sheet Underlayment, High Temperature: Minimum of 40-mil- thick; with slipresisting, polymer-film-reinforced or glass-reinforced top surface laminated to layer of butyl or

SBS-modified asphalt adhesive; with release backing; cold applied; and evaluated and documented to be suitable for use for intended purpose under applicable codes by a testing and inspecting agency acceptable to authorities having jurisdiction.

- 1. Thermal Stability: Stable after testing at 240 deg F according to ASTM D 1970/D 1970M.
- 2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F according to ASTM D 1970/D 1970M.

2.4 ACCESSORIES

- A. Asphalt Roofing Cement: ASTM D 4586, Type II, asbestos free.
- B. Roofing Nails: ASTM F 1667; aluminum, stainless-steel, copper, or hot-dip galvanized-steel wire shingle nails, minimum 0.120-inch- diameter, sharp-pointed, with a minimum 3/8-inch-diameter flat head and of sufficient length to penetrate 3/4 inch into solid wood decking or extend at least 1/8 inch through OSB or plywood sheathing.
 - 1. Shank: Barbed.
 - 2. Where nails are in contact with metal flashing, use nails made from same metal as flashing.
- C. Felt-Underlayment Nails: Aluminum, stainless-steel, or hot-dip galvanized-steel wire with lowprofile capped heads or disc caps, 1-inch minimum diameter.

2.5 METAL FLASHING AND TRIM

- A. General: Comply with requirements in Section 076200 "Sheet Metal Flashing and Trim."
 1. Sheet Metal: Stainless steel.
- B. Fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of the item.
 - 1. Apron Flashings: Fabricate with lower flange a minimum of 4 inches over and 4 inches beyond each side of downslope asphalt shingles and 6 inches up the vertical surface.
 - 2. Step Flashings: Fabricate with a headlap of 2 inches and a minimum extension of 4 inches over the underlying asphalt shingle and up the vertical surface.
 - 3. Drip Edges: Fabricate in lengths not exceeding 10 feet with 2-inch roof-deck flange and 1-1/2-inch fascia flange with 3/8-inch drip at lower edge.
- C. Vent Pipe Flashings: Premolded EPDM boot with collar.

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.

- 1. Examine roof sheathing to verify that sheathing joints are supported by framing and blocking or metal clips and that installation is within flatness tolerances.
- 2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and completely anchored; and that provisions have been made for flashings and penetrations through asphalt shingles.
- 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 UNDERLAYMENT INSTALLATION

- A. General: Comply with underlayment manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.
- B. Single-Layer Felt Underlayment: Install on roof deck parallel with and starting at the eaves. Lap sides a minimum of 2 inches over underlying course. Lap ends a minimum of 4 inches. Stagger end laps between succeeding courses at least 72 inches. Fasten with felt-underlayment nails.
 - 1. Install felt underlayment on roof deck not covered by self-adhering sheet underlayment. Lap sides of felt over self-adhering sheet underlayment not less than 3 inches in direction that sheds water. Lap ends of felt not less than 6 inches over self-adhering sheet underlayment.
 - 2. Install fasteners at no more than 36 inches o.c.
- C. Self-Adhering Sheet Underlayment: Install, wrinkle free, on roof deck. Comply with low-temperature installation restrictions of underlayment manufacturer if applicable. Install lapped in direction that sheds water. Lap sides not less than 3-1/2 inches. Lap ends not less than 6 inches staggered 24 inches between courses. Roll laps with roller. Cover underlayment within seven days.
 - 1. Prime concrete and masonry surfaces to receive self-adhering sheet underlayment.
 - 2. Eaves: Extend from edges of eaves 36 inches beyond interior face of exterior wall.
 - 3. Rakes: Extend from edges of rake 36 inches beyond interior face of exterior wall.
 - 4. Valleys: Extend from lowest to highest point 18 inches on each side.
 - 5. Hips: Extend 18 inches on each side.
 - 6. Ridges: Extend 36 inches on each side without obstructing continuous ridge vent slot.
 - 7. Dormers, Chimneys, Skylights, and Other Roof-Penetrating Elements: Extend beyond penetrating element 18 inches, and return vertically against penetrating element not less than 4 inches.
 - 8. Roof Slope Transitions: Extend 18 inches on each roof slope.

3.3 METAL FLASHING INSTALLATION

- A. General: Install metal flashings and other sheet metal to comply with requirements in Section 076200 "Sheet Metal Flashing and Trim."
 - 1. Install metal flashings according to recommendations in ARMA's "Residential Asphalt Roofing Manual" and NRCA's "NRCA Guidelines for Asphalt Shingle Roof Systems."

- B. Apron Flashings: Extend lower flange over and beyond each side of downslope asphalt shingles and up the vertical surface.
- C. Step Flashings: Install with a headlap of 2 inches and extend over the underlying asphalt shingle and up the vertical surface. Fasten to roof deck only.
- D. Cricket or Backer Flashings: Install against the roof-penetrating element extending concealed flange beneath upslope asphalt shingles and beyond each side.
- E. Rake Drip Edges: Install rake drip-edge flashings over underlayment and fasten to roof deck.
- F. Eave Drip Edges: Install eave drip-edge flashings below underlayment and fasten to roof sheathing.
- G. Pipe Flashings: Form flashing around pipe penetrations and asphalt shingles. Fasten and seal to asphalt shingles as recommended by manufacturer.

3.4 ASPHALT-SHINGLE INSTALLATION

- A. General: Install asphalt shingles according to manufacturer's written instructions, recommendations in ARMA's "Residential Asphalt Roofing Manual," and recommendations in NRCA's "NRCA Guidelines for Asphalt Shingle Roof Systems."
- B. Install starter strip along lowest roof edge, consisting of an asphalt-shingle strip with tabs removed with self-sealing strip face up at roof edge.
 - 1. Extend asphalt shingles 3/4 inch over fasciae at eaves and rakes.
 - 2. Install starter strip along rake edge.
- C. Install first and remaining courses of asphalt shingles stair-stepping diagonally across roof deck with manufacturer's recommended offset pattern at succeeding courses, maintaining uniform exposure.
- D. Install first and remaining courses of asphalt shingles stair-stepping diagonally across roof deck with manufacturer's recommended offset pattern at succeeding courses, maintaining uniform exposure.
- E. Fasten asphalt-shingle strips with a minimum of four roofing nails located according to manufacturer's written instructions.
 - 1. When ambient temperature during installation is below 50 deg F, seal asphalt shingles with asphalt roofing cement spots.
- F. Ridge Vents: Install continuous ridge vents over asphalt shingles according to manufacturer's written instructions. Fasten with roofing nails of sufficient length to penetrate sheathing.
- G. Hip and Ridge Shingles: Maintain same exposure of cap shingles as roofing shingle exposure. Lap cap shingles at ridges to shed water away from direction of prevailing winds. Fasten with roofing nails of sufficient length to penetrate sheathing.
 - 1. Fasten ridge cap asphalt shingles to cover ridge vent without obstructing airflow.

END OF SECTION 073113

SECTION 07 4113.16 - 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 standing-seam metal roof 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 roof accessories and roof-mounted equipment.
 - 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 structural loading limitations of deck, purlins and rafters during and after roofing.
 - 6. Review flashings, special details, drainage, penetrations, equipment curbs, and condition of other construction that affect metal panels.
 - 7. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
 - 8. Review temporary protection requirements for metal panel systems during and after installation.
 - 9. Review procedures for repair of metal panels damaged after installation.
 - 10. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

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 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.
- 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 long by actual panel width. Include clips, fasteners, closures, and other metal panel accessories.

1.5 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.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal panels 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.

1.8 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.

STANDING-SEAM METAL ROOF PANELS

- 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.

1.9 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.

1.10 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.

1.11 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: Five 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 Weathertightness 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. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 30% percent.
- B. Solar Reflectance Index: Not less than 29 when calculated according to ASTM E 1980, based on testing identical products by a qualified testing agency.
- C. Energy Performance: Provide roof panels that are listed on the EPA/DOE's ENERGY STAR "Roof Product List" for steep-slope roof products.
- D. Energy Performance: Provide roof panels according to one of the following when tested according to CRRC-1:
 - 1. Three-year, aged solar reflectance of not less than 0.55 and emissivity of not less than 0.75.
- E. 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.
- F. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. when tested according to ASTM E 1680/ASTM E 283 at the following test-pressure difference:
 1. Test-Pressure Difference: 1.57 lbf/sq. ft..
- G. Water Penetration under Static Pressure: No water penetration when tested according to
 - ASTM E 1646/ASTM E 331 at the following test-pressure difference:
 - 1. Test-Pressure Difference: 6.24 lbf/sq. ft..
- H. Hydrostatic-Head Resistance: No water penetration when tested according to ASTM E 2140.
- I. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.
 1. Uplift Rating: UL 90.
 - 1. Opint Rating: OL 90.
- J. 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, ambient; 180 deg F, material surfaces.

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. Integral-Standing-Seam Metal Roof Panels (Existing West Wing Roofing): Formed with integral ribs at panel edges and a flat pan between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels and lapping and interconnecting side edges of adjacent panels.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Centria Roof Systems, SRS-3.
 - b. Imetco, Series 300.
 - c. Merchant & Evans, Inc, Zip-Rib.
 - 2. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A 653/A 653M, G90 coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A 792/A 792M, Class AZ50 coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
 - a. Nominal Thickness: 0.034 inch.
 - b. Exterior Finish: Three-coat fluoropolymer.
 - c. Color: As selected by Architect from manufacturer's full range.

2.3 UNDERLAYMENT MATERIALS

- A. Self-Adhering, High-Temperature Underlayment: Provide self-adhering, cold-applied, sheet underlayment, a minimum of 30 mils 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; ASTM D 1970.
 - 2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F; ASTM D 1970.
- B. Slip Sheet: Manufacturer's recommended slip sheet, of type required for application.

2.4 MISCELLANEOUS MATERIALS

- A. Miscellaneous Metal Subframing and Furring: ASTM C 645; cold-formed, metallic-coated steel sheet, ASTM A 653/A 653M, G90 coating designation or ASTM A 792/A 792M, Class AZ50 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-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. Finish flashing and trim with same finish system as adjacent metal panels.
- D. Roof Curbs: Fabricated from same material as roof panels, 0.048-inch nominal thickness; with bottom of skirt profiled to match roof panel profiles and with welded top box and integral fulllength cricket. Fabricate curb subframing of 0.060-inch-nominal thickness, angle-, C-, or Zshaped steel sheet. Fabricate curb and subframing to withstand indicated loads of size and height indicated. Finish roof curbs to match metal roof panels.
 - 1. Insulate roof curb with 1-inch-thick, rigid insulation.
- E. Panel Fasteners: Self-tapping screws designed to withstand design loads.
- F. 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 wide and 1/8 inch 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.

2.5 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 flatlock 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.

2.6 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 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.

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 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 below, wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. 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 beyond interior wall line.
 - b. Rake edges for a distance of 18 inches.
 - c. Hips and ridges for a distance on each side of 12 inches.
 - d. Roof-to-wall intersections for a distance from wall of 18 inches.
 - e. Around dormers, chimneys, skylights, and other penetrating elements for a distance from element of 18 inches.
- B. Felt Underlayment: Apply at locations indicated below, in shingle fashion to shed water, and with lapped joints of not less than 2 inches.
 - 1. Apply on roof not covered by self-adhering sheet underlayment. Lap over edges of selfadhering sheet underlayment not less than 3 inches, in shingle fashion to shed water.
- C. Slip Sheet: Apply slip sheet over underlayment before installing metal roof panels.
- D. Flashings: Install flashings to cover underlayment to comply with requirements specified in Section 076200 "Sheet Metal Flashing and Trim."

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. 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 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 with no joints allowed within 24 inches 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 deep, filled with mastic sealant (concealed within joints).

H. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to metal roof panels as recommended by manufacturer.

3.4 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align metal panel units 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.

3.5 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.

3.6 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.
 - 1. 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 4113.16

SECTION 075423 - 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. Fully Adhered Thermoplastic Polyolefin (TPO) roofing system, including all components specified.
 - 2. Fully Adhered Cover Board
 - 3. Fully Adhered Tapered 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. Section 061000 "Rough Carpentry" for wood nailers, curbs, and blocking.
 - 2. Section 076200 "Sheet Metal Flashing and Trim" for metal roof flashings, counterflashings and roofing associated trim items.
 - 3. Section 077100 "Roof Specialties" for manufactured copings, fascias, gravel stops, and other flashing-related items.
 - 4. Section 079200 "Joint Sealants" for joint sealants, joint fillers, and joint preparation.

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.

1.4 PREINSTALLATION MEETINGS

- A. 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 existing roofing removal and 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 ACTION SUBMITTALS

- A. Refer to Section 013000 "Administrative Requirements" for submittal procedures.
- B. Product Data: For each type of product.
 - 1. Provide membrane manufacturer's printed data sufficient to show that all components of roofing system, including insulation and fasteners, comply with the specified requirements and with the membrane manufacturer's requirements and recommendations for the system type specified: include data for each product used in conjunction with roofing membrane.
 - 2. Where UL or FM requirements are specified, provide documentation that shows that the roofing system to be installed is UL-Classified or FM-approved, as applicable; include data itemizing the components of the classified or approved system.
 - 3. Installation Instructions: Provide manufacturer's instructions to installer, marked up to show exactly how all components will be installed; where instructions allow installation options, clearly indicate which option will be used.
- C. 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.
- D. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work, including:
 - 1. Roof membrane manufacturer's standard details customized for this project for all relevant conditions, including flashings, base tie-ins, roof edges, terminations, expansion joints, penetrations, and drains.
 - 2. Base flashings and membrane terminations.
 - 3. Tapered insulation, project-specific layout, slopes, and dimensions for each board.
 - 4. Roof plan showing orientation of steel roof deck and orientation of roofing, fastener spacing, and patterns for mechanically fastened roofing.
 - 5. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.

- E. Samples for Verification: For the following products:
 - 1. Sheet roofing, of color required.
 - 2. Each additional product to be used in project.

1.6 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.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roofing system to include in maintenance manuals.

1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer that is UL listed and FM Global approved for roofing system identical to that used for this Project.
- B. Installer Qualifications:
 - 1. Approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.
 - 2. At least five years' experience in installing specified system.
 - 3. Foreman must be present at all times during install. Foreman must have manufacturer training certification. Crew must have a minimum of "in-house" training.

1.9 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. Keep combustible materials away from ignition source.
- D. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.

1.10 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.

1.11 WARRANTY

- A. Refer to Section 017800 "Closeout Submittals", for additional warranty requirements.
- B. Comply with all warranty procedures required by the manufacturer, including notifications, scheduling, and inspections.
- C. Warranty: Full System Warranty covering membrane, roof insulation, labor, materials, and other indicated components of roofing system, for the specified warranty period.
 - 1. Limit of Liability: No dollar limitation.
 - 2. Warranty Period: Thirty (30) years from date of Substantial Completion.
 - 3. Scope of Coverage: Repair leaks in the roofing system caused by;
 - a. Ordinary wear and tear of the elements.
 - b. Manufacturing defect in specified brand materials.
 - c. Defective workmanship used to install these materials.
 - d. Damage sue to winds up to 90 mph.
 - 4. Not Covered:
 - a. Damage due to winds in excess of 90 mph.
 - b. Damage due to hurricanes or tornadoes.
 - c. Hail.
 - d. Intentional damage.
 - e. Unintentional damage sue to normal rooftop inspections maintenance, or service.
- D. Contractor Guarantee: Contractor to issue a guarantee for workmanship.
 - 1. Guarantee Term: 2 years from date of Substantial Completion.

E. Metal Roof Edging: Full-system warranty for roof edge system, covering blow-off from winds up to 150 mph.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer Roofing System: UltraPly TPO by Firestone Building Products LLC; www.firestonebpco.com.
 - 1. Roofing systems manufactured by others are acceptable provided the roofing system is completely equivalent in materials and warranty conditions and the manufacturer meets the following qualifications:
 - a. Specializing in manufacturing the roofing system to be provided.
 - b. Roofing systems manufactured by the companies listed below are acceptable provided they are completely equivalent in materials and warranty conditions:
 - 1) Carlisle.
 - 2) Johns Manville.
- B. Manufacturer of Insulation and Cover Boards: Manufacturer approved by roof membrane manufacturer.
- C. Manufacturer of Metal Roof Edging: Manufacturer approved by roof membrane manufacturer.
 1. Field or shop fabricated metal roof edgings are not acceptable.

2.2 ROOFING SYSTEM DESCRIPTION

- A. Roofing System: Thermoplastic Olefin (TPO) single-ply membrane.
 - 1. Membrane Attachment: Fully adhered.
 - 2. Slope: At flat decks provide minimum slope of ¹/₄" per foot, at sloped decks conform to deck slope.
 - 3. Comply with applicable local building code requirements.
 - 4. Provide assembly having Underwriters Laboratories, Inc. (UL) Class A Fire Hazard Classification.
 - 5. The TPO system and warranty shall achieve a wind uplift rating in accordance with ANSI/SPRI WD-1 and ASCE 7-10 for a Risk Category III structure.
- B. Roofing System Components: Listed in order from the top of the roof down:
 - 1. Membrane: Thickness as specified.
 - 2. Insulation Cover Board: High density polyisocyanurate; cold adhesive attached.
 - 3. Insulation Type: Polyisocyanurate insulation boards with fiberglass facers. Insulation shall be fabricated in tapered and non-tapered boards as required.

2.3 MEMBRANE MATERIALS

- A. Membrane: Flexible heat weldable sheet composed of thermoplastic polyolefin polymer and ethylene propylene rubber; complying with ASTM D6878, with polyester weft inserted reinforcement and the following additional characteristics:
 - 1. Thickness: 0.080 inch plus/minus 10 percent, with coating thickness over reinforcement of 0.030 inch plus/minus 10 percent.
 - 2. Puncture Resistance: 415 lbf, minimum, when tested in accordance with FTM 101C method 2031.
 - 3. Solar Reflectance: 0.79, minimum, when tested in accordance with ASTM C1549.
 - 4. Color: White.
- B. Formable Flashing: Non-reinforced, flexible, heat weldable sheet, composed of thermoplastic polyolefin polymer and ethylene propylene rubber.
 - 1. Thickness: 0.060 inch plus/minus 10 percent.
 - 2. Tensile Strength: 1550 psi, minimum, when tested in accordance with ASTM D638 after heat aging.
 - 3. Elongation at Break: 650 percent, minimum, when tested in accordance with ASTM D638 after heat aging.
 - 4. Tearing Strength: 12 lbf, minimum, when tested in accordance with ASTM D1004 after heat aging.
 - 5. Color: White.
- C. Tape Flashing: 6 inch nominal wide TPO membrane laminated to cured rubber polymer seaming tape, overall thickness 0.065 inch nominal.
 - 1. In addition to locations where required by manufacturer, provide tape flashing at all seams.
- D. Bonding Adhesive: Neoprene and SBR rubber blend, formulated for compatibility with the membrane and other substrate materials including masonry, wood and insulation facings.
- E. Seam Plates: Steel with barbs and Galvalume coating; corrosion-resistance complying with FM 4470.
- F. Termination Bars: Stainless Steel bars with integral caulk ledge; 1.3" wide by .10" thick.
- G. Cut Edge Sealant: Synthetic rubber-based, for use where membrane reinforcement is exposed.
- H. General Purpose Sealant: EPDM-based, one part, white general purpose sealant.
- I. Molded Flashing Accessories: Unreinforced TPO membrane pre-molded to suit a variety of flashing details, including pipe boots, inside corners, outside corners, etc.
- J. Water Block Seal: Butyl rubber sealant for use between two surfaces, not exposed; Water Block Seal by Firestone or equal.
- K. Perimeter Fastening Strips: 6" pressure sensitive reinforced perimeter fastening strips.

2.4 SUBSTRATE BOARDS

- A. Substrate Board: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate, 1/2 inch thick.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CertainTeed Corporation.
 - b. Georgia-Pacific Building Products.
 - c. National Gypsum Company.
 - d. United States Gypsum Company.
- B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Global 4470, designed for fastening substrate board to roof deck.

2.5 ROOF INSULATION AND COVER BOARDS

- A. Polyisocyanurate Board Insulation: Closed cell polyisocyanurate foam with black glass reinforced mat laminated to faces, complying with ASTM C1289 Type II Class 1, with the following additional characteristics:
 - 1. Overall Thickness: As indicated on the drawings.
 - 2. Compressive Strength: 20 psi when tested in accordance with ASTM C 1289.
 - 3. Ozone Depletion Potential: Zero; made without CFC or HCFC blowing agents.
 - 4. Recycled Content: 19 percent post-consumer and 15 percent post-industrial average.
- B. High Density Polyisocyanurate Cover Board: Non-combustible, water resistant high density closed cell polyisocyanurate core with coated glass mat facers, with the following characteristics:
 - 1. Size: 48" by 96", nominal.
 - 2. Thickness: $\frac{1}{2}$ ".
 - 3. Thermal Value: R-value of 2.5, when tested in accordance with ASTM C 518 and ASTM C 177.
 - 4. Surface Water Absorption: 3 percent, maximum, when tested in accordance with ASTM C 209.
 - 5. Compressive Strength: 120 psi when tested in accordance with ASTM D 1621.
 - 6. Density: 5 pcf, when tested in accordance with ASTM D 1622/D 1622M.
 - 7. Factory Mutual approved for use with FM 1-60 and 1-90 rated roofing assemblies.
 - 8. Mold Growth Resistance: Passing ASTM D 3273.
- C. Adhesive for Insulation Attachment: Type as required by roof membrane manufacturer for roofing system and warranty to be provided; use only adhesives furnished by roof membrane manufacturer.

2.6 METAL ACCESSORIES

- A. Metal Roof Edging and Fascia: Continuous metal edge member serving as termination of roof mem brane and retainer for metal fascia; watertight with no exposed fasteners; mounted to roof edge nailer.
 - 1. Wind Performance:
 - a. Membrane Pull-Off Resistance: 100 lbs/ft, minimum, when tested in accordance with ANSI/SPRIES ES-1 Test Method RE-1, current edition.
 - b. Fascia Pull-Off Resistance: At least the minimum required when tested in accordance with ANSI/SPRIES ES-1 Test Method RE-2, current edition.
 - c. Provide product listed in current Factory Mutual Research Corporation Approval Guide with at least FM 1-270 rating.
 - 2. Functional Characteristics: Fascia retainer supports while allowing for free thermal cycling of fascia.
 - 3. Stainless Steel Bar: Continuous bar with pre-punched slotted holes; miters welded; injection molded EPDM splices to allow thermal expansion.
 - 4. Anchor Bar Cleat: 20 ga, 0.036" G90 coated commercial type galvanized steel with perpunched holes.
 - 5. Fasteners: Factory-provided corrosion resistant fasteners, with drivers; no exposed fasteners permitted.
 - 6. Special Shaped Components: Provide factory-fabricated pieces necessary for complete installation, including miters, scuppers and end caps; minimum 14' long legs on corner pieces.

2.7 ACCESSORY MATERIALS

- A. Cant Strips and Tapered Edge Strips: 45 degree face slope and minimum 5" face dimension; provide at all angle changes between vertical and horizontal planes that exceed 45 degrees.
 - 1. Install using roofing mastic, or mechanically fastened using fasteners and plates approved by roofing manufacturer.

2.8 WALKWAYS

A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway pads, approximately 3/16 inchthick and acceptable to roofing system manufacturer.

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 surface plane flatness and fastening of steel roof deck complies with requirements in Section 053100 "Steel Decking."
- 4. Verify that minimum concrete drying period recommended by roofing system manufacturer has passed.
- 5. Verify that concrete substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
- 6. 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.

3.4 SUBSTRATE BOARD INSTALLATION

- A. Install substrate board with long joints in continuous straight lines, perpendicular to roof slopes with end joints staggered between rows. Tightly butt substrate boards together.
 - 1. Fasten substrate board to top flanges of steel deck according to recommendations in FM Global's "RoofNav" and FM Global Loss Prevention Data Sheet 1-29 for specified Windstorm Resistance Classification.
 - 2. Fasten substrate board to top flanges of steel deck to resist uplift pressure at corners, perimeter, and field of roof according to roofing system manufacturers' written instructions.

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 or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches 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 with insulation.
 - 1. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
- G. Adhered Insulation: Install each layer of insulation and adhere to substrate as follows:
 - 1. Set each layer of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.
 - 2. Set each layer of insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.
- H. 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.
- 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 in each direction. Loosely butt cover boards together and fasten to roof deck.
 - 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 cover board and immediately beneath roofing.

3.6 ADHERED ROOFING INSTALLATION

- A. Adhere roofing over area to receive roofing according to roofing system manufacturer's written instructions. Unroll roofing and allow to relax before retaining.
- B. Start installation of roofing in presence of roofing system manufacturer's technical personnel.
- C. Accurately align roofing, and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
- D. Bonding Adhesive: Apply to substrate and underside of roofing at rate required by manufacturer, and allow to partially dry before installing roofing. Do not apply to splice area of roofing.
- E. In addition to adhering, mechanically fasten roofing securely at terminations, penetrations, and perimeter of roofing.
- F. Apply roofing with side laps shingled with slope of roof deck where possible.
- G. Seams: Clean seam areas, overlap roofing, and hot-air weld side and end laps of roofing and sheet flashings according to manufacturer's written instructions, to ensure a watertight seam installation.
 - 1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of sheet.
 - 2. Verify field strength of seams a minimum of twice daily, and repair seam sample areas.
 - 3. Repair tears, voids, and lapped seams in roofing that do not comply with requirements.
- H. Spread sealant bed over deck-drain flange at roof drains, and securely seal roofing in place with clamping ring.

3.7 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 and mechanically anchor to substrate through termination bars.

3.8 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.

3.9 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to inspect substrate conditions, surface preparation, membrane application, flashings, protection, and drainage components, and to furnish reports to Architect.
- 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.

3.10 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.

END OF SECTION 075423

SECTION 076200 - 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 reglets with counterflashing.
 - 2. Roof drainage sheet metal fabrications.
 - 3. Formed low-slope roof sheet metal fabrications.
 - 4. Formed steep-slope roof sheet metal fabrications.
 - 5. Formed equipment support flashing.

B. Related Requirements:

- 1. Section 061000 "Rough Carpentry" for wood nailers, curbs, and blocking.
- 2. 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 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 2. Review special roof details, roof drainage, roof-penetration flashing, equipment curbs, and condition of other construction that affect sheet metal flashing and trim.
 - 3. Review requirements for insurance and certificates if applicable.
 - 4. Review sheet metal flashing observation and repair procedures after flashing installation.

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.
- 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 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 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 SPRI ES-1 tested.
- 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, shop shall be listed as able to fabricate required details as tested and approved.
- B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
 - 1. Build mockup of typical roof edge flashing, including parapet and coping approximately 10 feet long, including supporting construction, cleats, seams, attachments and accessories utilizing actual section of existing building as directed by the Architect.
 - 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. 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

1.

- 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.
 - Exposed sheet metal 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. SPRI Wind Design Standard: Manufacture and install roof edge flashings tested according to SPRI ES-1 and capable of resisting the following design pressure:
 1. Design Pressure: 50 psf.
- D. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 20% percent.
- E. 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, ambient; 180 deg F, material surfaces.

2.2 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.
- B. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with smooth, flat surface.
 - 1. Exposed Coil-Coated Finish:
 - a. Two-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish 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. Color: As selected by Architect from manufacturer's full range.
 - 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 minimum total dry film thickness of 0.5 mil.
- C. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 316, dead soft, fully annealed; with smooth, flat surface.
 - 1. Finish: 2D (dull, cold rolled).

2.3 UNDERLAYMENT MATERIALS

A. Felt: ASTM D 226/D 226M, Type II (No. 30), asphalt-saturated organic felt; nonperforated.

2.4 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as 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 factoryapplied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.

- 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 Aluminum Sheet: Aluminum or Series 300 stainless steel.
- 3. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.
- 4. Fasteners for Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

C. Solder:

- 1. For Stainless Steel: ASTM B 32, Grade Sn96, with acid flux of type recommended by stainlesssteel sheet manufacturer.
- D. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with releasepaper 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; 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. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.
- H. Bituminous Coating: Cold-applied asphalt emulsion according to ASTM D 1187.
- I. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.5 MANUFACTURED SHEET METAL FLASHING AND TRIM

- A. Reglets: Units of type, material, and profile required, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated with factory-mitered and welded corners and junctions and with interlocking counterflashing on exterior face, of same metal as reglet.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Fry Reglet Corporation
 - b. Heckmann Building Products, Inc.
 - c. Hickman Company, W.P.
 - d. Hohmann & Barnard, Inc.
 - e. National Sheet Metal Systems, Inc.
 - 2. Material: Stainless steel, 0.019 inch thick.
 - 3. Masonry Type: Provide with offset top flange for embedment in masonry mortar joint.
 - 4. Accessories:
 - a. 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 Drawings show reglet without metal counterflashing.
 - b. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing's lower edge.
 - 5. Finish: With manufacturer's standard color coating.

2.6 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in 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 to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
 - 4. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners 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 indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
- C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
 - 1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
- D. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.
- E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal. in sizes as recommended by cited sheet metal standard for application, but not less than thickness of metal being secured
- F. Seams for stainless steel: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.
- G. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer.
- H. Do not use graphite pencils to mark metal surfaces.

2.7 ROOF-DRAINAGE SHEET METAL FABRICATIONS

- A. Parapet Scuppers: Fabricate scuppers to dimensions required, with closure flange trim to exterior, 4-inchwide wall flanges to interior, and base extending 4 inches beyond cant or tapered strip into field of roof. Fabricate from the following materials:
 - 1. Stainless Steel: 0.019 inch thick.

2.8 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Roof Edge Flashing (Gravel Stop) and Fascia Cap: Fabricate in minimum 96-inch-long, but not exceeding 12-foot-long sections. Furnish with 6-inch-wide, joint cover plates. Shop fabricate interior and exterior corners.
 - 1. Joint Style: Butted with expansion space and 6-inch-wide, concealed backup plate.
 - 2. Fabricate from the Following Materials:
 - a. Aluminum: 0.050 inch thick.

- B. Roof-to-Wall Transition and Expansion-Joint Cover: Fabricate from the following materials: Shop fabricate interior and exterior corners.
 1. Stainless Steel: 0.025 inch thick.
- C. Counterflashing: Shop fabricate interior and exterior corners. Fabricate from the following materials: 1. Stainless Steel: 0.019 inch thick.
- D. Flashing Receivers: Fabricate from the following materials:1. Stainless Steel: 0.016 inch thick.
- E. Roof-Drain Flashing: Fabricate from the following materials:1. Stainless Steel: 0.016 inch thick.

2.9 STEEP-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Counterflashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:
 1. Stainless Steel: 0.019 inch thick.
- B. Flashing Receivers: Fabricate from the following materials:1. Stainless Steel: 0.016 inch thick.

2.10 MISCELLANEOUS SHEET METAL FABRICATIONS

A. Equipment Support Flashing: Fabricate from the following materials:1. Stainless Steel: 0.019 inch thick.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrate, 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.
 - 3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 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, 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, levels, and slopes. 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. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
- 4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
- 5. Torch cutting of sheet metal flashing and trim is not permitted.
- 6. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
 - 1. Coat concealed side of uncoated-aluminum and stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
 - 2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.
 - 1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
 - 2. Use lapped expansion joints only where indicated on Drawings.
- D. Fasteners: Use fastener sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.
- E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.
- F. Seal joints as required for watertight construction.
 - 1. Use sealant-filled joints unless otherwise indicated. 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 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 Section 079200 "Joint Sealants."
- G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets with solder to width of 1-1/2 inches; however, reduce pre-tinning where pre-tinned surface would show in completed Work.
 - 1. Do not solder metallic-coated steel and aluminum sheet.
 - 2. Do not pre-tin zinc-tin alloy-coated stainless steel and zinc-tin alloy-coated copper.
 - 3. Do not use torches for soldering.
 - 4. Heat surfaces to receive solder, and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
 - 5. Stainless-Steel Soldering: Tin edges of uncoated sheets, using solder 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.
 - 6. Copper Soldering: Tin edges of uncoated sheets, using solder for copper.
 - 7. Copper-Clad Stainless-Steel Soldering: Tin edges of uncoated sheets, using solder for copper-clad stainless steel.

3.3 ROOF-DRAINAGE SYSTEM INSTALLATION

- A. Parapet Scuppers: 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 solder or seal with elastomeric sealant to scupper.
- B. Expansion-Joint Covers: Install expansion-joint covers at locations and of configuration indicated. Lap joints minimum of 4 inches in direction of water flow.

3.4 ROOF FLASHING INSTALLATION

- A. General: Install sheet metal flashing and trim to comply with performance requirements and cited sheet metal standard. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.
- B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard unless otherwise indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at staggered 3-inch centers.
- C. Copings: Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard unless otherwise indicated.
 - 1. Interlock exterior bottom edge of coping with continuous cleat anchored to substrate at 24-inch centers.
 - 2. Anchor interior leg of coping with washers and screw fasteners through slotted holes at 24-inch centers.
- D. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten.
- E. 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 minimum of 4 inches. Secure in waterproof manner by means of snap-in installation and sealant or lead wedges and sealant unless otherwise indicated.
- F. 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 cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.
- B. Through-Wall Flashing: Installation of through-wall flashing is specified in Section 042000 "Unit Masonry." Section 044200 "Exterior Stone Trim."
- C. Reglets: Installation of reglets is specified in Section 042000 "Unit Masonry."

3.6 MISCELLANEOUS FLASHING INSTALLATION

A. 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 indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

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 sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim manufacturer. Maintain sheet metal flashing and trim in 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 076200

SECTION 077100 - 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. Roof-edge specialties.
 - 2. Roof-edge drainage systems.
- B. Related Requirements:
 - 1. Section 061000 "Rough Carpentry" for wood nailers, curbs, and blocking.
 - 2. Section 074113.16 "Standing-Seam Metal Roof Panels" for roof-edge drainage-system components provided by metal-roof-panel manufacturer.
 - 3. Section 076200 "Sheet Metal Flashing and Trim" for custom- and site-fabricated sheet metal flashing and trim.
 - 4. Section 077200 "Roof Accessories" for set-on-type curbs, equipment supports, roof hatches, vents, and other manufactured roof accessory units.
 - 5. Section 079200 "Joint Sealants" for field-applied sealants between roof specialties and adjacent materials.

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.
- 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 Initial Selection: For each type of roof specialty indicated with factory-applied color finishes.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer.
- B. Product Certificates: For each type of roof specialty.
- C. Product Test Reports: For roof-edge flashings, for tests performed by a qualified testing agency.
- D. Sample Warranty: For manufacturer's special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roofing specialties to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer offering products meeting requirements that are FM Approvals listed for specified class.
- B. Source Limitations: Obtain roof specialties approved by manufacturer providing roofing-system warranty specified in Section075423 "Thermoplastic Polyolefin (TPO) Roofing".

1.7 DELIVERY, STORAGE, AND HANDLING

- A. 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.
- B. 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. Roofing-System Warranty: Roof specialties are included in warranty provisions in Section 075423 "Thermoplastic Polyolefin (TPO) Roofing."
- B. 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.
 - 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

1.

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. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- C. FMG Approvals' Listing: Manufacture and install roof-edge specialties that are listed in FMG's "Approved Guide" and approved for windstorm classification, Wind Zone 2.. Identify materials with FM Approvals' markings.
- D. SPRI Wind Design Standard: Manufacture and install roof-edge specialties tested according to SPRI ES-1 and capable of resisting the following design pressures:
 - 1. Design Pressure: As indicated on Drawings.
- E. 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, ambient; 180 deg F, material surfaces.

2.2 ROOF-EDGE SPECIALTIES

A. Roof-Edge Fascia and Gravel Stop: Manufactured, two-piece, roof-edge fascia consisting of a 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. Hickman Company, W. P.
 - c. Metal-Era, Inc.
 - d. Petersen Aluminum Corporation.
- 2. Formed Aluminum Sheet Fascia Covers: Aluminum sheet, 0.050 inch thick minimum.
 - a. Surface: Smooth, flat finish.
 - b. Finish: Two-coat fluoropolymer.
 - c. Color: As selected by Architect from manufacturer's full range.
- 3. Corners: Factory mitered and mechanically clinched and sealed watertight.
- 4. Splice Plates: Exposed, of same material, finish, and shape as fascia cover.
- 5. Fascia Accessories: Overflow scuppers Downspout scuppers with integral conductor head and downspout adapters.
- B. One-Piece Gravel Stops: Manufactured, one-piece, metal gravel stop in section lengths not exceeding 12 feet, with a horizontal flange and vertical leg fascia terminating in a drip edge, and concealed splice plates of same material, finish, and shape as gravel stop. Provide matching corner units.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Architectural Products Company.
 - b. Hickman Company, W. P.
 - c. Metal-Era, Inc.
 - d. Petersen Aluminum Corporation.
 - Formed Aluminum Sheet Gravel Stops: Aluminum sheet, 0.050 inch thick.
 - a. Surface: Smooth, flat finish.
 - b. Finish: Two-coat fluoropolymer.
 - c. Color: As selected by Architect from manufacturer's full range.
 - 3. Corners: Factory mitered and mechanically clinched and sealed watertight.

2.3 ROOF-EDGE DRAINAGE SYSTEMS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Architectural Products Company.
 - 2. Hickman Company, W. P.
 - 3. Metal-Era, Inc.
- B. Parapet Scuppers: Manufactured with closure flange trim to exterior, 4-inch- wide wall flanges to interior, and base extending 4 inches beyond cant or tapered strip into field of roof.
 - 1. Formed Aluminum: 0.032 inch thick.
- C. Aluminum Finish: Two-coat fluoropolymer.
 - 1. Color: As selected by Architect from manufacturer's full range.

2.

2.4 MATERIALS

A. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, with temper to suit forming operations and performance required.

2.5 UNDERLAYMENT MATERIALS

- A. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils thick, consisting of slipresisting 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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Carlisle Coatings & Waterproofing Inc.
 - b. Grace Construction Products; W.R. Grace & Co. -- Conn.
 - c. Henry Company.
 - 2. Thermal Stability: ASTM D 1970/D 1970M; stable after testing at 240 deg F.
 - 3. Low-Temperature Flexibility: ASTM D 1970/D 1970M; passes after testing at minus 20 deg F.
- B. Felt: ASTM D 226/D 226M, Type II (No. 30), asphalt-saturated organic felt, nonperforated.
- C. Slip Sheet: Rosin-sized building paper, 3-lb/100 sq. ft. minimum.

2.6 MISCELLANEOUS MATERIALS

- A. 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.
- B. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane polymer sealant of type, grade, class, and use classifications required by roofing-specialty manufacturer for each application.
- C. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type joints with limited movement.

2.7 FINISHES

- 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 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.
- D. Coil-Coated Aluminum Sheet Finishes:
 - . High-Performance Organic Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - a. Two-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish 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.
 - b. Concealed Surface Finish: Apply pretreatment and manufacturer's standard acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

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 where applicable, and securely anchored.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

- A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply wrinkle free, in shingle fashion to shed water, and 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.
 - 1. Apply continuously under roof-edge specialties.
 - 2. Coordinate application of self-adhering sheet underlayment under roof specialties with requirements for continuity with adjacent air barrier materials.
- B. 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.
- C. 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, underlayments, 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 weathertight 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. 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 indicated 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 penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.
- E. Seal concealed joints with butyl sealant as required by roofing-specialty manufacturer.
- F. Seal joints as required for weathertight construction. Place sealant to be completely concealed in joint. Do not install sealants at temperatures below 40 deg F.

3.4 ROOF-EDGE SPECIALITIES 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.

3.5 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. 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.

3.6 REGLET AND COUNTERFLASHING INSTALLATION

- A. General: Coordinate installation of reglets and counterflashings with installation of base flashings.
- B. Surface-Mounted Reglets: Install reglets to receive flashings where flashing without embedded reglets is indicated on Drawings. Install at height so that inserted counterflashings overlap 4 inches over top edge of base flashings.
- 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 butyl sealant. Fit counterflashings tightly to base flashings.

3.7 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 and sealants.
- C. 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.
- D. Replace roof specialties that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 077100

SECTION 077200 - 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.
 - 4. Pipe and duct supports.
- B. Related Sections:
 - 1. Section 055000 "Metal Fabrications" for metal vertical ladders, ships' ladders, and stairs for access to roof hatches.
 - 2. Section 055213 "Pipe and Tube Railings" for safety railing systems not attached to roofhatch curbs.
 - 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, gutters and downspouts, and counterflashing.
 - 5. Section 237413 "Packaged, Outdoor, Central-Station Air-Handling Units" for standard curbs specified with rooftop units.

1.3 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.

1.4 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.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Roof plans, drawn to scale, and coordinating penetrations and roofmounted 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.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For roof accessories to include in operation and maintenance manuals.

1.7 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.

2.2 ROOF CURBS

- A. Roof Curbs: Internally reinforced roof-curb units capable of supporting superimposed live and dead loads, including equipment loads and other construction indicated on Drawings, bearing continuously on roof structure, and capable of meeting performance requirements; with welded or mechanically fastened and sealed corner joints, straight sides, and integrally formed deckmounting flange at perimeter bottom.
 - 1. The Pate Company
 - 2. Thybar Corporation.
 - 3. Greenheck Fan Corporatuon.
- B. Size: Coordinate dimensions with roughing-in information or Shop Drawings of equipment to be supported.
- C. Material: Zinc-coated (galvanized) steel sheet, 0.079 inch thick.
 - 1. Finish: Mill phosphatized.
- D. Construction:
 - 1. Curb Profile: Manufacturer's standard compatible with roofing system.
 - 2. On ribbed or fluted metal roofs, form deck-mounting flange at perimeter bottom to conform to roof profile.
 - 3. Fabricate curbs to minimum height of 12 inches above roofing surface unless otherwise indicated.
 - 4. 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.
 - 5. Insulation: Factory insulated with 1-1/2-inch- thick glass-fiber board insulation.
 - 6. Liner: Same material as curb, of manufacturer's standard thickness and finish.
 - 7. Nailer: Factory-installed wood nailer under top flange on side of curb, continuous around curb perimeter.
 - 8. Wind Restraint Straps and Base Flange Attachment: Provide wind restraint straps, welded strap connectors, and base flange attachment to roof structure at perimeter of curb, of size and spacing required to meet wind uplift requirements.
 - 9. Platform Cap: Where portion of roof curb is not covered by equipment, provide weathertight platform cap formed from 3/4-inch thick plywood covered with metal sheet of same type, thickness, and finish as required for curb.
 - 10. Metal Counterflashing: Manufacturer's standard, removable, fabricated of same metal and finish as curb.

2.3 EQUIPMENT SUPPORTS

- A. Equipment Supports: Rail-type metal equipment supports capable of supporting superimposed live and dead loads between structural supports, including equipment loads and other construction indicated on Drawings, spanning between structural supports; capable of meeting performance requirements; with welded corner joints, stepped integral metal cant raised the thickness of roof insulation, and integrally formed structure-mounting flange at bottom.
 - 1. The Pate Company.
 - 2. Thybar Corporation.
 - 3. Greenheck Fan Corporation.

- B. Size: Coordinate dimensions with roughing-in information or Shop Drawings of equipment to be supported.
- C. Material: Zinc-coated (galvanized) steel sheet, 0.079 inch thick.1. Finish: Mill phosphatized.
- D. Construction:
 - 1. Curb Profile: Manufacturer's standard compatible with roofing system.
 - 2. Insulation: Factory insulated with 1-1/2-inch- thick glass-fiber board insulation.
 - 3. Liner: Same material as equipment support, of manufacturer's standard thickness and finish.
 - 4. Nailer: Factory-installed continuous wood nailers 3-1/2 inches wide under top flange on side of curb, continuous around support perimeter.
 - 5. Wind Restraint Straps and Base Flange Attachment: Provide wind restraint straps, welded strap connectors, and base flange attachment to roof structure at perimeter of curb of size and spacing required to meet wind uplift requirements.
 - 6. Platform Cap: Where portion of equipment support is not covered by equipment, provide weathertight platform cap formed from 3/4-inch thick plywood covered with metal sheet of same type, thickness, and finish as required for curb.
 - 7. Metal Counterflashing: Manufacturer's standard, removable, fabricated of same metal and finish as equipment support.
 - 8. On ribbed or fluted metal roofs, form deck-mounting flange at perimeter bottom to conform to roof profile.
 - 9. Fabricate equipment supports to minimum height of 12 inches above roofing surface unless otherwise indicated.
 - 10. 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.

2.4 ROOF HATCH

- A. Roof Hatches: Metal 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, straight sides, and integrally formed deck-mounting flange at perimeter bottom.
 - 1. Bilco Company.
 - 2. Babcock-Davis.
 - 3. Milcor, Inc.
- B. Type and Size: Single-leaf lid;
 - 1. Building C: 2'-6" X 8'-0".
 - 2. Building B, north addition: 2'-6" X 2'-6".
- C. Loads: Minimum 40-lbf/sq. ft. external live load and 20-lbf/sq. ft. internal uplift load.
- D. Hatch Material: Aluminum sheet.
 - 1. Thickness: Manufacturer's standard thickness for hatch size indicated.
 - 2. Finish: Mill.

E. Construction:

- 1. Insulation: Glass-fiber board, R-Value: 12.0 according to ASTM C 1363.
- 2. Nailer: Factory-installed wood nailer continuous around hatch perimeter.
- 3. Hatch Lid: Opaque, insulated, and double walled, with manufacturer's standard metal liner of same material and finish as outer metal lid.
- 4. Curb Liner: Manufacturer's standard, of same material and finish as metal curb.
- 5. On ribbed or fluted metal roofs, form flange at perimeter bottom to conform to roof profile.
- 6. Fabricate curbs to minimum height of 12 inches above roofing surface unless otherwise indicated.
- 7. Sloping Roofs: Where slope or roof deck exceeds 1:48, fabricate curb with perimeter curb height that is tapered to accommodate roof slope so that top surfaces of perimeter curb are level. Equip hatch with water diverter or cricket on side that obstructs water flow.
- F. Hardware: Spring operators, hold-open arm, galvanized-steel spring latch with turn handles, galvanized-steel butt- or pintle-type hinge system, and padlock hasps inside and outside.
 - 1. Provide two-point latch on lids larger than 84 inches.
- G. 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. Maximum Opening Size: System constructed to prevent passage of a sphere 21 inches in diameter.
 - 4. Chain Passway Barrier: Galvanized proof coil chain with quick link on fixed end.
 - 5. Post and Rail Tops and Ends: Weather resistant, closed or plugged with prefabricated end fittings.
 - 6. Provide weep holes or another means to drain entrapped water in hollow sections of handrail and railing members.
 - 7. Fabricate joints exposed to weather to be watertight.
 - 8. Fasteners: Manufacturer's standard, finished to match railing system.
 - 9. Finish: Manufacturer's standard.
- H. 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: Steel tube.
 - 4. Post: 1-5/8-inch- diameter pipe.
 - 5. Finish: Manufacturer's standard baked enamel or powder coat.

2.5 PIPE AND DUCT SUPPORTS

A. Fixed-Height Roller-Bearing Pipe Supports: Polycarbonate pipe stand with stainless-steel roller carrying assembly accommodating up to 7-inch- diameter pipe or conduit; with provision for pipe retainer and with manufacturer's support pad or deck plate as recommended for penetration-free installation over roof membrane type; as required for quantity of pipe runs and sizes.

2.6 METAL MATERIALS

- A. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 coating designation.
 - 1. Mill-Phosphatized Finish: Manufacturer's standard for field painting.
 - 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.
- B. Aluminum Sheet: ASTM B 209, manufacturer's standard alloy for finish required, with temper to suit forming operations and performance required.
 - 1. Mill Finish: As manufactured.
 - 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.
- C. 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.
- D. Stainless-Steel Sheet and Shapes: ASTM A 240/A 240M or ASTM A 666, Type 304.
- E. Steel Shapes: ASTM A 36/A 36M, hot-dip galvanized according to ASTM A 123/A 123M unless otherwise indicated.
- F. Steel Tube: ASTM A 500/A 500M, round tube.
- G. Galvanized-Steel Tube: ASTM A 500/A 500M, round tube, hot-dip galvanized according to ASTM A 123/A 123M.
- H. Steel Pipe: ASTM A 53/A 53M, galvanized.

2.7 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, nominal density of 3 lb/cu. ft., thermal resistivity of 4.3 deg F x h x sq. ft./Btu x in. at 75 deg F, thickness as indicated.

- C. 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.
- D. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.
- E. 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.
- F. 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.
- G. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for expansion joints with limited movement.
- H. Asphalt Roofing Cement: ASTM D 4586/D 4586M, asbestos free, of consistency required for application.

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. 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 stainless-steel 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 Install: 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. 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.
- G. 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.
- H. Roof Walkway Installation:
 - 1. Verify that locations of access and servicing points for roof-mounted equipment are served by locations of roof walkways.
- I. Seal joints 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.

END OF SECTION 07720

ROOF ACCESSORIES

SECTION 078413 - 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 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 lowemitting materials.
- C. 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.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For each penetration firestopping system, for tests performed by a qualified testing agency.

1.5 CLOSEOUT SUBMITTALS

A. Installer Certificates: From Installer indicating that penetration firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.6 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."

1.7 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.

1.8 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) 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.
 - 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.
 - 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.
 - 1. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at and no more than 50cfm cumulative total for any 100 sq. ft. 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 high and with minimum 0.375-inch strokes.
 - 1. Locate in accessible concealed floor, floor-ceiling, or attic space at 15 feet from end of wall and at intervals not exceeding 30 feet.
- B. Penetration Identification: Identify each penetration firestopping system with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of penetration firestopping system edge so labels are visible to anyone seeking to remove penetrating items or firestopping systems. 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 Penetration Firestopping Do Not Disturb. Notify Building Management of Any Damage."
 - 2. Contractor's name, address, and phone number.
 - 3. Designation of applicable testing and inspecting agency.
 - 4. Date of installation.
 - 5. Manufacturer's name.
 - 6. Installer's name.

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 078413

SECTION 078443 - 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 at exterior curtain-wall/floor intersections.
 - 3. Joints in smoke barriers.
- B. Related Requirements:
 - 1. Section 078413 "Penetration Firestopping" for penetrations in fire-resistance-rated walls, horizontal assemblies, and smoke barriers.
 - 2. Section 079513.13 "Interior Expansion Joint Cover Assemblies" for fire-resistive manufactured expansion-joint cover assemblies for interior floors, walls, and ceilings.
 - 3. Section 079513.16 "Exterior Expansion Joint Cover Assemblies" for fire-resistive manufactured expansion-joint cover assemblies for exterior building walls, soffits, and parapets.
 - 4. Section 092216 "Non-Structural Metal Framing" for firestop tracks for metal-framed partition heads.

1.3 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 lowemitting 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.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For each joint firestopping system, for tests performed by a qualified testing agency.

1.5 CLOSEOUT SUBMITTALS

A. Installer Certificates: From Installer indicating that joint firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.6 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."

1.7 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.

1.8 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.

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. 3M Fire Protection Products.
 - b. Hilti, Inc.
 - c. Roxul Inc.
 - d. Tremco, Inc.
 - 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 at Exterior Curtain-Wall/Floor Intersections: Provide joint firestopping systems with rating determined per ASTM E 2307.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. 3M Fire Protection Products.
 - b. Hilti, Inc.
 - c. Roxul Inc.
 - d. Tremco, Inc.
 - 2. F-Rating: Equal to or exceeding the fire-resistance rating of the floor assembly.
- D. 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.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. 3M Fire Protection Products.
- b. Hilti, Inc.
- c. Roxul Inc.
- d. Tremco, Inc.
- 2. L-Rating: Not exceeding 5.0 cfm/ft. of joint at both ambient and elevated temperatures.
- E. Exposed Joint Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined 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 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 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.

END OF SECTION 078443
SECTION 079200 - 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. The sealing of the following exterior joints;
 - a. New masonry expansion & control joints.
 - b. Joints between different types of masonry.
 - c. New and existing masonry to adjacent dissimilar materials.
 - d. Penetrations through exterior masonry by ducts, pipes and conduit.
 - e. Frame to masonry joints at exterior doors, windows, louvers, etc.
 - 2. The sealing of the following interior joints;
 - a. Wall-to-adjacent-surface joints (including wall-to-wall and wall-to-ceiling).
 - b. Control and expansion joints on exposed interior surface of exterior masonry, on interior masonry and on interior drywall.
 - c. Joints between ceiling edge angle and wall.
 - d. Joints around perimeter of frames.
 - e. Joints between countertops and walls and cabinet vertical and horizontal edges at adjacent wall. Also joint between cabinetwork and fillers.
 - f. Joints in hollow metal door frames and borrowed light frames at the head-to-jamb mitered joint and at joints between glazing beads at corners and between glazing bead and frame after opening is glazed.
 - g. Setting bed for thresholds and sill plates.
- B. Related Requirements:
 - 1. Section 079219 "Acoustical Joint Sealants" for sealing joints in sound-rated construction.
 - 2. Section 321373 "Concrete Paving Joint Sealants" for sealing joints in paved roads, parking lots, walkways, and curbing.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

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 lowemitting 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-wide joints formed between two 6-inch-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. 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.
- B. Field-Adhesion-Test Reports: For each sealant application tested.
- C. Sample Warranties: For special warranties.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.
- B. 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 Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates as follows:
 - 1. Locate test joints 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.

- 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.
- 4. 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.
- 5. 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 jointsealant manufacturer.
 - 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. 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."
- C. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 SILICONE JOINT SEALANTS

- A. Silicone, S, NS, 50, NT: Single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Use NT.
 - 1. Products: Subject to compliance with requirements, provide one of the following;
 - a. Dow Corning Corporation; 791.
 - b. GE Construction Sealants; SCS2000 SilPruf.
 - c. Pecora Corporation; PCS.

2.3 MILDEW-RESISTANT SILICONE 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.
 - 1. Products; Subject to compliance with requirements, provide one of the following;
 - a. Dow Corning Corporation; 786-M White.
 - b. GE Construction Sealants; SCS1700 Sanitary.
 - c. Tremco Incorporated; Tremsil 200.

2.4 URETHANE JOINT SEALANTS

- A. Polyurethane-Based Joint Sealants: ASTM C 920-86, S or M, P, 25, T.
 - 1. Products; Subject to compliance with requirements, provide one of the following;

1.

- a. Bostik, Inc.; 955-SL
- b. Pecora Corporation; Dyna Tred
- c. Tremco, Inc., Vulkem 45 SSL

2.5 LATEX JOINT SEALANTS

- A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.
 - Products; Subject to compliance with requirements, provide one of the following;
 - a. BASF Construction Chemicals, LLC, Building Systems; Sonolac.
 - b. Pecora Corporation; AC-20.
 - c. Sherwin-Williams Company; PowerHouse.
 - d. Tremco Incorporated; Tremflex 834.

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), 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. Gypsum drywall.
 - e. Wood.
 - 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.
 - 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 5 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. Control and expansion joints in brick pavers.
 - b. Isolation and contraction joints in cast-in-place concrete slabs.
 - c. Control and expansion joints in tile flooring.
 - d. Joints in stone paving units, including steps.

- e. Joints between different materials listed above.
- f. Aluminum thresholds and sill plates.
- g. Other joints as indicated on Drawings.
- 2. Joint Sealant: Urethane, S or M, P, 25, T.
- 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- B. 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 dimension stone units and unit masonry.
 - c. Control and expansion joints in unit masonry.
 - d. Joints in dimension stone cladding.
 - e. Joints between glazed unit masonry assemblies and adjacent surfaces.
 - f. Joints between metal panels.
 - g. Joints between different materials listed above.
 - h. Perimeter joints between materials listed above and frames of doors windows and louvers.
 - i. Control and expansion joints on exposed interior surfaces of exterior walls.
 - j. Other joints as indicated on Drawings.
 - 2. Joint Sealant: Silicone, nonstaining, S, NS, 50, NT.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- C. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces not subject to significant movement.
 - 1. Joint Locations:
 - a. Perimeter joints between interior wall surfaces and frames of interior doors windows and elevator entrances.
 - b. All other interior non-moveable joints.
 - c. Other joints as indicated on Drawings.
 - 2. Joint Sealant: Acrylic latex.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- D. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces.
 - 1. Joint Locations:
 - a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
 - b. Tile control and expansion joints where indicated.
 - c. Other joints as indicated on Drawings.
 - 2. Joint Sealant: Silicone, mildew resistant, acid curing, S, NS, 25, NT.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

END OF SECTION 079200

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SECTION 079219 - ACOUSTICAL 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 acoustical joint sealants.
- B. Related Requirements:
 - 1. Section 079200 "Joint Sealants" for elastomeric, latex, and butyl-rubber-based joint sealants for nonacoustical applications.

1.3 ACTION SUBMITTALS

- A. Product Data: For each acoustical joint sealant.
- B. Sustainable Design Submittals:
 - 1. Product Data: For sealants, indicating VOC content.
 - 2. Laboratory Test Reports: For sealants, indicating compliance with requirements for lowemitting 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.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each kind of acoustical joint sealant, for tests performed by manufacturer and witnessed by a qualified testing agency.
- B. Sample Warranties: For special warranties.

1.5 WARRANTY

- A. Special Installer's Warranty: Installer agrees to repair or replace acoustical 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.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Provide acoustical joint-sealant products that effectively reduce airborne sound transmission through perimeter joints and openings in building construction, as demonstrated by testing representative assemblies according to ASTM E 90.
 - 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."

2.2 ACOUSTICAL JOINT SEALANTS

- A. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex acoustical sealant complying with ASTM C 834.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. GE Construction Sealants; Momentive Performance Materials Inc.
 - b. Hilti, Inc.
 - c. Pecora Corporation.
 - d. Tremco Incorporated.
 - e. United States Gypsum Company.
 - 2. Colors of Exposed Acoustical Joint Sealants: As selected by Architect from manufacturer's full range of colors.

2.3 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by acoustical-joint-sealant manufacturer where required for adhesion of sealant to joint substrates.
- 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 acoustical 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 acoustical joint sealants to comply with joint-sealant manufacturer's written instructions.
- B. Joint Priming: Prime joint substrates where recommended by acoustical-joint-sealant manufacturer. 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 ACOUSTICAL JOINT SEALANTS

- A. Comply with acoustical joint-sealant manufacturer's written installation instructions unless more stringent requirements apply.
- B. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical joint sealant. Install acoustical joint sealants at both faces of partitions, at perimeters, and through penetrations. Comply with ASTM C 919, ASTM C 1193, and manufacturer's written recommendations for closing off sound-flanking paths around or through assemblies, including sealing partitions to underside of floor slabs above acoustical ceilings.
- C. Acoustical Ceiling Areas: Apply acoustical joint sealant at perimeter edge moldings of acoustical ceiling areas in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.

3.4 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 acoustical joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect acoustical 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 acoustical joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION 079219

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SECTION 079513.16 - EXTERIOR EXPANSION JOINT COVER 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 exterior building expansion joint cover assemblies.
- B. Related Requirements:
 - 1. Section 077129 "Manufactured Roof Expansion Joints" for factory-fabricated roof expansion joint cover assemblies.
 - 2. Section 079100 "Preformed Joint Seals" for preformed foam and extruded-silicone joint seals.

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 expansion joint cover assemblies.
- B. Shop Drawings: For each expansion joint cover assembly.
 - 1. Include plans, elevations, sections, details, splices, block-out requirement, attachments to other work, and line diagrams showing entire route of each expansion joint.
 - 2. Where expansion joint cover assemblies change planes, provide isometric or clearly detailed drawing depicting how components interconnect.
- C. Samples: For each exposed expansion joint cover assembly and for each color and texture specified, full width by 6 inches long in size.
- D. Expansion Joint Cover Assembly 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 joint cover assembly.
 - 2. Expansion joint cover assembly location cross-referenced to Drawings.
 - 3. Nominal, minimum, and maximum joint width.
 - 4. Movement direction.
 - 5. Materials, colors, and finishes.
 - 6. Product options.
 - 7. Fire-resistance ratings.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each fire-resistance-rated expansion joint cover assembly, for tests performed by a qualified testing agency.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

- A. Furnish units in longest practicable lengths to minimize field splicing.
- B. Include factory-fabricated closure materials and transition pieces, T-joints, corners, curbs, crossconnections, and other accessories as required to provide continuous expansion joint cover assemblies.

2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance Ratings: Provide expansion joint cover assemblies with fire barriers identical to those of systems tested for fire resistance according to UL 2079 or ASTM E 1966 by a qualified testing agency.
 - 1. Hose Stream Test: Wall-to-wall and wall-to-soffit assemblies shall be subjected to hose stream testing.
- B. Expansion Joint Design Criteria:
 - 1. Type of Movement: .
 - a. Nominal Joint Width: 2" or as indicated on Drawings.

2.3 EXTERIOR EXPANSION JOINT COVERS

- A. Exterior Metal-Plate Joint Cover: Assembly consisting of sliding metal cover plate in continuous contact with gaskets mounted on metal frames fixed to sides of joint gap.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Architectural Art Manufacturing Inc.; a division of Pittcon Architectural Metals, LLC.
 - b. Balco, Inc.
 - c. Construction Specialties, Inc.
 - d. MM Systems Corporation.
 - 2. Application: Wall to wall.
 - 3. Installation: Surface mounted.
 - 4. Fire-Resistance Rating: Not less than that of adjacent construction.
 - 5. Exposed Metal:
 - a. Stainless steel: No. 4.

2.4 MATERIALS

- A. Aluminum: ASTM B 221, Alloy 6063-T5 for extrusions; ASTM B 209, Alloy 6061-T6 for sheet and plate.
 - 1. Apply manufacturer's standard protective coating on aluminum surfaces to be placed in contact with cementitious materials.
- B. Stainless Steel: ASTM A 240/A 240M or ASTM A 666, Type 304 for plates, sheet, and strips.

- C. 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 comply with performance criteria for required fire-resistance rating.
- D. Moisture Barrier: Manufacturer's standard, flexible elastomeric material.

2.5 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.

2.6 ACCESSORIES

- A. Moisture Barriers: Manufacturer's standard continuous, waterproof membrane within joint and attached to substrate on sides of joint.
 - 1. Provide where indicated on Drawings.
- B. Manufacturer's stainless-steel attachment devices. Include anchors, clips, fasteners, set screws, spacers, and other accessories compatible with material in contact, as indicated or required for complete installations.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces where expansion joint cover assemblies will be installed for installation tolerances and other conditions affecting performance of the Work.
- B. Notify Architect where discrepancies occur that will affect proper expansion joint cover assembly installation and performance.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to expansion joint cover assembly manufacturer's written instructions.
- B. Coordinate and furnish anchorages, setting drawings, and instructions for installing expansion joint cover assemblies. Provide fasteners of metal, type, and size to suit type of construction indicated and to provide for secure attachment of expansion joint cover assemblies.

3.3 INSTALLATION

- A. Comply with manufacturer's written instructions for storing, handling, and installing expansion joint cover assemblies and materials unless more stringent requirements are indicated.
- B. Metal Frames: Perform cutting, drilling, and fitting required to install expansion joint cover assemblies.
 - 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.
 - 3. Cut and fit ends to accommodate thermal expansion and contraction of metal without buckling of frames.
 - 4. Install frames in continuous contact with adjacent surfaces.
 - a. Shimming is not permitted.
 - 5. Locate anchors at interval recommended by manufacturer, but not less than 3 inches from each end and not more than 24 inches o.c.
- C. Seals: 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. 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. Install with hairline mitered corners where expansion joint cover assemblies change direction or abut other materials.
- E. Terminate exposed ends of expansion joint cover assemblies with field- or factory-fabricated termination devices.
- F. Fire-Resistance-Rated Assemblies: Coordinate installation of expansion joint cover assembly materials and associated work so complete assemblies comply with performance requirements.
 - 1. Fire Barriers: Install fire barriers to provide continuous, uninterrupted fire resistance throughout length of joint, including transitions and field splices.
- G. Moisture Barrier Drainage: If indicated, provide drainage fitting and connect to drains.

3.4 CONNECTIONS

A. Transition to Roof Expansion Joint Covers: Coordinate installation of exterior wall and soffit expansion joint covers with roof expansion joint covers specified in Section 077129 "Manufactured Roof Expansion Joints."

3.5 **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.

END OF SECTION 079513.16

SECTION 079513.13 - INTERIOR EXPANSION JOINT COVER 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 interior expansion joint cover assemblies.

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 expansion joint cover assemblies.
- B. Shop Drawings: For each expansion joint cover assembly.
 - 1. Include plans, elevations, sections, details, splices, block-out requirement, attachments to other work, and line diagrams showing entire route of each expansion joint.
 - 2. Where expansion joint cover assemblies change planes, provide isometric or clearly detailed drawing depicting how components interconnect.
- C. Samples: For each expansion joint cover assembly and for each color and texture specified, full width by 6 inches long in size.
- D. Expansion Joint Cover Assembly 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 joint cover assembly.
 - 2. Expansion joint cover assembly location cross-referenced to Drawings.
 - 3. Nominal, minimum, and maximum joint width.
 - 4. Movement direction.
 - 5. Materials, colors, and finishes.
 - 6. Product options.
 - 7. Fire-resistance ratings.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each fire-resistance-rated expansion joint cover assembly, for tests performed by a qualified testing agency.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

- A. Furnish units in longest practicable lengths to minimize field splicing.
- B. Include factory-fabricated closure materials and transition pieces, T-joints, corners, curbs, crossconnections, and other accessories as required to provide continuous expansion joint cover assemblies.

2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance Ratings: Provide expansion joint cover assemblies with fire barriers identical to those of systems tested for fire resistance according to UL 2079 or ASTM E 1966 by a qualified testing agency.
 - 1. Hose Stream Test: Wall-to-wall and wall-to-ceiling assemblies shall be subjected to hose stream testing.
- B. Expansion Joint Design Criteria:
 - 1. Type of Movement: .
 - a. Nominal Joint Width: 2" or as indicated on Drawings.

2.3 FLOOR EXPANSION JOINT COVERS

- A. Metal-Plate Floor Joint Cover: Metal cover plate fixed on one side of joint gap and free to slide on other.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Architectural Art Manufacturing Inc.; a division of Pittcon Architectural Metals, LLC.
 - b. Balco, Inc.
 - c. Construction Specialties, Inc.
 - d. MM Systems Corporation.
 - 2. Application: Floor to floor.
 - 3. Installation: Surface mounted.
 - 4. Load Capacity:
 - a. Uniform Load: 50 lb/sq. ft..
 - b. Concentrated Load: 300 lb.
 - c. Maximum Deflection: 0.0625 inch.
 - 5. Fire-Resistance Rating: Not less than that of adjacent construction.
 - 6. Cover-Plate Design: Plain.
 - 7. Exposed Metal:
 - a. Aluminum: Mill.
- B. Center-Plate Floor Joint Cover: Assembly consisting of center plate that slides over metal frames fixed to sides of joint gaps.

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Architectural Art Manufacturing Inc.; a division of Pittcon Architectural Metals, LLC.
 - b. Balco, Inc.
 - c. Construction Specialties, Inc.
 - d. MM Systems Corporation.
- 2. Application: Floor to floor Floor to wall.
- 3. Installation: Recessed.
- 4. Load Capacity:
 - a. Uniform Load: 50 lb/sq. ft..
 - b. Concentrated Load: 300 lb.
 - c. Maximum Deflection: 0.0625 inch.
- 5. Fire-Resistance Rating: Not less than that of adjacent construction.
- 6. Cover-Plate Design: Plain.
- 7. Exposed Metal:
 - a. Aluminum: Mill.

2.4 WALL EXPANSION JOINT COVERS

- A. Center-Plate Wall Joint Cover: Assembly consisting of center plate that slides over gaskets in metal frames fixed to sides of joint gaps.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Architectural Art Manufacturing Inc.; a division of Pittcon Architectural Metals, LLC.
 - b. Balco, Inc.
 - c. Construction Specialties, Inc.
 - d. MM Systems Corporation.
 - 2. Application: Wall to wall.
 - 3. Fire-Resistance Rating: Not less than that of adjacent construction.
 - 4. Exposed Metal:
 - a. Aluminum: Mill.

2.5 CEILING EXPANSION JOINT COVERS

- A. Elastomeric-Seal Ceiling Joint Cover: Assembly consisting of elastomeric seal anchored to frames fixed to sides of joint gap.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Architectural Art Manufacturing Inc.; a division of Pittcon Architectural Metals, LLC.
 - b. Balco, Inc.
 - c. Construction Specialties, Inc.
 - d. MM Systems Corporation.
 - 2. Application: Ceiling to ceiling.
 - 3. Exposed Metal:
 - a. Aluminum: Mill.

- 4. Seal: Preformed elastomeric membranes or extrusions.
 - a. Color: As selected by Architect from manufacturer's full range.

2.6 MATERIALS

- A. Aluminum: ASTM B 221, Alloy 6063-T5 for extrusions; ASTM B 209, Alloy 6061-T6 for sheet and plate.
 - 1. Apply manufacturer's standard protective coating on aluminum surfaces to be placed in contact with cementitious materials.
- B. Elastomeric Seals: Manufacturer's standard preformed elastomeric membranes or extrusions to be installed in metal frames.
- C. 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 comply with performance criteria for required fire-resistance rating.
- D. Moisture Barrier: Manufacturer's standard, flexible elastomeric material.
- E. 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.

2.7 ALUMINUM FINISHES

A. Mill finish.

2.8 ACCESSORIES

- A. Moisture Barriers: Manufacturer's standard continuous, waterproof membrane within joint and attached to substrate on sides of joint.
 - 1. Provide where indicated on Drawings.
- B. Manufacturer's standard attachment devices. Include anchors, clips, fasteners, set screws, spacers, and other accessories compatible with material in contact, as indicated or required for complete installations.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces where expansion joint cover assemblies will be installed for installation tolerances and other conditions affecting performance of the Work.
- B. Notify Architect where discrepancies occur that will affect proper expansion joint cover assembly installation and performance.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to expansion joint cover assembly manufacturer's written instructions.
- B. Coordinate and furnish anchorages, setting drawings, and instructions for installing expansion joint cover assemblies. Provide fasteners of metal, type, and size to suit type of construction indicated and to provide for secure attachment of expansion joint cover assemblies.

3.3 INSTALLATION

- A. Comply with manufacturer's written instructions for storing, handling, and installing expansion joint cover assemblies and materials unless more stringent requirements are indicated.
- B. Metal Frames: Perform cutting, drilling, and fitting required to install expansion joint cover assemblies.
 - 1. Repair or grout block out as required for continuous frame support using nonmetallic, shrinkage-resistant grout.
 - 2. Install frames in continuous contact with adjacent surfaces.
 - a. Shimming is not permitted.
 - 3. Install in true alignment and proper relationship to joints and adjoining finished surfaces measured from established lines and levels.
 - 4. Adjust for differences between actual structural gap and nominal design gap due to ambient temperature at time of installation.
 - 5. Cut and fit ends to accommodate thermal expansion and contraction of metal without buckling of frames.
 - 6. Locate anchors at interval recommended by manufacturer, but not less than 3 inches from each end and not more than 24 inches o.c.
- C. Seals: 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. 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. Install with hairline mitered corners where expansion joint cover assemblies change direction or abut other materials.
- E. Terminate exposed ends of expansion joint cover assemblies with field- or factory-fabricated termination devices.

- F. Fire-Resistance-Rated Assemblies: Coordinate installation of expansion joint cover assembly materials and associated work so complete assemblies comply with performance requirements.
 - 1. Fire Barriers: Install fire barriers to provide continuous, uninterrupted fire resistance throughout length of joint, including transitions and field splices.
- G. Moisture Barrier Drainage: If indicated, provide drainage fittings and connect to drains.

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 joint cover assemblies. Reinstall cover plates or seals prior to Substantial Completion.

END OF SECTION 079513.13

SECTION 081113 - 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. Section 087100 "Door Hardware" for door hardware for hollow-metal doors.

1.3 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

1.4 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.

1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, temperature-rise ratings, and finishes.
- B. Sustainable Design Submittals:
 - 1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.

- C. 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.
- D. Samples for Verification:
 - 1. For each type of exposed finish required, prepared on Samples of not less than 3 by 5 inches.
 - 2. For "Doors" and "Frames" subparagraphs below, prepare Samples approximately 8 by 10 inches 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.

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- high wood blocking. Provide minimum 1/4-inch 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. Ceco Door; ASSA ABLOY.
 - 2. Curries Company; ASSA ABLOY.
 - 3. Republic Doors and Frames.
 - 4. 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 INTERIOR DOORS AND FRAMES

- A. Construct interior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Extra-Heavy-Duty Doors and Frames: SDI A250.8, Level 3. Interior doors indicated as HM and interior frames.
 - 1. Physical Performance: Level A according to SDI A250.4.
 - 2. Doors:
 - a. Type: As indicated in the Door and Frame Schedule.
 - b. Thickness: 1-3/4 inches.
 - c. Face: Uncoated, cold-rolled steel sheet, minimum thickness of 0.053 inch.
 - d. Edge Construction: Model 2, Seamless.
 - e. Core: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core at manufacturer's discretion.

- 3. Frames:
 - a. Materials: Uncoated, steel sheet, minimum thickness of 0.053 inch.
 - b. Sidelite and Transom Frames: Fabricated from same thickness material as adjacent door frame.
 - c. Construction: Full profile welded.
- 4. Exposed Finish: Prime.

2.4 EXTERIOR HOLLOW-METAL DOORS AND FRAMES

- A. Construct exterior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Maximum-Duty Doors and Frames: SDI A250.8, Level 4. At locations indicated in the Door and Frame Schedule.
 - 1. Physical Performance: Level A according to SDI A250.4.
 - 2. Doors:
 - a. Type: As indicated in the Door and Frame Schedule.
 - b. Thickness: 1-3/4 inches
 - c. Face: Metallic-coated steel sheet, minimum thickness of 0.067 inch, with minimum A40 coating.
 - d. Edge Construction: Model 2, Seamless.
 - e. Core: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core at manufacturer's discretion.
 - 1) Thermal-Rated Doors: Provide doors fabricated with thermal-resistance value (R-value) of not less than 2.1 deg F x h x sq. ft./Btu when tested according to ASTM C 1363.
 - 3. Frames:
 - a. Materials: Metallic-coated steel sheet, minimum thickness of 0.067 inch, with minimum A40 coating.
 - b. Construction: Full profile welded.
 - 4. Exposed Finish: Prime.

2.5 BORROWED LITES

- A. Hollow-metal frames of uncoated steel sheet, minimum thickness of 0.053 inch.
- B. Construction: Full profile welded.

2.6 FRAME ANCHORS

- A. Jamb Anchors:
 - 1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
 - 2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
- B. Floor Anchors: Formed from same material as frames, minimum thickness of 0.042 inch, and as follows:
 - 1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

2.7 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. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.
- D. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z 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.
- E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- F. 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.
- G. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143/C 143M.
- H. 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.
- I. Glazing: Comply with requirements in Section 088000 "Glazing."

J. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.8 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 metal thickness. 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. Hollow-Metal Doors:
 - 1. Steel-Stiffened Door Cores: Provide minimum thickness 0.026 inch, steel vertical stiffeners of same material as face sheets extending full-door height, with vertical webs spaced not more than 6 inches apart. Spot weld to face sheets no more than 5 inches o.c. Fill spaces between stiffeners with glass- or mineral-fiber insulation.
 - 2. Fire Door Cores: As required to provide fire-protection ratings indicated.
 - 3. Vertical Edges for Single-Acting Doors: Bevel edges 1/8 inch in 2 inches.
 - 4. Top Edge Closures: Close top edges of doors with inverted closures of same material as face sheets.
 - 5. Bottom Edge Closures: Close bottom edges of doors where required for attachment of weather stripping with end closures or channels of same material as face sheets.
 - 6. Exterior Doors: Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
 - 7. 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 beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.
- C. 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. Sidelite and Transom Bar 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.
 - 2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 - 3. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
 - 4. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.
 - 5. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Masonry Type: Locate anchors not more than 16 inches from top and bottom of frame. Space anchors not more than 32 inches o.c., to match coursing, and as follows:

- 1) Two anchors per jamb up to 60 inches high.
- 2) Three anchors per jamb from 60 to 90 inches high.
- 3) Four anchors per jamb from 90 to 120 inches high.
- 4) Four anchors per jamb plus one additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.
- b. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - 1) Three anchors per jamb up to 60 inches high.
 - 2) Four anchors per jamb from 60 to 90 inches high.
 - 3) Five anchors per jamb from 90 to 96 inches high.
 - 4) Five anchors per jamb plus one additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
- 6. Head Anchors: Two anchors per head for frames more than 42 inches wide and mounted in metal-stud partitions.
- 7. Door Silencers: Except on weather-stripped frames, 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.
- D. Fabricate concealed stiffeners and edge channels from either cold- or hot-rolled steel sheet.
- E. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.
 - 1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
 - 2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.
- F. Stops and Moldings: Provide stops and moldings around glazed lites and louvers where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
 - 1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollowmetal work.
 - 2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
 - 3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
 - 4. Provide loose stops and moldings on inside of hollow-metal work.
 - 5. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.

2.9 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.

2.10 ACCESSORIES

- A. Louvers: Provide louvers for interior doors, where indicated, which comply with SDI 111C, with blades or baffles formed of 0.020-inch- thick, cold-rolled steel sheet set into 0.032-inch-thick steel frame.
 - 1. Sightproof Louver: Stationary louvers constructed with inverted-V or inverted-Y blades.
- B. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.
- C. Grout Guards: Formed from same material as frames, not less than 0.016 inch thick.

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. 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. Metal-Stud Partitions: Solidly pack mineral-fiber insulation inside frames.
 - 4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
 - 5. Concrete Walls: Solidly fill space between frames and concrete with mineral-fiber insulation.
 - 6. 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.
 - 7. In-Place Metal or Wood-Stud Partitions: Secure slip-on drywall frames in place according to manufacturer's written instructions.
 - 8. 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, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.

- c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
- d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.
- C. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with hollowmetal manufacturer's written instructions.
 - 1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches 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.
- E. Factory-Finish Touchup: Clean abraded areas and repair with same material used for factory finish according to manufacturer's written instructions.
- F. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION 081113

SECTION 081416 - 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 wood-veneer faces.
 - 2. Factory finishing flush wood doors.
 - 3. Factory fitting flush wood doors to frames and factory machining for hardware.
- B. Related Requirements:
 - 1. Section 088000 "Glazing" for glass view panels in flush wood doors.

1.3 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. 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: 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.
- D. Samples for Initial Selection: For factory-finished doors.
- E. 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. For each wood species and transparent finish, provide set of three Samples showing typical range of color and grain to be expected in finished Work.
 - 2. 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. Finish veneer-faced door Samples with same materials proposed for factoryfinished doors.
 - 3. Louver blade and frame sections, 6 inches (150 mm) long, for each material and finish specified.
 - 4. Frames for light openings, 6 inches (150 mm) long, for each material, type, and finish required.

1.4 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For special warranty.
- B. Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

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 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.
- C. Mark each door on bottom rail with opening number used on Shop Drawings.

1.7 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 temperature between 60 and 90 deg F and relative humidity between 43 and 70 percent during remainder of construction period.

1.8 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 in a 42-by-84-inch section.
 - b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch 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: Subject to compliance with requirements, provide products by one of the following:
 - 1. Algoma Hardwoods, Inc.
 - 2. Eggers Industries.
 - 3. Graham Wood Doors; ASSA ABLOY Group company.
 - 4. Marshfield DoorSystems, Inc.
 - 5. Mohawk Flush Doors, Inc.
 - 6. Oshkosh Door Company.
 - 7. VT Industries Inc.
- B. Source Limitations: Obtain flush wood doors from single manufacturer.

2.2 FLUSH WOOD DOORS, GENERAL

- A. Quality Standard: In addition to requirements specified, comply with AWI's, AWMAC's, and WI's "Architectural Woodwork Standards."
 - 1. Provide AWI Quality Certification Labels indicating that doors comply with requirements of grades specified.
 - 2. Contract Documents contain selections chosen from options in quality standard and additional requirements beyond those of quality standard. Comply with those selections and requirements in addition to quality standard.
- B. Regional Materials: Wood doors 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 doors shall be certified as "FSC Pure" or "FSC Mixed Credit" according to FSC STD-01-00 and FSC STD-40-004.
- D. Adhesives: Use adhesives that meet 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."
- E. 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."
- F. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
 - 1. Cores: Provide core specified or mineral core as needed to provide fire-protection rating indicated.
 - 2. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.
 - 3. 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.
- G. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control, based on testing according to UL 1784.
- H. Structural-Composite-Lumber-Core Doors:
 - 1. Structural Composite Lumber: WDMA I.S.10.
 - a. Screw Withdrawal, Face: 700 lbf.
 - b. Screw Withdrawal, Edge: 400 lbf.
- I. 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.
 - a. Screw-Holding Capability: 550 lbf per WDMA T.M.-10.

2.3 VENEER-FACED DOORS FOR TRANSPARENT FINISH

- A. Interior Solid-Core Doors:
 - 1. Grade: Custom (Grade A faces).
 - 2. Species: Select white maple.
 - 3. Cut: Rotary cut.
 - 4. Match between Veneer Leaves: Book match.
 - 5. Assembly of Veneer Leaves on Door Faces: Running match.

- 6. Pair and Set Match: Provide for doors hung in same opening.
- 7. Exposed Vertical Edges: Same species as faces edge Type A.
- 8. Core: Structural composite lumber.
- 9. Thickness: 1-3/4 inch.
- 10. Construction: Five plies. Stiles and rails are bonded to core, then entire unit is abrasive planed before veneering. Faces are bonded to core using a hot press.

2.4 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.
- 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.

2.5 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.
 - 1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on bottom edges, edges of cutouts, and mortises.
- B. Factory finish doors.
- C. Transparent Finish:
 - 1. Grade: Custom.
 - 2. Finish: WDMA TR-6 catalyzed polyurethane.
 - 3. Staining: As selected by Architect from manufacturer's full range.
 - 4. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and installed door frames, with Installer present, before hanging doors.

FLUSH WOOD 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. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
 - 1. Clearances: Provide 1/8 inch at heads, jambs, and between pairs of doors. Provide 1/8 inch from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide1/4 inch from bottom of door to top of threshold unless otherwise indicated.
 - a. Comply with NFPA 80 for fire-rated doors.
 - b. Bevel non-fire-rated doors 1/8 inch in 2 inches at lock and hinge edges.
 - 2. Bevel fire-rated doors 1/8 inch in 2 inches at lock edge; trim stiles and rails only to extent permitted by labeling agency.
- D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- E. 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 081416

SECTION 083113 - 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. Section 077200 "Roof Accessories" for roof hatches.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, fire ratings, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Product Schedule: For access doors and frames.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Rated Access Doors and Frames: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, according to NFPA 252 or UL 10B.

2.2 ACCESS DOORS AND FRAMES

- A. Flush Access Doors with Exposed Flanges:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. JL Industries, Inc.; a division of the Activar Construction Products Group.
 - b. Karp Associates, Inc.
 - c. Larsens Manufacturing Company.
 - d. Milcor; Commercial Products Group of Hart & Cooley, Inc.
 - e. Nystrom, Inc.
 - 2. Description: Face of door flush with frame, with exposed flange and concealed hinge.

- 3. Locations: Masonry Walls.
- 4. Uncoated Steel Sheet for Door: Nominal 0.074 inch, 14 gage, factory primed.
- 5. Stainless-Steel Sheet for Door: Nominal 0.074 inch, 14 gage, No. 4 finish.
- 6. Frame Material: Same material, thickness, and finish as door.
- 7. Latch and Lock: Cam latch, key operated.
- B. Flush Access Doors with Concealed Flanges:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. JL Industries, Inc.; a division of the Activar Construction Products Group.
 - b. Karp Associates, Inc.
 - c. Larsens Manufacturing Company.
 - d. Milcor; Commercial Products Group of Hart & Cooley, Inc.
 - e. Nystrom, Inc.
 - 2. Description: Face of door flush with frame; with concealed flange for gypsum board installation and concealed hinge.
 - 3. Locations: Gypsum board walls and ceilings.
 - 4. Uncoated Steel Sheet for Door: Nominal 0.074 inch, 14 gage, factory primed.
 - 5. Stainless-Steel Sheet for Door: Nominal 0.074 inch, 14 gage, No. 4 finish.
 - 6. Frame Material: Same material and thickness as door.
 - 7. Latch and Lock: Cam latch, key operated.

2.3 FIRE-RATED ACCESS DOORS AND FRAMES

- A. Fire-Rated, Flush Access Doors with Exposed Flanges:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. JL Industries, Inc.; a division of the Activar Construction Products Group
 - b. Karp Associates, Inc.
 - c. Larsens Manufacturing Company.
 - d. Milcor; Commercial Products Group of Hart & Cooley, Inc.
 - e. Nystrom, Inc.
 - 2. Description: Door face flush with frame, uninsulated; with exposed flange, self-closing door, and concealed hinge.
 - 3. Locations: Rated Masonry Wall.
 - 4. Fire-Resistance Rating: Not less than that of adjacent construction.
 - 5. Uncoated Steel Sheet for Door: Nominal 0.074 inch, 14 gage, factory primed.
 - 6. Stainless-Steel Sheet for Door: Nominal 0.074 inch, 14 gage, No. 4 finish.
 - 7. Frame Material: Same material, thickness, and finish as door.
 - 8. Latch and Lock: Self-latching door hardware, operated by key with interior release.
- B. Fire-Rated, Flush Access Doors with Concealed Flanges:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. JL Industries, Inc.; a division of the Activar Construction Products Group.
 - b. Karp Associates, Inc.
 - c. Milcor; Commercial Products Group of Hart & Cooley, Inc.
 - d. Nystrom, Inc.

- 2. Description: Door face flush with frame, uninsulated; with concealed flange for gypsum board installation, self-closing door, and concealed hinge.
- 3. Locations: Wall and ceiling.
- 4. Fire-Resistance Rating: Not less than that of adjacent construction.
- 5. Uncoated Steel Sheet for Door: Nominal 0.074 inch, 14 gage, factory primed.
- 6. Stainless-Steel Sheet for Door: Nominal 0.074 inch, 14 gage, No. 4 finish.
- 7. Frame Material: Same material, thickness, and finish as door.
- 8. Latch and Lock: Self-closing, self-latching door hardware, operated by key, with interior release.
- C. Location: Provide factory primed access doors at surfaces that have a latex paint system finish and stainless steel access doors at surfaces that have a finish other than a latex paint system.

2.4 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. 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.
- D. Frame Anchors: Same material as door face.
- E. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

2.5 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.
- 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.

2.6 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.
- 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.

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 083113

SECTION 083313 - COILING COUNTER 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. Counter doors.
- B. Related Requirements:
 1. Section 055000 "Metal Fabrications" for miscellaneous steel supports.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type and size of coiling counter door and accessory.
 - 1. Include construction details, material descriptions, dimensions of individual components, profiles for slats, and finishes.
 - 2. Include rated capacities, 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, and 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.
- C. Samples for Initial Selection: Manufacturer's finish charts showing full range of colors and textures available for units with factory-applied finishes.
- D. Samples for Verification: For each type of exposed finish on the following components, in manufacturer's standard sizes:
 - 1. Physical samples of colors considered for selection.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For coiling counter doors to include in maintenance manuals.

1.6 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.
 - 1. Maintenance Proximity: Not more than two hours' normal travel time from Installer's place of business to Project site.

PART 2 - PRODUCTS

- 2.1 MANUFACTURERS, GENERAL
 - A. Source Limitations: Obtain coiling counter doors from single source from single manufacturer.

2.2 COUNTER DOOR ASSEMBLY

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Cookson Company.
 - b. Cornell Iron Works, Inc.
 - c. McKeon Rolling Steel Door Company, Inc.
 - d. Overhead Door Corporation.
- B. Operation Cycles: Door components and operators capable of operating for not less than 20,000. 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.
- C. Door Curtain Material: steel.
- D. Door Curtain Slats: Flat profile slats of 1-1/4-inch center-to-center height.
- E. Bottom Bar: Manufacturer's standard continuous channel or tubular shape, fabricated and finished to match door.
- F. Curtain Jamb Guides: Steel with exposed finish matching curtain slats.
- G. Hood: Match curtain material and finish.
 - 1. Shape: Square.
 - 2. Mounting: Face of wall.
- H. Sill Configuration: No sill.
- I. Locking Devices: Equip door with locking device assembly.
 - 1. Locking Device Assembly: locking bars, operable from inside with cylinder.

- J. Manual Door Operator: Manufacturer's standard crank operator.
- K. Curtain Accessories: Equip door with push/pull handles.
- L. Door Finish:
 - 1. Baked-Enamel or Powder-Coated Finish: Color as selected by Architect from manufacturer's full range.

2.3 DOOR CURTAIN MATERIALS AND CONSTRUCTION

- A. Door Curtains: Fabricate coiling counter-door curtain of interlocking metal slats 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.
- B. Curtain Jamb Guides: Manufacturer's standard angles or channels and angles of same material and finish as curtain slats unless otherwise indicated, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain.

2.4 HOODS

- 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. Galvanized Steel: Nominal 0.028-inch- thick, hot-dip galvanized steel sheet with G90 zinc coating, complying with ASTM A 653/A 653M.

2.5 LOCKING DEVICES

- A. 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 standard with manufacturer and keyed to building keying system.
 - 2. Keys: Three for each cylinder.

2.6 CURTAIN ACCESSORIES

A. Astragal: Equip each door bottom bar with a replaceable, adjustable, continuous, compressible gasket of flexible vinyl, rubber, or neoprene as a cushion bumper.

2.7 COUNTER DOOR ACCESSORIES

2.8 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, seamless or welded 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. 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.

2.9 MANUAL DOOR OPERATORS

- A. General: Equip door with manual door operator by door manufacturer.
- B. Crank Operator: Consisting of crank and crank gearbox, steel crank drive shaft, and gearreduction unit, of type indicated. Size gears to require not more than 25-lbf force to turn crank. Fabricate gearbox to be oil tight and to completely enclose operating mechanism. Provide manufacturer's standard crank-locking device.

2.10 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.

2.11 STEEL AND GALVANIZED-STEEL FINISHES

A. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

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. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install coiling counter doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.
- B. Install coiling counter doors, hoods, controls, and operators at the mounting locations indicated for each door.

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 safety devices. Replace damaged and malfunctioning controls and equipment.

3.4 ADJUSTING

- A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.
- B. Lubricate bearings and sliding parts as recommended by manufacturer.
- C. Adjust seals to provide tight fit around entire perimeter.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain coiling counter doors.

END OF SECTION 083313

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SECTION 083500 - SIDE 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. Aluminum, manually operated, side folding doors.
- B. Related Requirements:
 - 1. Section 055000 "Metal Fabrications" for miscellaneous steel supports.
 - 2. Section 083100 "Access Doors and Panels"
 - 3. Section 087000 "Door Hardware"

1.3 ACTION SUBMITTALS

- A. Product Data: For each type and size of coiling door and accessory.
 - 1. Include construction details, material descriptions, dimensions of individual components, profiles for slats, and finishes.
 - 2. Include rated capacities, operating 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, and 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.
- C. Samples for Initial Selection: Manufacturer's finish charts showing full range of colors and textures available for units with factory-applied finishes.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For overhead coiling doors to include in maintenance manuals.

1.6 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.
 - 1. Maintenance Proximity: Not more than [two] hours' normal travel time from Installer's place of business to Project site.

PART 2 - PRODUCTS

- 2.1 MANUFACTURERS, GENERAL
 - A. Source Limitations: Obtain overhead coiling doors from single source from single manufacturer.

2.2 DOOR ASSEMBLY

- A. Service Door: Side folding door formed with curtain of interlocking metal slats.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Amarr Garage Doors.
 - b. Clopay Building Products.
 - c. Cookson Company.
 - d. Cornell Iron Works, Inc.
 - e. McKeon Rolling Steel Door Company, Inc.
 - f. Overhead Door Corporation.
- B. Operation Cycles: Door components and operators capable of operating for not less than 20,000. 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.
- C. Door Curtain Material: Aluminum.
- D. Curtain:
 - 1. Pivot Sections: Continuous vertical interlocking aluminum members with full height butt hinges, 7 inches on center with continuous recess in edges to accept panels, top and bottom closure panels and end member connectors.
 - 2. Solid Aluminum Panels: 0.072 inch thick by 6 inch wide, solid aluminum panels, full height between top and bottom closure panels.
 - 3. Top and Bottom Closure Panels: 4 inch high by 6 inch wide extruded aluminum panel shaped to fit into pivot sections and to accept trolley hanger assemblies.

- 4. Leading End Member: $1 \frac{5}{16} \ge \frac{2}{3} \le \frac{3}{8} \ge \frac{1}{8}$ inch thick extruded aluminum tube with recess for attaching curtain sections.
 - a. Provide concealed master keyable, cylinder operated hook-bolt member with lock operable from both sides of curtain that engages a full height wall channel. Provide rubber bumper at the edge of the locking member.
- 5. Intermediate Member(s): $1 \frac{5}{16} \ge \frac{2}{3} \times \frac{1}{8}$ inch thick extruded aluminum tube with recess for attaching curtain sections.
 - a. Provide bottom ratcheted rod member with no locking. Supply dustproof floor sockets for all drop bolts. Provide rubber bumper at the edge of the locking member.
- 6. Trailing End Member: $1 \frac{5}{16} \ge \frac{2}{3} \le \frac{3}{8} \ge \frac{1}{8}$ inch thick extruded aluminum tube with recess for attaching curtain sections.
 - a. Provide fixed end member.
- E. Trolleys: 1-1/8 inch diameter nylon tired ball bearing wheels; two wheel assembly at each hanger; three wheel assembly at all vertical members.
- F. Track: 1.3 x 1.8 inch thick extruded aluminum section with continuous recess for splice tongues and pins.
 - 1. Provide curve track section(s) with 14 inch radius.
- G. Panel Bottoms: Provide brush type door sweep at panel bottoms to prevent passage by rodents.
- H. Door Finish:
 - 1. Interior Curtain-Slat Facing: Match finish of exterior curtain-slat face.

2.3 DOOR CURTAIN MATERIALS AND CONSTRUCTION

- A. Door Curtains: Fabricate door curtain of interlocking metal slats, in a continuous length for height 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. Aluminum Door Curtain Slats: ASTM B 209 sheet or ASTM B 221 extrusions, alloy and temper standard with manufacturer for type of use and finish indicated; thickness of 0.050 inch; and as required.
 - 2. Metal Interior Curtain-Slat Facing: Match metal of exterior curtain-slat face, with minimum aluminum thickness of 0.032 inch.

2.4 LOCKING DEVICES

- A. 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.

2.5 MANUAL DOOR OPERATORS

A. General: Equip door with manual door operator by door manufacturer.

2.6 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.

2.7 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 substrates areas and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install coiling doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.

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 safety devices. Replace damaged and malfunctioning controls and equipment.

3.4 ADJUSTING

A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.

- B. Lubricate bearings and sliding parts as recommended by manufacturer.
- C. Adjust seals to provide tight fit around entire perimeter.

3.5 MAINTENANCE SERVICE

- A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of coiling-door Installer. Include monthly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for door 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, seven-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 doors.

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SECTION 084113 - 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. Interior storefront framing.
 - 2. Exterior manual-swing entrance doors.
- B. Related Requirements:
 - 1. Section 084413 "Glazed Aluminum Curtain Walls".

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.
- B. Sustainable Design Submittals:
 - 1. Product Data: For sealants, indicating VOC content.
 - 2. Laboratory Test Reports: For sealants, indicating compliance with requirements for lowemitting materials.
- C. 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 aluminumframed 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.
- D. Samples for Initial Selection: For units with factory-applied color finishes.
- E. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
- F. Fabrication Sample: Of each vertical-to-horizontal intersection of assemblies, made from 12inch 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. 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.
- H. 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.

1.4 INFORMATIONAL SUBMITTALS

- A. Preconstruction Laboratory Mockup Testing Submittals:
 - 1. Testing Program: Developed specifically for Project.
 - 2. Test Reports: Prepared by a qualified preconstruction testing agency for each mockup test.
 - 3. Record Drawings: As-built drawings of preconstruction laboratory mockups showing changes made during preconstruction laboratory mockup testing.
- B. Qualification Data: For Installer.
- C. 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 aluminumframed entrance and storefront.
- D. Product Test Reports: For aluminum-framed entrances and storefronts, for tests performed by a qualified testing agency.

- E. Quality-Control Program: Developed specifically for Project, including fabrication and installation, according to recommendations in ASTM C 1401. Include periodic quality-control reports.
- F. Sample Warranties: For special warranties.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For aluminum-framed entrances and storefronts to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. 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.

1.7 WARRANTY

- A. Special Warranty: Manufacturer 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. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - d. Water penetration through fixed glazing and framing areas.
 - e. Failure of operating components.
 - 2. Warranty Period: 10 years from date of Substantial Completion.
- B. Special Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. 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. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Exterior entrance design shall be included in Curtain Wall design by the qualified professional engineer, as defined in Section 014000 "Quality Requirements," .
- 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 1/175 of clear span for spans up to 13 feet 6 inches and to 1/240 of clear span plus 1/4 inch for spans greater than 13 feet 6 inches or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
 - 2. Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or 1/8 inch, whichever is smaller.
 - a. Operable Units: Provide a minimum 1/16-inch clearance between framing members and operable units.
- E. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:

- 1. Entrance Doors:
 - a. Pair of Doors: Maximum air leakage of 1.0 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft..
 - b. Single Doors: Maximum air leakage of 0.5 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft..
- F. 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..
- G. Energy Performance: Certify and label energy performance according to NFRC as follows:
 - 1. Thermal Transmittance (U-factor): Doors shall have U-factor of not more than 0.77 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 0.40 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 45 as determined according to NFRC 500.
- H. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes:
 - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 MANUFACTURERS

- A. Same as Curtain Wall manufacturer.
- B. Source Limitations: Obtain all components of aluminum-framed entrance and storefront system, including framing and accessories, from single manufacturer.

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 for exterior members, non-thermal for interior members.
 - 2. Glazing System: Retained mechanically with gaskets on four sides.
 - 3. Glazing Plane: Front.
 - 4. Finish: High-performance organic finish.
 - 5. 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.
 - b. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
 - 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 overall thickness, with minimum 0.125-inch for interior doors,- 2- to 2-1/4-inch overall thickness, with minimum 0.125-inch for exterior doors-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.
 - a. Thermal Construction: High-performance plastic connectors separate aluminum members exposed to the exterior from members exposed to the interior.
 - 2. Door Design: Wide stile; 5-inch nominal width.
 - 3. Glazing Stops and Gaskets: Beveled, 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."
- B. Cylinders: As specified in Section 087100 "Door Hardware."

- C. Removable Mullions: BHMA A156.3, extruded aluminum.
 - 1. When used with panic exit devices, provide removable mullions listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305. Use only mullions that have been tested with exit devices to be used.
- D. Thresholds: BHMA A156.21, raised thresholds beveled with a slope of not more than 1:2, with maximum height of 1/2 inch.

2.6 GLAZING

- A. Glazing: Comply with Section 088000 "Glazing."
 - 1. 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."

2.7 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.
 - 3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.
- 2.8 Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer
 - 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 exterior or 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. Storefront Framing: Fabricate components for assembly using shear-block system.
- F. 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.
- G. 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.
- H. 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.
- I. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.9 ALUMINUM FINISHES

- A. High-Performance Organic Finish: Three-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF or FEVE 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.
 - 1. Color and Gloss: As selected by Architect from manufacturer's full range.

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 PREPARATION

A. Prepare surfaces that are in contact with structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.

3.3 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. Set continuous sill members and flashing in full sealant bed as specified in Section 079200 "Joint Sealants" to produce weathertight installation.
- D. Install components plumb and true in alignment with established lines and grades.
- E. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation.
- F. Install glazing as specified in Section 088000 "Glazing."
- G. 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.
- H. 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.

3.4 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; 1/4 inch in 40 feet.
 - 2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.
 - 3. Alignment:
 - a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch wide, limit offset from true alignment to 1/16 inch.
 - b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, limit offset from true alignment to 1/8 inch.
 - c. Where surfaces are separated by reveal or protruding element of 1 inch wide or more, limit offset from true alignment to 1/4 inch.
 - 4. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Field Quality-Control Testing: Perform the following test on representative areas of aluminum-framed entrances and storefronts.
 - 1. Water-Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.
 - a. Perform a minimum of two tests in areas as directed by Architect.
- C. Aluminum-framed entrances and storefronts will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

3.6 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 084113

SECTION 084413 - GLAZED ALUMINUM CURTAIN WALLS

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 glazed aluminum curtain walls.

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.
- B. Sustainable Design Submittals:
 - 1. Laboratory Test Reports: For sealants, indicating compliance with requirements for lowemitting materials.
- C. Shop Drawings: For glazed aluminum curtain walls. 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 glazed aluminum curtain walls, 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.
- D. Samples for Initial Selection: For units with factory-applied color finishes.
- E. Delegated-Design Submittal: For glazed aluminum curtain walls indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Energy Performance Certificates: For glazed aluminum curtain walls, accessories, and components from manufacturer.
 - 1. Basis for Certification: NFRC-certified energy performance values for each glazed aluminum curtain wall.
- C. Product Test Reports: For glazed aluminum curtain walls, for tests performed by a qualified testing agency.
- D. Sample Warranties: For special warranties.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For glazed aluminum curtain walls to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. 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.

1.7 MOCKUPS

- A. 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 wall area 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 WARRANTY

- A. Special Assembly Warranty: Manufacturer agrees to repair or replace components of glazed aluminum curtain wall 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. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - d. Water penetration through fixed glazing and framing areas.
 - e. Failure of operating components.
 - 2. Warranty Period: 10 years from date of Substantial Completion.
- B. Special Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. 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. Warranty Period: 20 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 glazed aluminum curtain walls.
- B. General Performance: Comply with performance requirements specified, as determined by testing of glazed aluminum curtain walls representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
 - 1. Glazed aluminum curtain walls 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, whichever is less.
 - 2. Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or 1/8 inch, whichever is smaller.
 - a. Operable Units: Provide a minimum 1/16-inch clearance between framing members and operable units.
 - 3. Cantilever Deflection: Where framing members overhang an anchor point, as follows:
 - a. Perpendicular to Plane of Wall: No greater than 1/240 of clear span plus 1/4-inch for spans greater than 11 feet 8-1/4 inches or 1/175 times span, for spans less than 11 feet 8-1/4 inches.
- 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. at a static-air-pressure differential of 6.24 lbf/sq. ft..
- 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..
- H. 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 0.38 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 0.40 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 45 as determined according to NFRC 500.
- I. Noise Reduction: Test according to ASTM E 90, with ratings determined by ASTM E 1332, as follows:
 - 1. Outdoor-Indoor Transmission Class: Minimum 30.
- J. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes:
 - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. EFCO Corporation.
 - 2. Kawneer North America; an Alcoa company.
 - 3. YKK AP America Inc.
- B. Source Limitations: Obtain all components of curtain wall system, including framing spandrel panels venting windows entrances sun control and accessories, from single manufacturer.

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. Glazing Plane: Front.
 - 4. Finish: High-performance organic finish.
 - 5. Fabrication Method: Either factory- or field-fabricated system.
- B. Pressure Caps: Manufacturer's standard aluminum components that mechanically retain glazing.
 - 1. Include snap-on aluminum trim that conceals fasteners.
- 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.
 - b. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
 - 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 ENTRANCES

A. Entrances: Comply with Section 084113 "Aluminum-Framed Entrances and Storefronts."

2.5 SUN CONTROL

- A. Sunshades: Assemblies consisting of manufacturer's standard outrigger brackets, louvers, and fascia, designed for attachment to curtain wall with mechanical fasteners.
 - 1. Orientation: Horizontal.
 - 2. Projection from Wall: As indicated on Drawings.
 - 3. Outriggers: Straight with square edges.
 - 4. Louvers:
 - a. Number: Six louvers per unit.
 - b. Shape: Square.
 - c. Width: As shown on drawings.
 - d. Mounting Angle: As shown on drawings.
 - 5. Fasciae: Rectangular.
 - 6. Finish: Match adjacent glazed aluminum curtain wall.
- B. Materials:
 - 1. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - a. Sheet and Plate: ASTM B 209.
 - b. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
 - c. Extruded Structural Pipe and Tubes: ASTM B 429/B 429M.
 - d. Structural Profiles: ASTM B 308/B 308M.
2.6 GLAZING

- A. Glazing: Comply with Section 088000 "Glazing."
- B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.
- C. Glazing Sealants: As recommended by manufacturer.
 - 1. 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."

2.7 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.
 - 3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.
- B. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch 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- 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 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 exterior.
- 6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- D. Fabricate components to resist water penetration as follows:
 - 1. Internal guttering system or other means to drain water passing joints, condensation occurring within framing members, and moisture migrating within glazed aluminum curtain wall to exterior.
 - 2. Pressure-equalized system or double barrier design with primary air and vapor barrier at interior side of glazed aluminum curtain wall and secondary seal weeped and vented to exterior.
- E. Curtain-Wall Framing: Fabricate components for assembly using shear-block system.
- F. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.9 ALUMINUM FINISHES

- A. High-Performance Organic Finish: Three-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF or FEVE 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.
 - 1. Color and Gloss: As selected by Architect from manufacturer's full range.

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 PREPARATION

A. Prepare surfaces that will contact structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.

3.3 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. Where welding is required, weld components in concealed locations to minimize distortion or discoloration of finish. Protect glazing surfaces from welding.
 - 7. Seal 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 primer, applying sealant or tape, or installing nonconductive spacers as recommended by manufacturer for this purpose.
 - 2. Where aluminum is in contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within glazed aluminum curtain wall to exterior.
- D. Install components plumb and true in alignment with established lines and grades.
- E. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation.
- F. Install glazing as specified in Section 088000 "Glazing."
 - 1. Prepare surfaces that will contact structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.
- G. 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.

3.4 ERECTION TOLERANCES

- A. Erection Tolerances: Install glazed aluminum curtain walls to comply with the following maximum tolerances:
 - 1. Plumb: 1/8 inch in 10 feet; 1/4 inch in 40 feet.
 - 2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.
 - 3. Alignment:

- a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch wide, limit offset from true alignment to 1/16 inch.
- b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, limit offset from true alignment to 1/8 inch.
- c. Where surfaces are separated by reveal or protruding element of 1 inch wide or more, limit offset from true alignment to 1/4 inch.
- 4. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Test Area: Perform tests on representative areas of glazed aluminum curtain walls.
- C. Field Quality-Control Testing: Perform the following test on representative areas of glazed aluminum curtain walls.
 - 1. Water-Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.
 - a. Perform a minimum of two tests in areas as directed by Architect.
 - 2. Air Infiltration: ASTM E 783 at 1.5 times the rate specified for laboratory testing in "Performance Requirements" Article but not more than 0.09 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft..
 - a. Perform a minimum of two tests in areas as directed by Architect.
- D. Glazed aluminum curtain walls will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports.

END OF SECTION 084413

SECTION 085113 - ALUMINUM WINDOWS

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 windows for exterior locations.
- B. Related Requirements:
 - 1. Section 084113 "Aluminum-Framed Entrances and Storefronts" for coordinating finish among aluminum fenestration units.
 - 2. Section 088000 "Glazing".

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 and discuss the finishing of aluminum windows that is required to be coordinated with the finishing of other aluminum work for color and finish matching.
 - 3. Review, discuss, and coordinate the interrelationship of aluminum windows with other exterior wall components. Include provisions for anchoring, flashing, weeping, sealing perimeters, and protecting finishes.
 - 4. Review and discuss the sequence of work required to construct a watertight and weathertight exterior building envelope.
 - 5. Inspect and discuss the condition of substrate and other preparatory work performed by other trades.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, glazing and fabrication methods, dimensions of individual components and profiles, hardware, and finishes for aluminum windows.
- B. Shop Drawings: For aluminum windows.

- 1. Include plans, elevations, sections, hardware, accessories, insect screens, operational clearances, and details of installation, including anchor, flashing, and sealant installation.
- C. Samples: For each exposed product and for each color specified, 2 by 4 inches in size.
- D. Samples for Initial Selection: For units with factory-applied finishes.
 - 1. Include Samples of hardware and accessories involving color selection.
- E. Samples for Verification: For aluminum windows and components required, showing full range of color variations for finishes, and prepared on Samples of size indicated below:
 - 1. Exposed Finishes: 2 by 4 inches.
 - 2. Exposed Hardware: Full-size units.
- F. Product Schedule: For aluminum windows. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer and Installer.
- B. Product Test Reports: For each type of aluminum window, for tests performed by a qualified testing agency.
- C. Field quality-control reports.
- D. Sample Warranties: For manufacturer's warranties.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A manufacturer capable of fabricating aluminum windows that meet or exceed performance requirements indicated and of documenting this performance by test reports and calculations.
- B. Installer Qualifications: An installer acceptable to aluminum window manufacturer for installation of units required for this Project.
- C. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 - 1. Build mockup of typical wall area 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.

1.7 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace aluminum windows that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Failure to meet performance requirements.
 - b. Structural failures including excessive deflection, water leakage, condensation, and air infiltration.
 - c. Faulty operation of movable sash and hardware.
 - d. Deterioration of materials and finishes beyond normal weathering.
 - e. Failure of insulating glass.
 - 2. Warranty Period:
 - a. Window: 10 years from date of Substantial Completion.
 - b. Glazing Units: 10 years from date of Substantial Completion.
 - c. Aluminum Finish: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain aluminum windows from single source from single manufacturer.

2.2 WINDOW PERFORMANCE REQUIREMENTS

- A. Product Standard: Comply with AAMA/WDMA/CSA 101/I.S.2/A440 for definitions and minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.
 - 1. Window Certification: AAMA certified with label attached to each window.
- B. Performance Class and Grade: AAMA/WDMA/CSA 101/I.S.2/A440 as follows:
 - 1. Minimum Performance Class: AW.
 - 2. Minimum Performance Grade: 70.
- C. Thermal Transmittance: NFRC 100 maximum whole-window U-factor of 0.38 Btu/sq. ft. x h x deg F for fixed sashes, 0.45 Btu/sq. ft. x h x deg F for operable sashes.
- D. Solar Heat-Gain Coefficient (SHGC): NFRC 200 maximum whole-window SHGC of 0.40.
- E. Condensation-Resistance Factor (CRF): Provide aluminum windows tested for thermal performance according to AAMA 1503, showing a CRF of 45.

- F. Thermal Movements: Provide aluminum windows, including anchorage, that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change: 120 deg F ambient; 180 deg F material surfaces.
- G. Sound Transmission Class (STC): Rated for not less than 30 STC when tested for laboratory sound transmission loss according to ASTM E 90 and determined by ASTM E 413.
- H. Outside-Inside Transmission Class (OITC): Rated for not less than 26 OITC when tested for laboratory sound transmission loss according to ASTM E 90 and determined by ASTM E 1332.
- I. Windborne-Debris-Impact Resistance: Capable of resisting impact from windborne debris based on testing glazed windows identical to those specified, according to ASTM E 1886 and testing information in ASTM E 1996 and requirements of authorities having jurisdiction.

2.3 ALUMINUM WINDOWS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. EFCO Corporation.
 - 2. Graham Architectural Products Corporation.
 - 3. Kawneer North America; an Alcoa company.
 - 4. Peerless Products, Inc.
 - 5. YKK AP America Inc.
- B. Operating Types: Provide the following operating types in locations indicated on Drawings:
 1. Fixed.
- C. Frames and Sashes: Aluminum extrusions complying with AAMA/WDMA/CSA 101/I.S.2/A440.
 - 1. Thermally Improved Construction: Fabricate frames, sashes, and muntins with an integral, concealed, low-conductance thermal barrier located between exterior materials and window members exposed on interior side in a manner that eliminates direct metal-to-metal contact.
- D. Glazing System: Manufacturer's standard factory-glazing system that produces weathertight seal.
- E. Fasteners: Noncorrosive and compatible with window members, trim, hardware, anchors, and other components.
 - 1. Exposed Fasteners: Do not use exposed fasteners to greatest extent possible. For application of hardware, use fasteners that match finish hardware being fastened.

2.4 ACCESSORIES

- A. Dividers (False Muntins): Provide extruded-aluminum divider grilles in designs indicated for each sash lite.
 - 1. Type: Permanently located at exterior lite, between insulating-glass lites, and at interior lite..
 - 2. Pattern: As indicated on Drawings.
 - 3. Profile: As selected by Architect from manufacturer's full range.
- B. Subsills: Thermally broken, extruded-aluminum subsills in configurations indicated on Drawings.
- C. Column Covers: Extruded-aluminum profiles in sizes and configurations indicated on Drawings.
- D. Interior Trim: Extruded-aluminum profiles in sizes and configurations indicated on Drawings.
- E. Panning Trim: Extruded-aluminum profiles in sizes and configurations indicated on Drawings.
- F. Receptor System: Two-piece, snap-together, thermally broken, extruded-aluminum receptor system that anchors windows in place.

2.5 FABRICATION

- A. Fabricate aluminum windows in sizes indicated. Include a complete system for assembling components and anchoring windows.
- B. Glaze aluminum windows in the factory.
- C. Weather strip each operable sash to provide weathertight installation.
- D. Weep Holes: Provide weep holes and internal passages to conduct infiltrating water to exterior.
- E. Provide water-shed members above side-hinged sashes and similar lines of natural water penetration.
- F. Mullions: Provide mullions and cover plates, matching window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections. Provide mullions and cover plates capable of withstanding design wind loads of window units.
- G. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation.

2.6 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual" 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 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- B. High-Performance Organic Finish (Three-Coat Fluoropolymer): AA-C12C40R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: conversion coatings; Organic Coating: manufacturer's standard three-coat, thermocured system consisting of specially formulated inhibitive primer, fluoropolymer color coat, and clear fluoropolymer topcoat, with both color coat and clear topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA 2605 and with coating and resin manufacturers' written instructions.
 - 1. Color and Gloss: Match Curtain Wall color selection exactly, provide custom color if needed.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Verify rough opening dimensions, levelness of sill plate, and operational clearances.
- C. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure weathertight window installation.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components. For installation procedures and requirements not addressed in manufacturer's written instructions, comply with installation requirements in ASTM E 2112.
- B. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction to produce weathertight construction.
- C. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.
- D. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
 - 1. Testing and inspecting agency will interpret tests and state in each report whether tested work complies with or deviates from requirements.
- B. Testing Services: Testing and inspecting of installed windows shall take place as follows:
 - 1. Testing Methodology: Testing of windows for air infiltration and water resistance shall be performed according to AAMA 502.
 - 2. Air-Infiltration Testing:
 - a. Test Pressure: That required to determine compliance with AAMA/ WDMA/ CSA 101/I.S.2/A440 performance class indicated.
 - Allowable Air-Leakage Rate: 1.5 times the applicable AAMA/WDMA/ CSA 101/ I.S.2/A440 rate for product type and performance class rounded down to one decimal place.
 - 3. Water-Resistance Testing:
 - a. Test Pressure: Two-thirds times test pressure required to determine compliance with AAMA/ WDMA/ CSA 101/I.S.2/A440 performance grade indicated.
 - b. Allowable Water Infiltration: No water penetration.
 - 4. Testing Extent: Three windows of each type as selected by Architect and a qualified independent testing and inspecting agency. Windows shall be tested after perimeter sealants have cured.
 - 5. Test Reports: Prepared according to AAMA 502.
- C. Windows will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

3.4 ADJUSTING, CLEANING, AND PROTECTION

- A. Clean exposed surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.
 1. Keep protective films and coverings in place until final cleaning.
- B. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.
- C. Protect window surfaces from contact with contaminating substances resulting from construction operations. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written instructions.

END OF SECTION 085113

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 door hardware for the following:
 - a. Swinging doors.
 - 2. Cylinders for door hardware specified in other Sections.
 - 3. Electrified door hardware.
- B. Related Requirements:
 - 1. Section 081113 "Hollow Metal Doors and Frames".
 - 2. Section 081416 "Flush Wood Doors" for integral intumescent seals provided as part of labeled fire-rated assemblies.
 - 3. Section 083113 "Access Doors and Frames" for access door hardware, including cylinders.
 - 4. Section 087113 "Automatic Door Operators" for low-energy power operators and lowenergy power-assist operators.
 - 5. Section 281000 "Access Control and Intrusion Detection" for access control devices installed at door openings and provided as part of a security system.
 - 6. Section 283100 "Fire Detection and Alarm" for connections to building fire-alarm system.

1.3 COORDINATION

- A. 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.
- B. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.
- C. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.
- D. Existing Openings: Where hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing

conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Conference participants shall include Installer's Architectural Hardware Consultant and Owner's security consultant.
- B. Keying Conference: Conduct conference at Project site.
 - 1. Conference participants shall include Installer's Architectural Hardware Consultant.
 - 2. Incorporate conference decisions into keying schedule after reviewing door hardware keying system including, but not limited to, the following:
 - a. Flow of traffic and degree of security required.
 - b. Preliminary key system schematic diagram.
 - c. Requirements for key control system.
 - d. Requirements for access control.
 - e. Address for delivery of keys.

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 electrified door hardware.
 - 1. Include diagrams for power, signal, and control wiring.
 - 2. Include details of interface of electrified door hardware and building safety and security systems.
- C. Samples: For each exposed product in each finish specified, in manufacturer's standard size.
 - 1. Tag Samples with full product description to coordinate Samples with door hardware schedule.
- D. Door Hardware Schedule: Prepared by or under the supervision of Installer's Architectural Hardware Consultant. Coordinate door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 - 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 the fabrication of other work that is critical in Project construction schedule.

- 2. Format: Use same scheduling sequence and format and use same door numbers as in door hardware schedule in the Contract Documents.
- 3. Content: Include the following information:
 - a. Identification number, location, hand, fire rating, size, and material of each door and frame.
 - b. Locations of each door hardware set, cross-referenced to Drawings on floor plans and to door and frame schedule.
 - c. Complete designations, including name and manufacturer, type, style, function, size, quantity, function, and finish of each door hardware product.
 - d. Description of electrified door hardware sequences of operation and interfaces with other building control systems.
 - e. Fastenings and other installation information.
 - f. Explanation of abbreviations, symbols, and designations contained in door hardware schedule.
 - g. Mounting locations for door hardware.
 - h. List of related door devices specified in other Sections for each door and frame.
- E. Keying Schedule: Prepared by or under the supervision of Installer's Architectural Hardware Consultant, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations that are coordinated with the Contract Documents.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Architectural Hardware Consultant.
- B. Product Certificates: For each type of electrified door hardware.
 - 1. Certify that door hardware for use on each type and size of labeled fire-rated doors complies with listed fire-rated door assemblies.
- C. Product Test Reports: For compliance with accessibility requirements, for tests performed by manufacturer and witnessed by a qualified testing agency, for door hardware on doors located in accessible routes.
- D. Field quality-control reports.
- E. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of door hardware to include in maintenance manuals.
- B. Schedules: Final door hardware and keying schedule.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: Supplier of products and an employer of workers trained and approved by product manufacturers and of an Architectural Hardware Consultant who is available during the course of the Work to consult Contractor, Architect, and Owner about door hardware and keying.
 - 1. Warehousing Facilities: In Project's vicinity.
 - 2. Scheduling Responsibility: Preparation of door hardware and keying schedule.
 - 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.
- B. Architectural Hardware Consultant Qualifications: A 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 who is currently certified by DHI as an Architectural Hardware Consultant (AHC).

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.
- B. Tag each item or package separately with identification coordinated with the final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.
- C. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.
- D. Deliver keys and permanent cores to Owner by registered mail or overnight package service.

1.10 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including excessive deflection, cracking, or breakage.
 - b. Faulty operation of doors and door hardware.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
 - 2. Warranty Period: Three years from date of Substantial Completion unless otherwise indicated below:
 - a. Electromagnetic Locks: Five years from date of Substantial Completion.
 - b. Locksets and Exit Devices: Five years from date of Substantial Completion.

c. Surface Closers and Continuous Hinges: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain each type of door hardware from single manufacturer.
 - 1. Provide electrified door hardware from same manufacturer as mechanical door hardware unless otherwise indicated. Manufacturers that perform electrical modifications and that are listed by a testing and inspecting agency acceptable to authorities having jurisdiction are acceptable.

2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Door Assemblies: Where fire-rated doors are indicated, provide door hardware complying with NFPA 80 that is listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
- B. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that complies with 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. at the tested pressure differential of 0.3-inch wg of water.
- C. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. Means of Egress Doors: Latches do not require more than 15 lbf to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.
- E. Accessibility Requirements: For door hardware on doors in an accessible route, comply with the DOJ's "2010 ADA Standards for Accessible Design".
 - 1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.
 - 2. Comply with the following maximum opening-force requirements:
 - a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf applied perpendicular to door.
 - b. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
 - 3. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch high.

4. Adjust door closer sweep periods so that, from an open position of 90 degrees, the door will take at least 5 seconds to move to a position of 12 degrees from the latch.

2.3 SCHEDULED DOOR HARDWARE

- A. Provide products for each door that comply with requirements indicated in Part 2 and door hardware schedule.
 - 1. Door hardware is scheduled in Part 3.

2.4 HINGES

- A. Hinges: BHMA A156.1.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Hager Companies.
 - b. McKinney Products Company; an ASSA ABLOY Group company.
 - c. Stanley Commercial Hardware; a division of Stanley Security Solutions.
 - 2. Furnish three hinges for doors less than 90 inches in height and one additional hinge for each additional 30 inches or fraction thereof.
 - 3. Unless specified otherwise hinges for doors up to and including 36 inches in width shall be 4.5 x 4.5; hinges for doors over 36 inches wide shall be heavyweight 5 x 4.5.
 - 4. All hinges shall be heavyweight except at low use doors such as closets and private offices.
 - 5. Furnish non-removable pins (NRP) at all reverse bevel doors receiving locks, rigid outside trim, exit only hardware.
 - 6. Hinges for labeled doors shall comply with NFPA 80.

2.5 CONTINUOUS HINGES

- A. Continuous Hinges: BHMA A156.26; minimum 0.120-inch- thick, hinge leaves with minimum overall width of 4 inches; fabricated to full height of door and frame and to template screw locations; with components finished after milling and drilling are complete.
- B. Continuous, Gear-Type Hinges: Extruded-aluminum, pinless, geared hinge leaves joined by a continuous extruded-aluminum channel cap; with concealed, self-lubricating thrust bearings.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Hager Companies.
 - b. McKinney Products Company; an ASSA ABLOY Group company.
 - c. PBB, Inc.
 - d. Select Products Limited.
 - e. Stanley Commercial Hardware; a division of Stanley Security Solutions.
 - f. Zero International, Inc.
 - 2. Provide power transfer hinge where required.

2.6 MECHANICAL LOCKS AND LATCHES

- A. Lock Functions: As indicated in door hardware schedule.
- B. Lock Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:
 - 1. Mortise Locks: Minimum 3/4-inch latchbolt throw.
 - 2. Deadbolts: Minimum 1-inch bolt throw.
- C. Lock Backset: 2-3/4 inches unless otherwise indicated.
- D. Lock Trim:
 - 1. Description: Corbin Russwin Newport, basis of design.
 - 2. Levers: Cast.
 - a. NSB.
 - 3. Escutcheons (Roses): Cast.
 - 4. Dummy Trim: Match lever lock trim and escutcheons.
- E. Strikes: Provide manufacturer's standard strike for each lock bolt or latchbolt complying with requirements indicated for applicable lock or latch and with strike box and curved lip extended to protect frame; finished to match lock or latch.
 - 1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
 - 2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
 - 3. Aluminum-Frame Strike Box: Manufacturer's special strike box fabricated for aluminum framing.
 - 4. Rabbet Front and Strike: Provide on locksets for rabbeted meeting stiles.
- F. Furnish knurling to lever on corridor side of doors leading to hazardous areas including Mechanical Rooms, Electrical Rooms, and Elevator Machine Rooms.

2.7 ELECTRIC STRIKES

A. Electric Strikes: BHMA A156.31; Grade 1; with faceplate to suit lock and frame.

2.8 ELECTROMAGNETIC LOCKS

- A. Electromagnetic Locks: BHMA A156.23; electrically powered; with electromagnet attached to frame and armature plate attached to door; full-exterior or full-interior type, as required by application indicated.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Securitron Magnalock Corporation; an ASSA ABLOY Group company.
 - b. Security Door Controls.

- c. Schlage Electronics.
- 2. Operate at 24 volts with minimum holding force of 1200 pounds.
- 3. Provide all needed accessories and mounting plates for a complete installation.
- 4. Provide manufacturer standard UL listed power supply tested to meet UL 1012 and UL 294 specifications. Power supply shall have a NEMA, UL listed enclosure with battery backup.
- 5. Interface with security and fire alarm systems.

2.9 MANUAL FLUSH BOLTS

- A. Manual Flush Bolts: BHMA A156.16; minimum 3/4-inch throw; designed for mortising into door edge.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Hager.
 - b. Ives.
 - c. Rockwood.

2.10 EXIT DEVICES AND AUXILIARY ITEMS

- A. Exit Devices and Auxiliary Items: BHMA A156.3.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Von Duprin,- Allegion.
 - b. Precision Hardware, Inc.; a Stanley company.
 - c. SARGENT Manufacturing Company; ASSA ABLOY.
 - 2. Install with sex bolts. Through bolt trim on lock and hinge side of doors.

2.11 REMOVABLE MULLION

A. Provide removable mullions where shown. Match material and finish of door frame.1. Mullions are keyed.

2.12 LOCK CYLINDERS

- A. Lock Cylinders: Tumbler type, constructed from brass or bronze, stainless steel, or nickel silver.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Corbin Russwin, Inc.; an ASSA ABLOY Group company, Access 3.

DOOR HARDWARE

- b. SARGENT Manufacturing Company; ASSA ABLOY, Signature.
- c. Schlage, Everest 29.
- B. Standard Lock Cylinders: BHMA A156.5; Grade 1 permanent cores; face finished to match lockset.
 - 1. Core Type: Interchangeable.
 - 2. Include all necessary extensions, cams, tail pieces, and hardened collars required for a compete installation.
- C. Construction Master Keys: Provide cylinders with feature that permits voiding of construction keys without cylinder removal. Provide 10 construction master keys.
- D. Construction Cores: Provide construction cores that are replaceable by permanent cores. Provide 10 construction master keys.

2.13 KEYING

- A. Keying System: Factory registered, complying with guidelines in BHMA A156.28, appendix. Provide one extra key blank for each lock. Incorporate decisions made in keying conference.
 - 1. Grand Master Key System: Change keys, a master key, and a grand master key operate cylinders.
 - a. Provide three cylinder change keys and five each of master and grand master keys.
- B. Keys: Nickel silver.
 - 1. Stamping: Permanently inscribe each key with a visual key control number and include the following notation:
 - a. Notation: "DO NOT DUPLICATE."

2.14 KEY CONTROL SYSTEM

- A. Key Control Cabinet: BHMA A156.28; metal cabinet with baked-enamel finish; containing key-holding hooks, labels, two sets of key tags with self-locking key holders, key-gathering envelopes, and temporary and permanent markers; with key capacity of 150 percent of the number of locks.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Lund Equipment Co., Inc.
 - b. MMF Industries.
 - c. TelKee; Oasis International.
 - 2. Wall-Mounted Cabinet: Grade 1 cabinet with hinged-panel door equipped with keyholding panels and pin-tumbler cylinder door lock.

- 3. Cabinet shall have a three way cross index system. Include a hardbound copy and disk, including master key listing the keys alphabetically, the hooks numerically, and the bitting changes numerically.
- 4. Include three receipt forms for each key holding hook.
- 5. Identify and tag all change keys, set up the cabinet and index system.
 - a. Key index system shall include:
 - 1) Hook number
 - 2) Architectural key symbol
 - 3) Architectural door number
 - 4) Owner's door number
 - 5) Bitting number.
 - b. Key tags shall consist of two sets: Permanent self-locking key markers and loan key smap hook type with tag colors as follows: Red fiber marker of the permanent self-locking type on which shall be engraved "File Key must not be loaned."
 - c. Furnish for each hook a white key marker with snap hooks engraved "Loan Key".
 - d. Attach the keys to the two sets of numbered tags supplied with the cabinet, permanent tag and the loan key tags.
- 6. Verify that all keys are labeled for the proper lock.
- 7. Attach a key tag to each change key and mark it with the architectural key symbol and bitting number. Each group of keys shall be contained in a key gathering envelope, which shall include the key symbol, bitting number, and architectural room number.
- B. Key Lock Boxes (Knox box): Designed for storage of 10 keys.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Knox Company.
 - 2. Coordinate lock box keying with local fire department.
 - 3. Location: Exterior of building at main entrance and at interior door of main entrance vestibule. Coordinate exact locations with Architect.

2.15 ACCESSORIES FOR PAIRS OF DOORS

- A. Coordinators: BHMA A156.3; consisting of active-leaf, hold-open lever and inactive-leaf release trigger; fabricated from steel with nylon-coated strike plates; with built-in, adjustable safety release.
- B. Carry-Open Bars: BHMA A156.3; prevent the inactive leaf from opening before the active leaf; provide polished brass or bronze carry-open bars with strike plate for inactive leaves of pairs of doors unless automatic or self-latching bolts are used.
- C. Astragals: BHMA A156.22.

2.16 SURFACE CLOSERS

- A. Surface Closers: BHMA A156.4; heavy duty, rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves and forged-steel main arm. Comply with manufacturer's written instructions for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. DORMA Americas.
 - b. SARGENT Manufacturing Company; ASSA ABLOY.
 - c. LCN Allegion.
 - 2. All closer arms are heavy duty, forged.
 - 3. Provide all required accessory items and attachments for a complete installation including special arms, soffit shoes, and drop plates. Corner bracket installations are not acceptable.
 - 4. Install with sex bolts.

2.17 MECHANICAL STOPS AND HOLDERS

- A. Wall- and Floor-Mounted Stops: BHMA A156.16.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Baldwin Hardware Corporation.
 - b. Hager Companies.
 - c. Rockwood Manufacturing Company; an ASSA ABLOY Group company.

2.18 ELECTROMAGNETIC STOPS AND HOLDERS

- A. Electromagnetic Door Holders: BHMA A156.15, Grade 1; wall-mounted electromagnetic single unit with strike plate attached to swinging door; coordinated with fire detectors and interface with fire-alarm system for labeled fire-rated door assemblies.
 - 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. Architectural Builders Hardware Mfg., Inc.
 - b. DORMA Americas.
 - c. Hager Companies.
 - d. SARGENT Manufacturing Company; ASSA ABLOY.
 - 2. Protect unit against transients and voltage surges up to 600 volts.

2.19 DOOR GASKETING

- A. Door Gasketing: BHMA A156.22; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Hager Companies.
 - b. National Guard Products, Inc.
 - c. Pemko Manufacturing Co.
 - d. Zero International, Inc.
- B. Maximum Air Leakage: When tested according to ASTM E 283 with tested pressure differential of 0.3-inch wg, as follows:
 - 1. Smoke-Rated Gasketing: 0.3 cfm/sq. ft. of door opening.
 - 2. Gasketing on Single Doors: 0.3 cfm/sq. ft. of door opening.
 - 3. Gasketing on Double Doors: 0.50 cfm per foot of door opening.
- C. All gasketing material shall be silicone or neoprene.

2.20 THRESHOLDS

- A. Thresholds: BHMA A156.21; fabricated to full width of opening indicated.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Hager Companies.
 - b. National Guard Products, Inc.
 - c. Pemko Manufacturing Co.

2.21 METAL PROTECTIVE TRIM UNITS

- A. Metal Protective Trim Units: BHMA A156.6; fabricated from 0.050-inch- thick stainless steel; with manufacturer's standard machine or self-tapping screw fasteners.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Hager Companies.
 - b. Rockwood Manufacturing Company; an ASSA ABLOY Group company.
 - c. Trimco.

2.22 FABRICATION

A. Manufacturer's Nameplate: Do not provide products that have manufacturer's name or trade name displayed in a visible location except in conjunction with required fire-rating labels and as otherwise approved by Architect.

- 1. Manufacturer's identification is permitted on rim of lock cylinders only.
- B. Base Metals: Produce door hardware units of base metal indicated, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18.
- C. Fasteners: Provide door hardware manufactured to comply with published templates prepared for machine, wood, and sheet metal screws. Provide screws that comply with commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware unless otherwise indicated.
 - 1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
 - 2. Fire-Rated Applications:
 - a. Wood or Machine Screws: For the following:
 - 1) Hinges mortised to doors or frames; use threaded-to-the-head wood screws for wood doors and frames.
 - 2) Strike plates to frames.
 - 3) Closers to doors and frames.
 - b. Steel Through Bolts: For the following unless door blocking is provided:
 - 1) Surface hinges to doors.
 - 2) Closers to doors and frames.
 - 3) Surface-mounted exit devices.
 - 3. Spacers or Sex Bolts: For through bolting of hollow-metal doors.
 - 4. Gasketing Fasteners: Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

2.23 FINISHES

- A. Provide finishes complying with BHMA A156.18 as indicated in door hardware schedule.
- 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.

PART 3 - EXECUTION

3.1 DOOR HARDWARE SCHEDULE

Set 101 CYLINDER ONLY

1 Cylinder

Set 102 PASSAGE, RATED, SINGLE DOOR

500 101	Hinges	BB1279	Hager	
1	Passage latch	ML2010, passage function	Corbin Russwin	
1	Surface closer	4011	LCN	
1	Kick plate	194S	Hager	
1	Stop		Rockwood	
Set 103	3 CLOSET. SINGLE DOOR			
	Hinges	BB1279	Hager	
1	Passage latch	ML2010, passage function	Corbin Russwin	
1	Kick plate	194S	Hager	
1	Stop		Rockwood	
Set 104	4 SINGLE, PANIC			
1	Continuous Hinge	SL24HD	Select	
1	Exit Device	CD-98-L	Von Duprin	
	Cylinders as required		T T	
1	Surface Closer	4011	LCN	
1	Kick plate	194S	Hager	
Set 21() STUDENT TOILET			
500 210	Hinges	BB1279	Hager	
1	Classroom intruder deadlock	DL4122 x M34 x M40	Corbin Russwin	
-	Cylinders as required			
1	Push plate	80S	Hager	
1	Pull plate	H84J-FB (TB pull & conceal faste	eners under push plate)	Hager
1	Surface closer	4011-H	LCN	0
1	Kick plate	194S	Hager	
1	Mop plate	194S	Hager	
1	Stop		Rockwood	
Set 211	LOCKERS			
1	Continuous hinge	SL24 HD	Select	
1	Classroom intruder deadlock	DL4122 x M34 x M40	Corbin Russwin	
	Cylinder as required			
1	Push plate	80S	Hager	
1	Pull plate	H84J-FB (TB pull & conceal faste	eners under push plate)	Hager
1	Surface closer	4011	LCN	÷
1	Kick plate	194S	Hager	
1	Mop plate	194S	Hager	

Stop

1

Rockwood

Set 314 LARGE COMMUNITY ROOM

Hinges BB1279	Hager
1 Exit device CD98L x 996L	Von Duprin
1 Cylinder - as required	Corbin Russwin
1 EL Strike	
1 Card Reader	
1 Surface closer 4111 x 180-deg	ree swing LCN
1 Kick plate 194S	Hager
1 Stop	Rockwood
Astragal by door manufacturer	Rockwood
nstrugur og utor munuruterior	
Set 320 CROSS CORRIDOR	
2 Continuous hinges SL24 HD	Select
2 Exit devices 9847-L-LBR	Von Duprin
Cylinder as required	1
2 Surface closers 4111	LCN
2 Kick plates 194S	Hager
2 Electromagnetic holders SEM 7840	LCN
Set 320A CROSS CORRIDOR	
1 Continuous hinges SL24 HD	Select
1 Exit devices 9847-L-LBR	Von Duprin
Cylinder as required	L.
1 Surface closers 4111	LCN
1 Kick plates 194S	Hager
1 Electromagnetic holders SEM 7840	LCN
Set 320B CROSS CORRIDOR	
2 Continuous hinges SL24 HD	Select
2 Exit devices 9847-L-BE-LB	R Von Duprin
Cylinder as required	*
2 Surface closers 4111	LCN
2 Kick plates 194S	Hager
2 Electromagnetic holders SEM 7840	LCN
2 Electromagnetic Locks	
Power supply as needed	
Set 321 MECHANICAL & ELECTRICAL – EXTE	ERIOR PAIR
2 Continuous hinges SL24 HD	Select
1 Lockset ML 2057	Corbin Russwin
Cylinders as required	
1 EL Strike	
1 Card Reader	
1 Power Transfer	
2 Flush bolts 555	Rockwood
2 Surface closers 4111-H-SCNS	LCN
2 Closer mounting brackets 3 28SPR (Field P	aint) Zero
1 set Weather-stripping 332CR - Head 2	& Jambs Pemko
1 Threshold 2005AT	Pemko

1	Meeting stile gasket	375CR	Pemko
2	Sill sweeps	315CN	Pemko
1	Rain drip	346C	Pemko
2	Magnetic door contacts	1078C	GES
1	Latch guard		

Astragal by door manufacturer

Set 321A MECHANICAL & ELECTRICAL – EXTERIOR SINGLE

1	Continuous hinges	SL24 HD	Select
1	Lockset	ML 2057	Corbin Russwin
	Cylinder as required		
1	EL Strike		
1	Card Reader		
1	Power Transfer		
1	Surface closers	4111-H-SCNS	LCN
1	Closer mounting brackets 3	28SPB (Field Paint)	Zero
1 set	Weather-stripping	332CR - Head & Jambs	Pemko
1	Threshold	2005AT	Pemko
1	Sill sweeps	315CN	Pemko
1	Rain drip	346C	Pemko
1	Magnetic door contacts	1078C	GES
1	Latch guard		
Astraga	al by door manufacturer		

Set 321B GREENHOUSE – EXTERIOR PAIR

2	Continuous hinges	SL24 HD	Select
1	Lockset	ML 2057	Corbin Russwin
	Cylinders as required		
2	Flush bolts	555	Rockwood
2	Surface closers	4111-H-SCNS	LCN
2	Closer mounting brackets 3	28SPB (Aluminum)	Zero
1 set	Weather-stripping	332CR - Head & Jambs	Pemko
1	Threshold	2005AT	Pemko
1	Meeting stile gasket	375CR	Pemko
2	Sill sweeps	315CN	Pemko
1	Rain drip	346C	Pemko
1	Latch guard		

Astragal by door manufacturer

Set 323 GYMNASIUM - EXTERIOR

2	Continuous hinges	SL24 HD	Select
2	Exit device	98EO Exit Only – No Dogging	Von Duprin
1	Removable mullion	KR5654 x 154 (Aluminum)	Von Duprin
1	Cylinders – as required		Corbin Russwin
2	Surface closers	4111-H-SCNS	LCN
2	Closer mounting brackets	28SPB	Zero
2	Kick plates	194S	Hager
1 set	Weather-stripping	332CR - Head & Jambs	Pemko
1	Threshold	2005AT	Pemko
1 set	Meeting stile gaskets	303AS	Pemko

2	Sill sweeps	315CN	Pemko
1	Rain drip	346C	Pemko
2	Magnetic door contacts	1078C	GES
	Astragal by door manufactur	er	
Set 32	3A GYMNASIUM - EXTER	IOR	
1	Continuous hinges	SL24 HD	Select
1	Exit device	98EO Exit Only – No Dogging	Von Duprin
1	Cylinders – as required		Corbin Russwin
1	Surface closers	4111-H-SCNS	LCN
1	Closer mounting brackets	28SPB	Zero
1	Kick plates	194S	Hager
1 set	Weather-stripping	332CR - Head & Jambs	Pemko
1	Threshold	2005AT	Pemko
1	Sill sweeps	315CN	Pemko
1	Rain drip	346C	Pemko
1	Magnetic door contacts	1078C	GES
Sat 32	4 STAID DOOD - DOUBLE		
2 2	Continuous hinges	SI 24 HD	Select
2 1	Evit device	981 - F = 9961 - BF	Von Duprin
1	Exit device	98E-1 X 770E-DE	Von Duprin
1	Removable mullion	KR9954 x 154 (Field Paint)	Von Duprin
2	Cylinder – as required		Corbin Russwin
$\frac{2}{2}$	Surface closers	4011T x 180-degree swing	L CN
$\frac{2}{2}$	Kick plates	10/S	Hager
$\frac{2}{2}$	Flectromagnetic holders	SFM 7840	ICN
2	Lieutomagnetie noiders	SEM 7040	Leiv
Set 32	5 GYMNASIUM		
2	Continuous hinges	SL24 HD	Select
1	Exit devices	98L x 996L	Von Duprin
1	Exit devices	98EO x 996L	Von Duprin
1	Removable mullion	KR9954 x 154 (Field Paint)	Von Duprin
	Cylinders – as required		Corbin Russwin
2	Surface closers	4111 x 180-degree swing	LCN
2	Kick plates	194S	Hager
1	Electromagnetic holders	SEM 7840 (at doors 155-1 & 155	5-2 only) LCN
Set 32	6 STAIR DOOR - SINGLE		
1	Continuous hinges	SL24 HD	Select
1	Exit device	98L-F x 996L-BE	Von Duprin
1	Cylinder – as required		Corbin Russwin
1	Surface closers	4011T x 180-degree swing	LCN
1	Kick plates	194S	Hager
1	Electromagnetic holders	SEM 7840	LCN
-	0		

Set 440 MAIN ENTRANCE - EXTERIOR

2	Continuous hinges	SL24 HD	Select
1	Exit device	CD-98L x 996L	Von Duprin
1	Exit device	98EO	Von Duprin
1	Removable mullion	KR5654 x 154 (Aluminum)	Von Duprin

	Cylinders – as required		Corbin Russwin
2	Surface closers	4111-SCNS	LCN
1 set	Weather-stripping	Head & Jambs	Door Mfr
1	Threshold	2005AT	Pemko
1 set	Meeting stile gaskets	303AS	Pemko
2	Sill sweeps	315CN (grey neoprene insert)	Pemko
1	Rain drip	346C	Pemko
2	Magnetic door contacts	1078C	GES
	Astragal by door manufact	urer	

Set 441 STAIR DISCHARGE – EXTERIOR - DOUBLE

2	Continuous hinges	SL24 HD	Select
2	Exit device	98EO - Exit Only – No Dogging	Von Duprin
1	Removable mullion	KR4954 x 154 (Field Paint)	Von Duprin
1	Cylinders – as required		Corbin Russwin
2	Surface closers	4111-SCNS	LCN
1 set	Weather-stripping - Head & J	lambs	Door Manufacturer
1	Threshold	2005AT	Pemko
1 set	Meeting stile gaskets	303AS	Pemko
2	Sill sweeps	315CN (grey neoprene insert)	Pemko
1	Rain drip	346C	Pemko
2	Magnetic door contacts	1078C	GES
	Astragal by door manufacture	er	

Set 441A STAIR DISCHARGE – EXTERIOR - SINGLE

1	Continuous hinges	SL24 HD	Select
1	Exit device	98EO - Exit Only – No Dogging	Von Duprin
	Cylinders – as required		Corbin Russwin
1	Surface closers	4111-SCNS	LCN
1 set	Weather-stripping - Head & J	ambs	Door Manufacturer
1	Threshold	2005AT	Pemko
1	Sill sweeps	315CN (grey neoprene insert)	Pemko
1	Rain drip	346C	Pemko
1	Magnetic door contacts	1078C	GES
	Astragal by door manufacture	er	

Set 442 MAIN ENTRANCE W/OPERATOR - EXTERIOR

Continuous hinges	SL24 HD	Select
Exit device	CD-98NL Electric Latch Retraction	on Von Duprin
Exit device	CD-98EO	Von Duprin
Removable mullion	KR5654 x 154 (Aluminum)	Von Duprin
Cylinders – as required		Corbin Russwin
Low energy operator	9542	LCN
Remote 3 Position Key Switc	h for operator	
Card Reader		
Wall-mounted actuator 8310)-3856T (pull-side)	LCN
Hardwired jamb-mounted act	uator 8310-818T (push-side)	LCN
Surface closer	4111-SCNS	LCN
Exit button	631-AL-EX-DA	Schlage
Power supply	PS900-BB-FA	Schlage
	Continuous hinges Exit device Exit device Removable mullion Cylinders – as required Low energy operator Remote 3 Position Key Switc Card Reader Wall-mounted actuator 8310 Hardwired jamb-mounted act Surface closer Exit button Power supply	Continuous hingesSL24 HDExit deviceCD-98NL Electric Latch RetractionExit deviceCD-98EORemovable mullionKR5654 x 154 (Aluminum)Cylinders – as requiredLow energy operatorLow energy operator9542Remote 3 Position Key Switch for operatorCard ReaderWall-mounted actuator8310-3856T (pull-side)Hardwired jamb-mounted actuator8310-818T (push-side)Surface closer4111-SCNSExit button631-AL-EX-DAPower supplyPS900-BB-FA

1 set	Weather-stripping - Head & J	Door Manufacturer	
1	Threshold	2005AT	Pemko
1 set	Meeting stile gaskets	303AS	Pemko
2	Sill sweeps	315CN (grey neoprene insert)	Pemko
1	Rain drip	346C	Pemko
2	Magnetic door contacts	1078C	GES
1	Stop	466 (power-operator leaf)	Rockwood
	Astragal by		door manufacturer

Function: Access Control System shunts door contacts and releases panic latch retraction and enables operator to function. Exit button at reception desk shunt door contacts and release latch retraction and enables operator to function. Panic Device power supply connected to Fire Alarm. When door is secured, pull-side actuator should not function. When door is not secured & panic is dogged inside push and pull side operation shall function. Install push-side actuator in hinge jamb adjacent to operator; install pullside actuator in wall adjacent to intercom (must be clear of the door swing).

Set 444 MAIN ENTRANCE VESTIBULE W/OPERATOR

2	Continuous hinges	SL24 HD	Select
1	Exit device	CD-98NL Electric Latch Retraction	on Von Duprin
1	Exit device	CD-98EO	Von Duprin
1	Removable mullion	KR5654 x 154 (Aluminum)	Von Duprin
4	Cylinders – as required		Corbin Russwin
1	Low energy operator	9542	LCN
1	Remote 3 Position Key Swite	ch for operator	
1	Wall-mounted actuator	8310-3856T (pull-side)	LCN
1	Jamb-mounted actuator	8310-818T (push-side)	LCN
1	Surface closer	4111-SCNS	LCN
1	Exit button	631-AL-EX-DA	Schlage
1	Power supply	PS900-BB-FA	Schlage
1	Stop	466 (power-operator leaf)	Rockwood
	Astragal by		door manufacturer

Function: Access Control System releases panic latch retraction and enables operator to function. Exit button at reception desk shunt door contacts and release latch retraction and enables operator to function. Panic Device power supply connected to Fire Alarm. When door is secured, pull-side actuator should not function. When door is not secured & panic is dogged inside push and pull side operation shall function. Install push side actuator in hinge jamb adjacent to operator; install pull-side actuator in vestibule.

Set 445 MAIN ENTRANCE VESTIBULE

2	Continuous hinges	SL24 HD	Select
1	Exit device	CD-98NL	Von Duprin
1	Exit device	CD-98EO	Von Duprin
1	Removable mullion	KR4954 x 154 (Field Paint)	Von Duprin
4	Cylinders – as required		Corbin Russwin
2	Surface closers	4111-SCNS	LCN
	Astragal by		Door manufacturer

Set 446 MAIN ENTRANCE VESTIBULE

2	Continuous hinges	SL24 HD	Select
1	Card Reader		
1	Exit device	CD-98NL Electric Latch Retraction	on Von Duprin
1	Exit device	CD-98EO	Von Duprin

1	Power transfer		
1	Removable mullion	KR5654 x 154 (Aluminum)	Von Duprin
4	Cylinders – as required		Corbin Russwin
2	Surface closers	4111-SCNS	LCN
	Astragal by		Door manufacturer
Set 51	0 OFFICE		
	Hinges	BB1279	Hager
1	Lockset	ML2055	Corbin Russwin
1	Coat hook	945P	Hager
1	Stop		Rockwood
1	Latch guard		
Set 51	2 CAEFTEDIA / RITCHEN	T	
Set 51	Continuous hingo		Salaat
1	Lockset	MI 2055	Corbin Russwin
1	Surface closer	$4011T \times 180$ degree swing	L CN
1	Kick plate	104S	Hager
1	Electromagnetic holder	SFM 7840	I CN
1	Latch guard	SLW 7040	Leiv
1	Sween	315CN	Pemko
1	Бисер	51501	I CHIKO
Set 51	3 OFFICE		
	Hinges	BB1279	Hager
1	Lockset	ML2055	Corbin Russwin
1	Surface closer	4111-H-SCNS	LCN
1	Coat hook	945P	Hager
1	Stop		Rockwood
1	Latch guard		
Set 62	1 BUILDING SERVICES &	KITCHEN - EXTERIOR	
2	Continuous hinges	SL24 HD	Select
1	Lockset	ML2057	Corbin Russwin
2	Flush bolts	555	Rockwood
1	EL Strike		Rockwood
1	Card Reader		
2	Surface closers	4111-H-SCNS	LCN
2	Closer mounting brackets	328SPB	Zero
2	Armor plates	194S	Hager
1 set	Weather-stripping	332CR – Head & Jambs	Pemko
1	Threshold	2005AT	Pemko
1	Meeting stile gasket	375CR	Pemko
2	Sill sweeps	315CN	Pemko
2	Magnetic door contacts	1078C	GES
1	Latch guard		
Sat 71	2 MUSIC BOOM		
Set /1	Hinges	BB1279	Hager
1	Lockset	ML 2057	Corbin Russwin
1	Kick nlate	1948	Hager
1	ister plate		Theor

1 set 1 1 1	Seals Automatic door bottom Stop Latch guard	350CSPK – Head & Jambs 420APKL / 4301CPKL	Pemko Pemko Rockwood
Set 71	3 CLASSROOM		
	Hinges	BB1279	Hager
1	Lookset	MI 2057	Corbin Duggue

1	Lockset	ML2057	Corbin Russwin
1	Kick plate	194S	Hager
1	Stop		Rockwood
1	Latch guard		

Set 713A COLLABORATION STAIR

Hinges	BB1279	Hager
Lockset	ML2057	Corbin Russwin
Surface closer	4011-H	LCN
Kick plate	194S	Hager
Electromagnetic holder	SEM 7840	LCN
Power supply as needed		
Latch guard		
	Hinges Lockset Surface closer Kick plate Electromagnetic holder Power supply as needed Latch guard	HingesBB1279LocksetML2057Surface closer4011-HKick plate194SElectromagnetic holderSEM 7840Power supply as neededLatch guard

Set 715 VIDEO STUDIO & MEDIA

	Hinges	BB1279	Hager
1	Lockset	ML2072	Corbin Russwin
1	Surface closer	4011-H	LCN
1	Kick plate	194S	Hager
1 set	Seals	350CSPK – Head & Jambs	Pemko
1	Threshold	151A	Pemko
1	Automatic door bottom	420APKL / 434CPKL	Pemko
1	Stop		Rockwood
1	Latch guard		

Set 716 THEATER CLASSROOM SINGLE

1	Continuous hinges	SL24 HD	Select
1	Exit devices	98L x 996L	Von Duprin
(Cylinders – as required		Corbin Russwin
1	Surface closers	4111 x 180-degree swing	LCN
1	Kick plates	194S	Hager

Set 717 THEATER CLASSROOM DOUBLE

2	Continuous hinges	SL24 HD	Select
1	Exit devices	98L x 996L	Von Duprin
1	Exit devices	98EO x 996L	Von Duprin
1	Removable mullion	KR9954 x 154 (Field Paint)	Von Duprin
	Cylinders – as required		Corbin Russwin
2	Surface closers	4111 x 180-degree swing	LCN
2	Kick plates	194S	Hager

Set 725 MEDIA - PAIR

	Hinges	BB1279	Hager
1	Lockset	ML2057	Corbin Russwin
1	Exit device	CD-98NL	Von Duprin
1	Exit device	CD-98EO	Von Duprin
1	Removable mullion	KR5654 x 154 (Aluminum)	Von Duprin
2	Surface closer	4011-H	LCN
2	Kick plates	194S	Hager
1 set	Seals	350CSPK – Head & Jambs	Pemko
1	Threshold	151A	Pemko
1	Meeting stile gasket	375CR	Pemko
2	Automatic door bottoms	420APKL / 434CPKL	Pemko
2	Stops		Rockwood
1	Latch guard		

Set 811 MECHANICAL & ELECTRICAL & IDF & MDF CLOSETS

swin

Set 812 ELECTRICAL – SINGLE

	Hinges	BB1279	Hager
1	Exit Device	CD-98-L-DT	Corbin Russwin
1	EL Strike		Rockwood
1	Card Reader		
1	Surface closer	4011 / 4111	LCN
1	Stop		Rockwood
1	Latch guard		

Set 813 MECHANICAL & ELECTRICAL & IDF & MDF CLOSETS - PAIR

	Hinges	BB1279	Hager
1	-	ML2057	Corbin Russwin
1	EL Strike		Rockwood
1	Power Transfer		
2	Flush Bolts	555	Rockwood
1	Card Reader		
2	Surface closer	4011 / 4111	LCN
2	Stop		Rockwood
1	Latch guard		
1	Power Transfer		

Set 817 STORAGE, JANITOR'S CLOSET

	Hinges	BB1279	Hager
1	Lockset	ML2057	Corbin Russwin
1	Surface closer	4011	LCN
1	Stop		Rockwood
1	Latch guard		

Set 822 STORAGE - DOUBLE

	Hinges	BB1279	Hager
1	Lockset	ML2057	Corbin Russwin
2	Flush bolts	555	Rockwood
1	Dust strike	570	Rockwood
1	Surface closer	4011-DEL / 4111-DEL	LCN
2	Kick plates	194S	Hager
2	Stops		Rockwood
1	Latch guard		
	Astragal by door manu	ıfacturer	

Set 913 STAFF RESTROOM

1 Lockset ML202	9 Corbin Russwin
1 Surface closer 4011-D	EL/4111-DEL LCN
1 Kick plate 194S	Hager
1 Coat hook 945P	Hager
1 Stop	Rockwood
1 Latch guard	

Set 914 HEALTH RESTROOM

	Hinges	BB1279	Hager
1	Lockset	ML2060	Corbin Russwin
1	Kick plate	194S	Hager
1	Coat hook	945P	Hager
1	Stop		Rockwood
1	Latch guard		

Set 915 COLLABORATIVE STORAGE ROOMS

	Hinges	BB1279	Hager
1	-	ML2072	Corbin Russwin
1	Surface closer	4011-H	LCN
1	Kick plate	194S	Hager
1	Stop	Rockwood	-
1	Latch guard		

END OF SECTION 087100

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SECTION 087113 - 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. Low-energy door operators for swinging doors.
 - 2. Guide rails.

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-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.
- D. Safety Device: A control that, to avoid injury, prevents a door from opening or closing.
- E. For automatic door terminology, see BHMA A156.19 for definitions of terms.

1.4 COORDINATION

- A. Templates: Distribute for doors, frames, and other work specified to be factory prepared and reinforced for installing automatic door operators.
- B. Coordinate hardware for doors with operators to ensure proper size, thickness, hand, function, and finish.
- C. Electrical System Roughing-in: Coordinate layout and installation of automatic door operators with connections to power supplies and access-control system.

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 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.
 - 5. Include plans, elevations, sections, and attachment details for guide rails.
- C. Samples: For each exposed product and for each color and texture specified, manufacturer's standard size.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Sample Warranties: For manufacturer's special warranties.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For automatic door operators, safety devices, and control systems, to include in maintenance manuals.

1.8 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 two hours' normal travel time from Installer's place of business to Project site.
- B. Certified Inspector Qualifications: Certified by AAADM.

1.9 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: 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. LCN; an Allegion brand, 9500 Series.
 - 2. NABCO Entrances, Inc., GT System 710
 - 3. Stanley Access Technologies, Magic-Access.
- 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. 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..
- 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 Section 087100 "Door Hardware" for hinge type for each door that door operator shall accommodate.
- D. Cover for Surface-Mounted Operators: Fabricated from 0.125-inch- thick, extruded or formed aluminum; manufacturer's standard width; with enclosed end caps, provision for maintenance access, and fasteners concealed when door is in closed position.
- E. Brackets and Reinforcements: Fabricated from aluminum with nonstaining, nonferrous shims for aligning system components.
- 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.

2.3 LOW-ENERGY DOOR OPERATORS

- A. Standard: BHMA A156.19.
- B. Performance Requirements:
 - 1. Opening Force if Power Fails: Not more than 15 lbf required to release latch if provided, not more than 30 lbf required to manually set door in motion, and not more than 15 lbf required to fully open door.
 - 2. Entrapment-Prevention Force: Not more than 15 lbf required to prevent stopped door from closing or opening.
- C. Configuration: Operator to control single swinging door.
 - 1. Traffic Pattern: Two way.
 - 2. Operator Mounting: Surface.
- D. Operation: Power opening and spring closing. Provide time delay for door to remain open before initiating closing cycle as required by BHMA A156.19. When not in automatic mode, door operator shall function as manual door closer, with or without electrical power.
- E. Operating System: Electromechanical.
- F. Microprocessor Control Unit: Solid-state controller.
- G. Features:
 - 1. Adjustable opening 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. Obstruction recycle.
 - 8. On-off/hold-open switch to control electric power to operator; key operated.
- H. Activation Device: Push-plate switch on each side of door to activate door operator.
- I. Exposed Finish: Finish matching door and frame.
 - 1. Color: As selected by Architect from full range of industry colors and color densities.

2.4 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - 1. Extrusions: ASTM B 221.
 - 2. Sheet: ASTM B 209.

- 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. 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: Square push plate with 4-by-4-inch junction box.
 - a. Mounting: As indicated on Drawings.
 - 2. Push-Plate Material: Stainless steel as selected by Architect from manufacturer's full range.
 - 3. Message: International symbol of accessibility and "Push to Open."
- C. 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: Decals.
- 2. Provide sign materials with instructions for field application when operators are installed.

2.8 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying strippable, temporary protective covering before shipping.
- B. Apply organic and anodic finishes to formed metal after fabrication unless otherwise indicated.
- 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 range of approved Samples and are assembled or installed to minimize contrast.

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 and less than 3/4 inch 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.
- B. Controls: Install activation and safety devices according to manufacturer's written instructions and cited BHMA standard for operator type and direction of pedestrian travel. Connect control wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

- C. Access-Control System: Connect operators to access-control system as specified in Section 281300 "Access Control."
- D. Signage: Apply on both sides of each door as required by cited BHMA standard for type of door operator and direction of pedestrian travel.
- E. Guide Rails: Install according to BHMA A156.10, including Appendix A and manufacturer's written instructions unless otherwise indicated.

3.3 FIELD QUALITY CONTROL

- A. 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.
- B. Automatic door operators will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

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 087113

SECTION 088000 - 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:
 - 1. Glass for windows, doors, interior borrowed lites, storefront framing, and glazed curtain walls.
 - 2. Glazing sealants and accessories.
- B. Related Requirements:
 - 1. Section 084126 "All-Glass Entrances and Storefronts."
 - 2. Section 088300 "Mirrors."

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. IBC: International Building Code.
- D. Interspace: Space between lites of an insulating-glass unit.

1.4 COORDINATION

A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.5 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 lowemitting materials.
- C. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches square.
- D. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: For glass.
- C. Product Test Reports: For insulating glass, for tests performed by a qualified testing agency.
- D. Sample Warranties: For special warranties.

1.7 QUALITY ASSURANCE

- A. 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.
- B. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for materials and execution.
 - 1. Install glazing in mockups specified in Section 084413 "Glazed Aluminum Curtain Walls" to match glazing systems required for Project, including glazing methods.
 - 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. 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 instructions for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.9 FIELD 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 are below 40 deg F.

1.10 WARRANTY

- A. Manufacturer's Special Warranty for Coated-Glass Products: 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 for 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 for 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 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Guardian Industries Corp.; SunGuard.
 - 2. JE Berkowitz, LP.
 - 3. Oldcastle BuildingEnvelopeTM.
 - 4. Pilkington North America.
 - 5. PPG Industries, Inc.
 - 6. Viracon, Inc.
- B. Source Limitations for Glass: Obtain from single source from single manufacturer for each glass type.
- C. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

2.2 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. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined according to the IBC and ASTM E 1300.
 - 1. Design Wind Pressures: As indicated on Drawings.
 - 2. Design Snow Loads: As indicated on Drawings.
 - 3. 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.
 - 4. 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, whichever is less.
 - 5. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.
- C. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.
- D. 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 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.
 - 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.

2.3 GLASS PRODUCTS, GENERAL

- A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.
 - 1. GANA Publications: "Laminated Glazing Reference Manual" and "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."

- B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction or manufacturer. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- C. Thickness: Where glass thickness is indicated, it is a minimum.
- D. Strength: Where annealed float glass is indicated, provide annealed float glass, heatstrengthened float glass, or fully tempered float glass. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass. Where fully tempered float glass is indicated, provide fully tempered float glass.

2.4 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) or Class 2 (tinted) as indicated, 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-Strengthened Float Glass: ASTM C 1048, Kind HS (heat strengthened), Type I, Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, 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.
- D. Silicone-Coated Spandrel Glass: ASTM C 1048, Type I, Condition C, Quality-Q3.

2.5 LAMINATED GLASS

- A. Burglar Resistant Laminated Glass: ASTM C 1172. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation. Meet UL 972 for Burglary
 - 1. Construction: Laminate glass with polyvinyl butyral interlayer to comply with interlayer manufacturer's written instructions.
 - 2. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
 - 3. Interlayer Color: Clear unless otherwise indicated.

2.6 INSULATING GLASS

- A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190.
 - 1. Sealing System: Dual seal, with manufacturer's standard primary and secondary sealants.
 - 2. Spacer: Manufacturer's standard spacer material and construction.
 - 3. Desiccant: Molecular sieve or silica gel, or a blend of both.

2.7 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.

2.8 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, with 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).

2.9 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.
 - 1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
 - a. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
- 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.

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 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. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.
- C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- D. 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.
- E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- F. Provide spacers for glass lites where length plus width is larger than 50 inches.
 - 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 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.
- G. 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.
- H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- I. Set glass lites with proper orientation so that coatings face exterior or interior as specified.
- J. 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.
- K. 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, then to jambs. Cover horizontal framing joints by applying tapes to jambs, 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 CLEANING AND PROTECTION

- A. Immediately after installation remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. 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.
 - 1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.

- C. Remove and replace glass that is damaged during construction period.
- D. Wash glass on both exposed surfaces 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.

3.8 MONOLITHIC GLASS SCHEDULE

- A. Glass Type GL-1: Clear fully tempered float glass.
 - 1. Minimum Thickness: 6 mm.
 - 2. Safety glazing required.

3.9 INSULATING GLASS SCHEDULE

- A. Glass Type GL-2: Low-E-coated, clear insulating glass.
 - 1. Overall Unit Thickness: 1 inch.
 - 2. Minimum Thickness of Each Glass Lite: 6 mm.
 - 3. Outdoor Lite: Heat-strengthened float glass.
 - 4. Interspace Content: Air.
 - 5. Indoor Lite: Annealed float glass.
 - 6. Low-E Coating: Pyrolytic or sputtered on second or third surface.
 - 7. Winter Nighttime U-Factor: 0.47 maximum.
 - 8. Summer Daytime U-Factor: 0.49 maximum.
 - 9. Visible Light Transmittance: 77 percent minimum.
 - 10. Solar Heat Gain Coefficient: 0.70 maximum.
 - 11. Safety glazing required.
- B. Glass Type GL-3: Low-E-coated, clear insulating glass.
 - 1. Overall Unit Thickness: 1 inch.
 - 2. Minimum Thickness of Each Glass Lite: 6 mm.
 - 3. Outdoor Lite: Heat-strengthened float glass.
 - 4. Interspace Content: Air.
 - 5. Indoor Lite: Annealed float glass.
 - 6. Low-E Coating: Pyrolytic or sputtered on second or third surface.
 - 7. Winter Nighttime U-Factor: 0.31 maximum.
 - 8. Summer Daytime U-Factor: 0.29 maximum.
 - 9. Visible Light Transmittance: 65 percent minimum.
 - 10. Solar Heat Gain Coefficient: 0.39 maximum.
- A. Glass Type GL-4: Low-E-coated, clear insulating glass.
 - 1. Overall Unit Thickness: 1 inch.
 - 2. Minimum Thickness of Each Glass Lite: 6 mm.
 - 3. Outdoor Lite: Heat-strengthened float glass.
 - 4. Interspace Content: Air.
 - 5. Indoor Lite: Annealed float glass.
 - 6. Low-E Coating: Pyrolytic or sputtered on second or third surface.
 - 7. Winter Nighttime U-Factor: 0.31 maximum.
 - 8. Summer Daytime U-Factor: 0.29 maximum.

- 9. Visible Light Transmittance: 55 percent minimum.
- 10. Solar Heat Gain Coefficient: 0.41 maximum.
- 11. Safety glazing required.
- B. Glass Type GL-8: Ceramic-coated, low-E, insulating spandrel glass.
 - 1. Coating Color: As selected by Architect from manufacturer's full range.
 - 2. Overall Unit Thickness: 1 inch.
 - 3. Minimum Thickness of Each Glass Lite: 6 mm.
 - 4. Outdoor Lite: Heat-strengthened float glass.
 - 5. Interspace Content: Air.
 - 6. Indoor Lite: Heat-strengthened float glass.
 - 7. Low-E Coating: Pyrolytic or sputtered on second or third surface.
 - 8. Opaque Coating Location: Fourth surface.

3.10 INSULATING-LAMINATED-GLASS SCHEDULE

- A. Glass Type GL-5: Low-E-coated, clear insulating laminated glass.
 - 1. Overall Unit Thickness: 1 inch.
 - 2. Minimum Thickness of Indoor Lite: 6 mm.
 - 3. Indoor Lite: Heat-strengthened float glass.
 - 4. Interspace Content: Air.
 - 5. Outdoor Lite: Clear laminated glass with two plies of heat-strengthened float glass.
 - a. Minimum Thickness of Each Glass Ply: 3 mm.
 - b. Interlayer Thickness: 0.060 inch.
 - 6. Low-E Coating: Pyrolytic or sputtered on second or third surface.
 - 7. Winter Nighttime U-Factor: 0.47 maximum.
 - 8. Summer Daytime U-Factor: 0.49 maximum.
 - 9. Visible Light Transmittance: 77 percent minimum.
 - 10. Solar Heat Gain Coefficient: 0.70 maximum.
 - 11. Safety glazing required.
- B. Glass Type GL-6: Low-E-coated, clear insulating laminated glass.
 - 1. Overall Unit Thickness: 1 inch.
 - 2. Minimum Thickness of Indoor Lite: 6 mm.
 - 3. Indoor Lite: Heat-strengthened float glass.
 - 4. Interspace Content: Air.
 - 5. Outdoor Lite: Clear laminated glass with two plies of heat-strengthened float glass.
 - a. Minimum Thickness of Each Glass Ply: 3 mm.
 - b. Interlayer Thickness: 0.060 inch.
 - 6. Low-E Coating: Pyrolytic or sputtered on second or third surface.
 - 7. Winter Nighttime U-Factor: 0.31 maximum.
 - 8. Summer Daytime U-Factor: 0.29 maximum.
 - 9. Visible Light Transmittance: 65 percent minimum.
 - 10. Solar Heat Gain Coefficient: 0.39 maximum.
 - 11. Safety glazing required.
- C. Glass Type GL-7: Low-E-coated, clear insulating laminated glass.
 - 1. Overall Unit Thickness: 1 inch.
 - 2. Minimum Thickness of Indoor Lite: 6 mm.

- 3. Indoor Lite: Heat-strengthened float glass.
- 4. Interspace Content: Air.
- 5. Outdoor Lite: Clear laminated glass with two plies of heat-strengthened float glass.
 - a. Minimum Thickness of Each Glass Ply: 3 mm.
 - b. Interlayer Thickness: 0.060 inch.
- 6. Low-E Coating: Pyrolytic or sputtered on second or third surface.
- 7. Winter Nighttime U-Factor: 0.31 maximum.
- 8. Summer Daytime U-Factor: 0.29 maximum.
- 9. Visible Light Transmittance: 55 percent minimum.
- 10. Solar Heat Gain Coefficient: 0.41 maximum.
- 11. Safety glazing required.
- D. Glass Type GL-9: Ceramic-coated, low-E, insulating laminated spandrel glass.
 - 1. Coating Color: As selected by Architect from manufacturer's full range.
 - 2. Overall Unit Thickness: 1 inch.
 - 3. Minimum Thickness of Each Glass Lite: 6 mm.
 - 4. Outdoor Lite: Clear laminated glass with two plies of heat-strengthened float glass.
 - a. Minimum Thickness of Each Glass Ply: 3 mm.
 - b. Interlayer Thickness: 0.060 inch.
 - 5. Interspace Content: Air.
 - 6. Indoor Lite: Heat-strengthened float glass.
 - 7. Low-E Coating: Pyrolytic or sputtered on second or third surface.
 - 8. Opaque Coating Location: Fourth surface.
- E. Glass Type GL-10: Low-E-coated, clear insulating laminated glass.
 - 1. Overall Unit Thickness: 1 inch.
 - 2. Minimum Thickness of Indoor Lite: 6 mm.
 - 3. Indoor Lite: Clear laminated glass with two plies of heat-strengthened float glass.
 - a. Minimum Thickness of Each Glass Ply: 3 mm.
 - b. Interlayer Thickness: 0.060 inch.
 - 4. Interspace Content: Air.
 - 5. Outdoor Lite: Clear laminated glass with two plies of heat-strengthened float glass.
 - a. Minimum Thickness of Each Glass Ply: 3 mm.
 - b. Interlayer Thickness: 0.060 inch.
 - 6. Low-E Coating: Pyrolytic or sputtered on second or third surface.
 - 7. Winter Nighttime U-Factor: 0.47 maximum.
 - 8. Summer Daytime U-Factor: 0.49 maximum.
 - 9. Visible Light Transmittance: 77 percent minimum.

END OF SECTION 088000

SECTION 088300 - MIRRORS

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 types of silvered flat glass mirrors:
 1. Film-backed glass mirrors qualifying as safety glazing.
- B. Related Requirements:
 1. Section 102800 "Toilet, Bath, and Laundry Accessories" for metal-framed mirrors.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Mirrors. Include description of materials and process used to produce each type of silvered flat glass mirror specified that indicates sources of glass, glass coating components, edge sealer, and quality-control provisions.
- B. Sustainable Design Submittals:
 - 1. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
- C. Shop Drawings: Include mirror elevations, edge details, mirror hardware, and attachment details.

1.4 INFORMATIONAL SUBMITTALS

- A. Preconstruction Test Reports: From mirror manufacturer indicating that mirror mastic was tested for compatibility and adhesion with mirror backing and substrates on which mirrors are installed.
- B. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For mirrors to include in maintenance manuals.

1.6 PRECONSTRUCTION TESTING

- A. Preconstruction Mirror Mastic Compatibility Test: Submit mirror mastic products to mirror manufacturer for testing to determine compatibility of mastic with mirror backing.
 - 1. Testing is not required if data are submitted based on previous testing of mirror mastic products and mirror backing matching those submitted.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect mirrors according to mirror manufacturer's written instructions and as needed to prevent damage to mirrors from moisture, condensation, temperature changes, direct exposure to sun, or other causes.
- B. Comply with mirror manufacturer's written instructions for shipping, storing, and handling mirrors as needed to prevent deterioration of silvering, damage to edges, and abrasion of glass surfaces and applied coatings. Store indoors.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not install mirrors until ambient temperature and humidity conditions are maintained at levels indicated for final occupancy.

1.9 WARRANTY

- A. Special Warranty: Manufacturer agrees to replace mirrors that deteriorate within specified warranty period. Deterioration of mirrors is defined as defects developed from normal use that are not attributed to mirror breakage or to maintaining and cleaning mirrors contrary to manufacturer's written instructions. Defects include discoloration, black spots, and clouding of the silver film.
 - 1. Warranty Period: Five years from date of manufacture.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Mirrors: Obtain mirrors from single source from single manufacturer.
- B. Source Limitations for Mirror Accessories: Obtain mirror glazing accessories from single source.

2.2 SILVERED FLAT GLASS MIRRORS

- A. Mirrors, General: ASTM C 1503.
- B. Annealed Monolithic Glass Mirrors: Mirror Select Quality, clear.

- 1. Nominal Thickness: 6.0 mm.
- C. Safety Glazing Products: For film-backed mirrors, provide products that comply with 16 CFR 1201, Category II.

2.3 MISCELLANEOUS MATERIALS

- A. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- B. Edge Sealer: Coating compatible with glass coating and approved by mirror manufacturer for use in protecting against silver deterioration at mirrored glass edges.
- C. Mirror Mastic: An adhesive setting compound, asbestos-free, produced specifically for setting mirrors and certified by both mirror and mastic manufacturer as compatible with glass coating and substrates on which mirrors will be installed.
 - 1. Adhesives shall have a VOC content of 70 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."
- D. Film Backing for Safety Mirrors: Film backing and pressure-sensitive adhesive; both compatible with mirror backing paint as certified by mirror manufacturer.

2.4 MIRROR HARDWARE

- A. Aluminum J-Channels: Aluminum extrusions with a return deep enough to produce a glazing channel to accommodate mirrors of thickness indicated and in lengths required to cover edges of mirrors in a single piece.
 - 1. Bottom Trim: J-channels formed with front leg and back leg not less than 3/8 and 7/8 inch in height, respectively, and a thickness of not less than 0.04 inch.
 - 2. Top Trim: J-channels formed with front leg and back leg not less than 5/8 and 1 inch in height, respectively, and a thickness of not less than 0.04 inch.
 - 3. Finish: Clear bright anodized.
- B. Anchors and Inserts: Provide devices as required for mirror hardware installation. Provide toothed or lead-shield, expansion-bolt devices for drilled-in-place anchors. Provide galvanized anchors and inserts for applications on inside face of exterior walls and where indicated.

2.5 FABRICATION

- A. Fabricate mirrors in the shop to greatest extent possible.
- B. Fabricate cutouts for notches and holes in mirrors without marring visible surfaces. Locate and size cutouts so they fit closely around penetrations in mirrors.

- C. Mirror Edge Treatment: Rounded polished.
 - 1. Seal edges of mirrors with edge sealer after edge treatment to prevent chemical or atmospheric penetration of glass coating.
 - 2. Require mirror manufacturer to perform edge treatment and sealing in factory immediately after cutting to final sizes.
- D. Film-Backed Safety Mirrors: Apply film backing with adhesive coating over mirror backing paint, as recommended in writing by film-backing manufacturer, to produce a surface free of bubbles, blisters, and other imperfections.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, over which mirrors are to be mounted, with Installer present, for compliance with installation tolerances, substrate preparation, and other conditions affecting performance of the Work.
- B. Verify compatibility with and suitability of substrates, including compatibility of existing finishes or primers with mirror mastic.
- C. Proceed with installation only after unsatisfactory conditions have been corrected and surfaces are dry.

3.2 PREPARATION

A. Comply with mastic manufacturer's written installation instructions for preparation of substrates, including coating substrates with mastic manufacturer's special bond coating where applicable.

3.3 INSTALLATION

- A. General: Install mirrors to comply with mirror manufacturer's written instructions and with referenced GANA publications. Mount mirrors accurately in place in a manner that avoids distorting reflected images.
 - 1. GANA Publications: "Laminated Glazing Reference Manual," "Glazing Manual" and "Mirrors, Handle with Extreme Care: Tips for the Professional on the Care and Handling of Mirrors."
- B. Provide a minimum airspace of 1/8 inch between back of mirrors and mounting surface for air circulation between back of mirrors and face of mounting surface.
- C. Install mirrors withmirror hardware. Attach mirror hardware securely to mounting surfaces with mechanical fasteners installed with anchors or inserts as applicable. Install fasteners so heads do not impose point loads on backs of mirrors.

- 1. Aluminum J-Channels: Provide setting blocks 1/8 inch thick by 4 inches long at quarter points. To prevent trapping water, provide, between setting blocks, two slotted weeps not less than 1/4 inch wide by 3/8 inch long at bottom channel.
- 2. Aluminum J-Channels and Cleat: Fasten J-channel directly to wall and attach top trim to continuous cleat fastened directly to wall.
- 3. Mirror Clips: Place a felt or plastic pad between mirror and each clip to prevent spalling of mirror edges. Locate clips so they are symmetrically placed and evenly spaced.
- 4. Install mastic as follows:
 - a. Apply barrier coat to mirror backing where approved in writing by manufacturers of mirrors and backing material.
 - b. Apply mastic to comply with mastic manufacturer's written instructions for coverage and to allow air circulation between back of mirrors and face of mounting surface.
 - c. After mastic is applied, align mirrors and press into place while maintaining a minimum airspace of 1/8 inch between back of mirrors and mounting surface.

3.4 CLEANING AND PROTECTION

- A. Protect mirrors from breakage and contaminating substances resulting from construction operations.
- B. Do not permit edges of mirrors to be exposed to standing water.
- C. Maintain environmental conditions that prevent mirrors from being exposed to moisture from condensation or other sources for continuous periods of time.
- D. Clean exposed surface of mirrors not more than four days before date scheduled for inspections that establish date of Substantial Completion. Clean mirrors as recommended in writing by mirror manufacturer.

END OF SECTION 088300

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SECTION 089119 - 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.

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. Vertical Louver: Louver with vertical blades (i.e., the axes of the blades are vertical).
- D. 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.
- E. Wind-Driven-Rain-Resistant Louver: Louver that provides specified wind-driven rain performance, as determined by testing according to AMCA 500-L.

1.4 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.

1.5 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.

1.6 FIELD CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

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: Determine loads based on pressures as indicated on Drawings.
- B. 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.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
 - 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
- D. 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, Wind-Driven-Rain-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. Airolite Company, LLC (The).
- b. Construction Specialties, Inc.
- c. Industrial Louvers Inc.
- d. Ruskin Company.
- 2. Louver Depth: 5 inches.
- 3. Frame and Blade Nominal Thickness: Not less than 0.080 inch.
- 4. Louver Performance Ratings:
 - a. Free Area: Not less than 5.0 sq. ft. for 48-inch- wide by 48-inch- high louver.
 - b. Air Performance: Not more than 0.10-inch wg static pressure drop at 600-fpm freearea intake velocity.
 - c. Wind-Driven Rain Performance: Not less than 99 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 500 fpm.
- 5. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

2.4 LOUVER SCREENS

- A. General: Provide screen at each exterior louver.
 - 1. Screen Location for Fixed Louvers: Interior face.
 - 2. Screening Type: Bird screening.
- 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 type 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.
 - 3. Type: Non-rewirable, U-shaped frames.
- D. Louver Screening for Aluminum Louvers:
 - 1. Bird Screening: Aluminum, 1/2-inch- square mesh, 0.063-inch wire.

2.5 BLANK-OFF PANELS

- A. Uninsulated, Blank-Off Panels: Metal sheet attached to back of louver.
 - 1. Aluminum sheet for aluminum louvers, not less than 0.050-inch nominal thickness.
 - 2. Panel Finish: Same finish applied to louvers.
- B. Insulated, Blank-Off Panels: Laminated panels consisting of an 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 Insert insulation material.
 - 4. Edge Treatment: Trim perimeter edges of blank-off panels with louver manufacturer's standard channel frames, 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 finish applied to louvers.

2.6 MATERIALS

- A. Aluminum Extrusions: ASTM B 221, Alloy 6063-T5, T-52, or T6.
- B. 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.
- C. Fasteners: Use types and sizes to suit unit installation conditions.
 - 1. Use hex-head or Phillips pan-head screws for exposed fasteners unless otherwise indicated.
 - 2. For fastening aluminum, use aluminum or 300 series stainless-steel fasteners.
 - 3. For color-finished louvers, use fasteners with heads that match color of louvers.
- D. Postinstalled Fasteners for Concrete and Masonry: Torque-controlled expansion anchors, made from stainless-steel components, with capability to sustain, without failure, a load equal to 4 times the loads imposed, for concrete, or 6 times the load imposed for masonry, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
- E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.7 FABRICATION

- A. Factory assemble louvers to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- B. Vertical Assemblies: Where height of louver units exceeds fabrication and handling limitations, fabricate units to permit field-bolted assembly with close-fitting joints in jambs and mullions, reinforced with splice plates.
 - 1. Continuous Vertical Assemblies: Fabricate units without interrupting blade-spacing pattern unless horizontal mullions are indicated.
- C. Maintain equal louver blade spacing to produce uniform appearance.
- D. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.
- E. Include supports, anchorages, and accessories required for complete assembly.
- F. Provide vertical mullions of type and at spacings indicated, but not more than is recommended by manufacturer, or 72 inches o.c., whichever is less.
 - 1. Exposed Mullions: Where indicated, provide units with exposed mullions of same width and depth as louver frame. Where length of louver exceeds fabrication and handling limitations, provide interlocking split mullions designed to permit expansion and contraction.

- G. Provide subsills made of same material as louvers or extended sills for recessed louvers.
- H. Join frame members to each other and to fixed louver blades with fillet welds concealed from view, threaded fasteners, or both, as standard with louver manufacturer unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.8 ALUMINUM FINISHES

- A. Finish louvers after assembly.
- B. High-Performance Organic Finish: Three-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 50 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.
 - 1. Color and Gloss: As selected by Architect from manufacturer's full range.

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 089119

SECTION 090320 - HISTORIC TREATMENT OF PLASTER

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. Repair and replacement with interior gypsum plaster where required to maintain existing exposed original plaster finishes.
 - a. Including but not limited to; Building A interior first floor high walls at ends of former gymnasium; Building B interior walls at full height of Stairs B-1 and B-2; Building B interior walls and cornice of Vestibule 100A.
 - 2. Replication of cast gypsum plasterwork.
 - a. Prior to the beginning of any Hazardous Material Abatement operations this contractor shall prepare and submit for approval and record a 36" section of a mold and a casting of the historic plaster cornice in the B-Building Vestibule 100A.
- B. Related Requirements:
 - 1. Section 013591 "Historic Treatment Procedures" for general historic treatment requirements.

1.3 ALLOWANCES

- A. Allowances for historic treatment of plaster are specified in Section 012100 "Allowances."
 - 1. Perform historic treatment of plaster under quantity allowances and only as authorized. Authorized work includes work required by Drawings and Specifications and work as directed in writing by Architect.
 - 2. Notify Architect weekly of extent of work performed that is attributable to quantity allowances.
 - 3. Perform work that exceeds quantity allowances only as authorized by Change Orders.
- B. Historic plaster repair and replacement is part of historic plaster repair allowance unless otherwise indicated.

1.4 UNIT PRICES

A. Work of this Section is affected by unit prices specified in Section 012200 "Unit Prices."
1. Unit prices apply to authorized work covered by quantity allowances.

2. Unit prices apply to additions to and deletions from Work as authorized by Change Orders.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review minutes of Preliminary Historic Treatment Conference that pertain to historic treatment of plaster.

1.6 SEQUENCING AND SCHEDULING

- A. Perform historic treatment of plaster in the following sequence, which includes work specified in this and other Sections:
 - 1. Dismantle existing surface-mounted objects and hardware that overlie plaster surfaces except items indicated to remain in place. Tag items with location identification and protect.
 - 2. Verify that temporary protections have been installed.
 - 3. Examine condition of plaster surfaces.
 - 4. Clean plaster surface and remove paint and other finishes to the extent required.
 - 5. Repair and replace existing plaster and supports to the degree required for a uniform, tightly adhered surface on which to paint or apply other finishes.
 - 6. Cure repaired surfaces and allow them to dry for proper finishing.
 - 7. Paint and apply other finishes.
 - 8. Reinstall dismantled surface-mounted objects and hardware unless otherwise indicated.

1.7 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include recommendations for product application and use.
- B. Shop Drawings: For each configuration of new or replicated plaster molding and ornament required for the work.
 - 1. Include plans, elevations, and sections that show locations and extent of work.
 - 2. Show full-size details of configurations, joint locations, and attachments to other work.
- C. Samples for Initial Selection: For each exposed product that will be exposed and not be painted or otherwise finished and for each color and texture specified.
- D. Samples for Verification: For the following products:
 - 1. Cast Plaster: Each type and form of cast-plaster fabrication.
 - a. Patterns for Casting: Before manufacturing cast-plaster fabrications, submit the actual patterns from which molds will be made for casting new units. Package and ship to prevent loss or damage or make patterns available for inspection by Architect at fabrication plant.
 - b. Cast-Plaster Fabrications: Provide one unit of each shape and surface design, suitable and ready for installation.

- 2. Linear Moldings: 36 inch long section of each configuration wet-applied molding with finished joint. Show complete pattern and applied nonlinear cast-plaster shapes, if any.
- 3. Accessories: Each type in manufacturer's standard size.

1.8 QUALITY ASSURANCE

- A. Cast-Plaster Manufacturer Qualifications: A firm regularly engaged in manufacturing customcast plasterwork for building restoration purposes, of same types and of similar size, complexity, and tolerances as those required for the Work.
- B. Plasterwork Historic Treatment Program: Prepare a written, detailed description of materials, methods, equipment, and sequence of operations to be used for historic treatment work and protection of surrounding materials and Project site.
 - 1. Include methods and procedures to protect plastered surfaces from damage caused by construction operations, including, but not limited to, exposure to moisture, vibration, mechanical damage, and soiling.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver packaged materials to Project site in manufacturer's original and unopened containers, labeled with manufacturer's name and type of products.
- B. Store materials on elevated platforms, under cover, and in a dry location with ambient temperatures continuously maintained at not less than 45 deg F.
- C. Store hydrated lime and factory-prepared lime putty in manufacturer's original and unopened containers. Discard lime if containers have been damaged or have been opened for more than two days.
- D. Store materials not in use in tightly covered containers.
- E. Store sand where grading and other required characteristics can be maintained and contamination avoided.
- F. Handle cast-plaster fabrications to prevent overstressing, chipping, defacement, and other damage.

1.10 FIELD CONDITIONS

- A. Comply with plaster-material manufacturers' written instructions. For gypsum plaster, also comply with ASTM C 842 requirements.
- B. Temperatures: Maintain temperatures in work areas at not less than 55 deg For greater than 80 deg F for at least seven days before application of plaster, continuously during application, and for seven days after plaster has set or until plaster has dried.

- C. Conditioning: Acclimatize cast-plaster fabrications to ambient temperature and humidity of spaces in which they are installed. Remove packaging and move units into installation spaces not less than 48 hours before installing them.
- D. Field Measurements: Where cast-plaster fabrications 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.
- E. Avoid conditions that result in plaster drying out too quickly.
 - 1. Distribute heat evenly; prevent concentrated or uneven heat on plaster.
 - 2. Maintain relative humidity levels for prevailing ambient temperature that produce normal drying conditions.
 - 3. Ventilate work areas in a manner that prevents drafts of air from contacting surfaces during plaster application and until plaster is dry.

1.11 REUSABLE PLASTER MOLDS AND PATTERNS

- A. On completion of the manufacturing of cast units, deliver one unused mold and pattern of each shape and size of unit delivered to Project site. Deliver to a location and at a time determined by Owner, to become Owner's property.
- B. Have molds delivered carefully packed; protected from dirt, moisture, and breakage; so as to arrive in usable, undamaged condition and enable long-term storage and possible future use.

PART 2 - PRODUCTS

2.1 GYPSUM PLASTER MATERIALS

- A. Gypsum Materials:
 - 1. High-Strength Gypsum Neat Plaster: ASTM C 28/C 28M; with a minimum, average, dry compressive strength of 2800 psi per ASTM C 472 for a mix of 100 lb of plaster and 2 cu. ft. of sand.
 - 2. High-Strength Gypsum Gaging Plaster: ASTM C 28/C 28M; with a minimum, average, dry compressive strength of 5000 psi per ASTM C 472 for a neat mix.
 - 3. Gypsum Ready-Mixed Finish Plaster: ASTM C 28/C 28M; manufacturer's standard, millmixed, gaged, interior finish.
- B. Hydrated Lime: ASTM C 206, Type S.
- C. Aggregates:
 - 1. Aggregate for Base-Coat Plasters: ASTM C 35, sand.
 - 2. Aggregate for Float Finishes: ASTM C 35, sand; graded per ASTM C 842.
- D. Fabric Reinforcing: Coarse, open-weave, alkali-resistant fiberglass or polypropylene fabric; free of grease, waxes, and oils.
E. Bonding Compound: ASTM C 631.

2.2 LATH

- A. Metal Lath:
 - Expanded-Metal Lath: ASTM C 847, cold-rolled carbon-steel sheet, ASTM A 653/A 653M, G60, hot-dip galvanized zinc coated.
 a. Diamond-Mesh Lath: Self-furring, 3.4 lb/sq. yd.

2.3 TRIM ACCESSORIES

- A. General: According to ASTM C 841 for gypsum plaster; coordinate depth of trim and accessories with thicknesses and number of plaster coats required.
- B. Metal Accessories:
 - 1. Cornerite: Fabricated from expanded-metal lath with ASTM A 653/A 653M, G60, hotdip galvanized zinc coating.
 - 2. Cornerbeads: Fabricated from zinc-coated (galvanized) steel.
 - a. Small nose cornerbead with expanded flanges; use unless otherwise indicated.
 - 3. Casing Beads: Fabricated from zinc-coated (galvanized) steel; square-edged style; with expanded flanges.
 - 4. Control Joints: Fabricated from zinc-coated (galvanized) steel; one-piece-type, folded pair of unperforated screeds in M-shaped configuration; with perforated flanges and removable protective tape on plaster face of control joint.
 - 5. Expansion Joints: Fabricated from zinc-coated (galvanized) steel; folded pair of unperforated screeds in M-shaped configuration; with expanded flanges.

2.4 MISCELLANEOUS MATERIALS

- A. Water for Mixing and Finishing Plaster: Potable and free of substances capable of affecting plaster set or of damaging plaster, lath, or accessories.
- B. Fasteners for Attaching Lath to Substrates:1. For Gypsum Plaster: ASTM C 841.
- C. Wire Ties: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, not less than 0.0475inchdiameter, unless otherwise indicated.
- D. Plaster-Stabilization Materials: Acrylic emulsion(s) and related installation products shall have proven effectiveness in reattaching delaminated plaster and shall have been used previously by historic treatment specialist with successful results.
 - 1. Acrylic Emulsion(s), General: Aqueous emulsion(s) of acrylic polymer, adhesive to plaster and plaster substrates, nontoxic, and non-reemulsifiable after curing.
 - 2. Prewet Solution: Low-viscosity acrylic emulsion.
 - 3. Adhesive: Thickened acrylic emulsion; thickener as recommended in writing by resin manufacturer and historic treatment specialist.

- E. General: Fabricate cast-plaster units with uniformly finished surfaces and sharply defined details; repair hollows, voids, scratches, and other surface imperfections.
 - 1. Fabricate units of sizes and shapes to match similar existing plasterwork unless otherwise indicated.
 - 2. Fabricate units in lengths and sizes that minimize number of joints between abutting units unless otherwise indicated.
 - 3. Configure joints between units so that they may be finished flush or otherwise concealed inconspicuously.
 - 4. Maximum deviation from true line, size, or shape shall be 1/16 inch, noncumulative.
- F. Composition: Fabricate units from gypsum-plaster materials. Reinforce units with fabric reinforcing.
 - 1. Plaster Face: Molding plaster with or without aggregate as is standard with manufacturer for required surface finish.
 - 2. Plaster Backup: Molding plaster with or without aggregate, but with high-proportion of plaster-saturated fiber or fabric reinforcing as is standard with manufacturer.
- G. Thickness: Not less than 3/8" thickness of plaster material at any point.
- H. Finish: Smooth for paint finish.
- I. Embedments: Incorporate manufacturer's standard embedments for attaching units to supporting elements unless otherwise indicated. Place embedments to develop the full strength of cast-plaster fabrications. Cover embedments with not less than 3/8" thickness of reinforced plaster material.
- J. Joint-Treatment Materials: As recommended in writing by manufacturer.

PART 3 - EXECUTION

3.1 HISTORIC TREATMENT OF PLASTER, GENERAL

- A. Historic Treatment Appearance Standard: Completed work is to have a uniform appearance as viewed by Architect from building interior at 5 feet away from surface.
- B. General: In treating historic plaster, disturb it as minimally as possible and as follows unless otherwise indicated:
 - 1. Dismantle loose, damaged, or deteriorated plaster, lath, and support systems that cannot be repaired.
 - 2. Verify extent of plaster deterioration against that indicated on Drawings. Consult Architect on types and extent of required work.
 - 3. Verify that substrate surface conditions are suitable for repairs.
 - 4. Provide lath, furring, and support systems for plaster included in the work of this Section.
 - 5. Replace lost details in new, wet-applied and cast plaster that replicate existing or indicated plaster configurations.
 - 6. Leave repaired plasterwork in proper condition for painting or applying other finishes as indicated.

C. Illumination: Perform plastering work with adequate, uniform illumination that does not distort the flatness or curvature of surfaces.

3.2 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrate and environmental conditions, installation tolerances, and other conditions affecting performance of the Work.
 - 1. If existing substrates cannot be prepared to an acceptable condition for plastering work, notify Architect in writing.
 - 2. Notify Architect of undocumented detrimental conditions including cracks, bulges, loose backup, rotted wood, rusted metal, and other deteriorated items.
- B. Masonry Substrates: Verify that mortar joints are struck flush. Notify Architect of undocumented masonry substrate without flush joints. Proceed with plastering as directed by Architect.
- C. Begin historic plastering work only after unsatisfactory conditions have been corrected.

3.3 PREPARATION FOR PLASTERING

- A. Substrates: Prepare according to plaster manufacturer's written instructions and as follows:
 - 1. Clean surfaces to remove dust, loose particles, grease, oil, incompatible curing compounds, form-release agents, and other foreign matter and deposits that could impair bond with plaster.
 - 2. Remove ridges and protrusions greater than 1/8 inchand fill depressions greater than 1/4 inchwith patching material. Allow to set and dry.

3.4 PLASTER REMOVAL AND REPLACEMENT, GENERAL

- A. Dismantle plaster that is damaged or deteriorated to the limits indicated. Carefully dismantle areas along straight edges that lie over supports, without damaging surrounding plasterwork.
- B. Maintain lath and supporting members in an undamaged condition so far as practicable. Dismantle damaged lath and supports that cannot be repaired or resecured and replace with new work of same type.
- C. Notify Architect of undocumented detrimental conditions including cracks, bulges, loose backup, rotted wood, rusted metal, and other deteriorated items.
- D. Do not deviate more than plus or minus 1/8 inch in 10 feetfrom a true plane in finished plaster surfaces, as measured by a 10-footstraightedge placed on surface.
- E. Clean substrate surfaces to remove grease, waxes, oils, waterborne staining, debris, and other foreign matter and deposits that could impair bond with repair material.

- F. Wet masonry bases before plaster application. Keep substrate damp to the touch but without visible water droplets.
- G. Wet remaining plaster abutting the replacement plaster before installing new plasterwork.
- H. Finish plaster flush with metal frames and other built-in metal items or accessories that act as a plaster ground unless otherwise indicated. Where casing bead does not terminate plaster at metal frame, cut base coat free from metal frame before plaster sets and groove finish coat at junctures with metal.
- I. Provide plaster surfaces that are ready to receive field-applied finishes indicated.

3.5 FLAT GYPSUM-PLASTER REMOVAL AND REPLACEMENT

- A. General: Dismantle deteriorated plaster to existing sound plaster at locations exposed in finished spaces and where indicated on Drawings. Use replacement plaster mixes of gypsum, lime, and aggregate; and application according to ASTM C 842 unless otherwise indicated.
 - 1. Inspect for lath deterioration. If any, replace lath.
 - 2. Sand bonding surfaces of repair area, and clean the surface with a nonmetallic bristle brush.
 - 3. Wet substrate to damp condition, but without visible water droplets, then install new plaster to original profiles.
- B. Bonding Compound: Apply on unit masonry plaster bases.
- C. Gypsum-Plaster Base Coats:
 - 1. Base Coats over Expanded-Metal Lath: High-strength gypsum plaster with job-mixed sand for scratch and brown coats. Add fiber to scratch coat.
- D. Gypsum-Plaster Finish Coats:
 - 1. Finish-Coat Mix for Smooth-Troweled Finishes: High-strength gypsum gaging plaster.
- E. Gypsum-Plaster Finishes: Match finish(es) of existing adjacent work.
 - 1. Provide troweled finish unless otherwise indicated.

3.6 CAST-PLASTER REMOVAL AND REPLACEMENT

- A. General: Dismantle and replace cast-plaster that is damaged or deteriorated at B-Building Vestibule 100A. Carefully dismantle whole cast units from joint to joint, without damaging surrounding plasterwork.
 - 1. Coordinate removal and installation of cast plaster with other plaster repair and installation work.
 - 2. Inspect for deterioration of supporting plaster and lath, and repair or replace deteriorated material as required for a sound substrate.
 - 3. Maintain lath and supporting members in an undamaged condition so far as practicable. Dismantle damaged lath and supports that cannot be repaired or resecured and replace with new work of same type.
 - 4. Sand repair bonding surfaces and clean the surface with a nonmetallic bristle brush.

- 5. Wetting Substrate: Wet to damp condition, but without visible water droplets.
- B. Replacement Material: Replace cast fabrications with cast gypsum-plaster fabrications. Replace cast gypsum-plaster fabrications with cast gypsum-plaster fabrications.
- C. Adhering Cast Plaster: Wet the substrate in replacement area and affix cast plaster using finishcoat plaster for smooth-troweled finish as adhesive. Support units until adhesive can fully support weight of plaster. Remove excess adhesive.
- D. Install cast-plaster fabrications level, plumb, true, and aligned with adjacent materials and ready to receive required finishes. Use concealed shims secured with wet plaster where required for alignment.
 - 1. Install replacement, cast-plaster units into bonding and coursing pattern of existing units. Maintain articulated joint widths, if any, between units to match existing joints.
 - 2. Finish nonarticulated joints with joint-treatment materials so that they are flush or otherwise concealed inconspicuously.
 - 3. Where cast-plaster units are joined to form composite fabrications, join units inconspicuously and as recommended in writing by manufacturer.
 - 4. Repair hollows, voids, scratches, and other surface imperfections on units.
- E. Hairline cracking within the plaster or plaster separation at edge of a replacement is unacceptable. Completely dismantle such work and reinstall or repair as a crack repair as directed by Architect.

3.7 REMOVING AND INSTALLING LATH AND ACCESSORIES

- A. General: Dismantle existing plaster as necessary to expose deteriorated or rusted lath, wire ties, and support system, back to firm substrates and supports. Repair with new materials, well secured to existing lath in good condition and to building structure.
 - 1. Cutting: Cut lath so it can be taken out completely from one support to the next. Cut to avoid cracking surrounding plaster.
 - 2. Cut out existing base-coat plaster beyond the edges of the new lath to permit new plaster to extend onto the old lath. Then step subsequent plaster coats to permit new plaster to extend over the old material.
 - 3. Fasten new lath to support system and to good existing lath. Wire tie at least every 6 inches.
 - 4. Install new lath according to ASTM C 841 for gypsum plaster.
- B. Notify Architect of undocumented detrimental conditions including cracks, bulges, loose backup, rotted wood, rusted metal, and other deteriorated items.
- C. Metal Lath: Install according to ASTM C 841 for gypsum plaster.

3.8 PATCH-TYPE REPAIR

A. General: Patch voids, fractured surfaces, and crushed areas in otherwise sound plaster that are larger than cracks.

- 1. Notify Architect of undocumented detrimental conditions including cracks, bulges, loose backup, rotted wood, rusted metal, and other deteriorated items.
- 2. Inspect for deterioration of supporting plaster and lath, and repair or replace deteriorated material as required for a sound substrate.
- 3. Rake perimeter of hole to sound plaster, and slightly undercut existing plaster to enable replacement plaster to tuck behind existing plaster.
- 4. Replace missing lath in kind. Bridge gaps in wood lath with expanded-metal lath, overlapping wood by 6 inchesand fastening them together.
- 5. Clean hole to remove loose materials and other foreign matter and deposits that could impair bond with repair material. Where grease, waxes, oils, waterborne staining, or other foreign matter and deposits that could impair bond with repair material have penetrated into the plaster, enlarge the hole to remove these deposits.
- 6. Wet substrate to damp condition, but without visible water droplets, then install patch material to original profiles.
- 7. Maintain adjacent plasterwork in an undamaged condition so far as practicable.
- B. Gypsum-Plaster Mix: Gypsum neat plaster with job-mixed sand to match existing adjacent, applied in two coats with fiber in first coat. Add hair fiber to mix and evenly distribute it without clumps just before spreading.
- C. Finishing: Finish flat surfaces flush and with same texture as adjacent existing plaster. For molded plaster shapes, tool surface to restore the sharp edges and the shape of the molded shape to original contours.
- D. Hairline cracking within the plaster or plaster separation at edge of a patch is unacceptable. Completely dismantle such work and reinstall or repair.

3.9 HAIRLINE CRACK REPAIR

- A. General: Repair cracks 1/32 inchin width or narrower in otherwise sound plaster.
 - 1. Notify Architect of undocumented detrimental conditions including cracks, bulges, loose backup, rotted wood, rusted metal, and other deteriorated items.
 - 2. Maintain adjacent plasterwork in an undamaged condition so far as practicable.
- B. Existing Topcoat: Open crack in existing topcoat to at least 1/8 inchin width and check for broken fiber reinforcement in base coats.
- C. Existing Base Coats: Do not open crack wider in existing base coats unless inspection or other indication shows that the fiber reinforcement has broken. Where inspections indicate failure of fiber reinforcement, proceed as for a large crack repair, but only for length of crack with broken fiber reinforcement.
- D. Clean out crack to remove loose materials and other foreign matter and deposits that could impair bond with repair material. Where grease, waxes, oils, waterborne staining, or other foreign matter and deposits that could impair bond with repair material have penetrated into the topcoat plaster, widen the crack and sand surface of the exposed basecoat to remove these deposits.
- E. Wet substrate to damp condition, but without visible water droplets.

- F. Force finish-coat plaster without aggregate into crack, filling crack to original plaster profile.
- G. Finishing: Finish flat surfaces flush and with same texture as adjacent existing plaster. For molded plaster shapes, tool surface to restore the sharp edges and the shape of the molded shape to original contours.

3.10 LARGE CRACK REPAIR

- A. General: Repair cracks over 1/32 inchin width in otherwise sound plaster.
 - 1. Notify Architect of undocumented detrimental conditions including cracks, bulges, loose backup, rotted wood, rusted metal, and other deteriorated items.
 - 2. Maintain adjacent plasterwork in an undamaged condition so far as practicable.
- B. Open crack to at least 1/8 inch in width and full depth with V-groove tool, and check for bond separation or lath deterioration.
- C. Abrade side surfaces of crack and remove inner crack debris by gouging (keying) the inside area of the crack.
- D. Clean out crack to remove loose materials and other foreign matter and deposits that could impair bond with repair material. Where grease, waxes, oils, waterborne staining, or other foreign matter and deposits that could impair bond with repair material have penetrated into the plaster, widen the crack to remove these deposits.
- E. Wet substrate to damp condition, but without visible water droplets.
- F. Install finish-coat plaster to fill crack to original plaster profile.
- G. Finishing: Finish flat surfaces flush and with same texture as adjacent existing plaster. For molded plaster shapes, tool surface to restore the sharp edges and the shape of the molded shape to original contours.
- H. Offset Cracks: If the crack is offset in surface plane by more than 1/8 inch, dismantle the plaster on each side of the crack, a minimum width of 6 inchesand down to the lath or other substrate. Then, repair as specified for flat-plaster removal and replacement.

3.11 REATTACHMENT OF DELAMINATED PLASTER

- A. General: Reattach plaster that has detached from its lath.
 - 1. Notify Architect of undocumented detrimental conditions including cracks, bulges, loose backup, rotted wood, rusted metal, and other deteriorated items.
 - 2. Maintain adjacent plasterwork in an undamaged condition so far as practicable.
- B. Verify extent of detachment of plaster that has not yet fallen by tapping on plaster surface and evaluating the hollow or solid resonance.
- C. Protect floors from spillage and debris in the vicinity of work. Use materials resistant to the passage of fluids used in work.

- D. Drill 1/4-inchinjection ports (holes) through the plaster spaced 3 to 6 inchesapart over surface of detached plaster. Dislodge loose plaster particles, and vacuum debris from holes.
- E. Prewet injection ports, gaps at edges of lost plaster, back of plaster, and wooden lath with prewet solution.
- F. Inject adhesive into ports, enough to fill gaps between detached plaster and lath, and inject into gaps at edges of lost plaster.
- G. Clean off excess and smeared adhesive while wet.
- H. Apply temporary battens over surface of treated plaster to prevent further separation during repair work. Secure battens in place against plaster with braces supported from floor below.
- I. Maintain temporary battens in place for a week or more, allowing adhesive to coalesce and dry.
- J. Remove battens, patch holes and missing plaster, and repair cracks.

3.12 INSTALLATION TOLERANCES

A. Completed plaster installation shall not deviate from a true plane by more than 1/8 inchas measured by a 5-footstraightedge placed at any location on a surface, except where existing plaster is retained as a substrate for new plasterwork.

3.13 CLEANING AND PROTECTION

- A. Protect work of other trades against damage. Promptly remove plaster from surfaces not indicated to be repaired or plastered. Do not scratch or damage finished surfaces.
- B. Repair floors, walls, and other surfaces stained, marred, or otherwise damaged during plastering.
- C. Correct damage to other historic surfaces and to new work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. Remove temporary protection and enclosure of other work.

END OF SECTION 090320

SECTION 092116.23 - GYPSUM BOARD SHAFT WALL 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 gypsum board shaft wall assemblies.

1.3 ACTION SUBMITTALS

- A. Product Data: For each component of gypsum board shaft wall assembly.
- B. Sustainable Design Submittals:
 - 1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
 - 2. 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.

1.4 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 support them on risers on a flat platform to prevent sagging.

1.5 FIELD CONDITIONS

- A. Environmental Limitations: Comply with gypsum-shaftliner-board manufacturer's written instructions.
- B. Do not install finish panels until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, moisture damaged, or mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and 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.
- B. STC-Rated Assemblies: Provide materials and construction identical to those of assemblies tested according to ASTM E 90 and classified according to ASTM E 413 by a testing and inspecting agency.
- C. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content.
- D. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- E. Regional Materials: 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.
- F. Regional Materials: Products shall be manufactured within 500 miles of Project site.

2.2 GYPSUM BOARD SHAFT WALL ASSEMBLIES

- A. Fire-Resistance Rating: 2 hours.
- B. Gypsum Shaftliner Board:
 - 1. Type X: ASTM C 1396/C 1396M; manufacturer's proprietary fire-resistive liner panels with paper faces, 1 inch thick, with double beveled long edges.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) CertainTeed Corporation.
 - 2) Georgia-Pacific Building Products.
 - 3) National Gypsum Company.
 - 4) United States Gypsum Company.
- C. Non-Load-Bearing Steel Framing, General: Complying with ASTM C 645 requirements for metal unless otherwise indicated and complying with requirements for fire-resistance-rated assembly indicated.
 - 1. Protective Coating: Coating with equivalent corrosion resistance of ASTM A 653/ A 653M, G40 unless otherwise indicated.
- D. Studs: Manufacturer's standard profile for repetitive, corner, and end members as follows:
 - 1. Depth: 4 inches.
 - 2. Minimum Base-Metal Thickness: 0.033 inch.

- E. Runner Tracks: Manufacturer's standard J-profile track with manufacturer's standard long-leg length, but at least 2 inches long and matching studs in depth.
 1. Minimum Base-Metal Thickness: Matching steel studs.
- F. Finish Panels: Gypsum board as specified in Section 092900 "Gypsum Board."

2.3 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with shaft wall manufacturer's written instructions.
- B. Trim Accessories: Cornerbead, edge trim, and control joints of material and shapes as specified in Section 092900 "Gypsum Board" that comply with gypsum board shaft wall assembly manufacturer's written instructions for application indicated.
- C. Steel Drill Screws: ASTM C 1002 unless otherwise indicated.
- D. Track Fasteners: Power-driven fasteners of size and material required to withstand loading conditions imposed on shaft wall assemblies without exceeding allowable design stress of track, fasteners, or structural substrates in which anchors are embedded.
 - 1. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.

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. Examine panels before installation. Reject panels that are wet, moisture damaged, or mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install gypsum board shaft wall assemblies to comply with requirements of fire-resistance-rated assemblies indicated and manufacturer's written installation instructions.
- B. Do not bridge building expansion joints with shaft wall assemblies; frame both sides of expansion joints with furring and other support.
- C. Install supplementary framing in gypsum board shaft wall assemblies around openings and as required for blocking, bracing, and support of gravity and pullout loads of fixtures, equipment,

services, heavy trim, furnishings, wall-mounted door stops, and similar items that cannot be supported directly by shaft wall assembly framing.

- D. Penetrations: At penetrations in shaft wall, maintain fire-resistance rating of shaft wall assembly by installing supplementary steel framing around perimeter of penetration and fire protection behind boxes containing wiring devices, elevator call buttons and floor indicators, and similar items.
- E. Isolate perimeter of gypsum panels from building structure to prevent cracking of panels while maintaining continuity of fire-rated construction.
- F. Control Joints: Install control joints at locations indicated on Drawings while maintaining fireresistance rating of gypsum board shaft wall assemblies.
- G. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

3.3 **PROTECTION**

- A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- B. Remove and replace panels that are wet, moisture damaged, or mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and 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 092116.23

SECTION 092216 - 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. Non-load-bearing steel framing systems for interior gypsum board assemblies.
 - 2. Suspension systems for interior gypsum ceilings, soffits, and grid systems.
 - 3. Grid suspension systems for gypsum board ceilings.
- B. Related Requirements:
 - 1. Section 054000 "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 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Sustainable Design 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.

1.4 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-loadbearing 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: ASTM A 653/A 653M, G40, 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: Per UL Design Standards, or indicated on Drawings. (20 Gauge)
 - b. Depth: As indicated on Drawings.
 - 2. Dimpled Steel Studs and Runners:
 - a. Minimum Base-Metal Thickness: Per UL Design Standards, or indicated on Drawings. (20 Gauge)
 - 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- 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 of the top of studs to provide lateral bracing.
 - 2. Double-Runner System: ASTM C 645 top runners, inside runner with 2-inch- 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, available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) ClarkDietrich Building Systems; SLP-TRK Slotted Deflection Track.
 - 2) MBA Building Supplies; FlatSteel Deflection Track or Slotted Deflecto Track.
 - 3) Steel Network Inc. (The); VertiClip SLD or VertiTrack VTD Series.
 - 4) Superior Metal Trim; Superior Flex Track System (SFT).
 - 5) Telling Industries; Vertical Slip Track or Vertical Slip Track II.
- 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, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Fire Trak Corp.; Fire Trak System.
 - b. Grace Construction Products; FlameSafe FlowTrak System.
 - c. Metal-Lite, Inc.; The System.
- F. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
 1. Minimum Base-Metal Thickness: Per UL Design Standards, or indicated on Drawings.
- G. Cold-Rolled Channel Bridging: Steel, 0.053-inch minimum base-metal thickness, with minimum 1/2-inch- wide flanges.
 - 1. Depth: As indicated on Drawings.
 - 2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch- thick, galvanized steel.
- H. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
 - 1. Minimum Base-Metal Thickness: Per UL Design Standards, or indicated on Drawings.
 - 2. Depth: As indicated on Drawings.
- I. Resilient Furring Channels: 1/2-inch- deep, steel sheet members designed to reduce sound transmission.
 - 1. Configuration: Asymmetrical or hat shaped.
- J. Cold-Rolled Furring Channels: 0.053-inch uncoated-steel thickness, with minimum 1/2-inch- wide flanges.
 - 1. Depth: As indicated on Drawings.
 - 2. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum uncoatedsteel thickness of 0.033 inch.
 - 3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- diameter wire, or double strand of 0.048-inch- diameter wire.
- K. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8 inch, minimum uncoated-metal thickness of 0.018 inch, 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- diameter wire, or double strand of 0.048-inch- 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: Cast-in-place anchor, designed for attachment to concrete forms Postinstalled, chemical anchor, or Postinstalled, expansion anchor.
 - 2. Powder-Actuated Fasteners: Suitable for application indicated, fabricated from corrosionresistant 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 in diameter.
- D. Flat Hangers: Steel sheet, in size indicated on Drawings.
- E. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.053 inch and minimum 1/2-inch- wide flanges.
 - 1. Depth: As indicated on Drawings.
- F. Furring Channels (Furring Members):
 - 1. Cold-Rolled Channels: 0.053-inch uncoated-steel thickness, with minimum 1/2-inch- wide flanges, 3/4 inch deep.
 - 2. Steel Studs and Runners: ASTM C 645.
 - a. Minimum Base-Metal Thickness: Per UL Design Standards, or indicated on Drawings.
 - b. Depth: As indicated on Drawings.
 - 3. Dimpled Steel Studs and Runners: ASTM C 645.
 - a. Minimum Base-Metal Thickness: Per UL Design Standards, or indicated on Drawings.
 - b. Depth: As indicated on Drawings.
 - 4. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch deep.
 - a. Minimum Base-Metal Thickness: Per UL Design Standards, or indicated on Drawings.
 - Resilient Furring Channels: 1/2-inch- 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, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Armstrong World Industries, Inc.; Drywall Grid Systems.
 - b. Chicago Metallic Corporation; Drywall Grid 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 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.
- B. Coordination with Sprayed Fire-Resistive Materials:
 - 1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches o.c.
 - 2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistive materials below that are required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

3.3 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C 754.
 - 1. Gypsum Plaster Assemblies: Also comply with requirements in ASTM C 841 that apply to framing installation.
 - 2. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.
- B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.
- C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- D. Install bracing at terminations in assemblies.
- E. 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 o.c. unless otherwise indicated.
 - 2. Multilayer Application: 16 inches o.c. unless otherwise indicated.
 - 3. Tile Backing Panels: 16 inches 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 that penetrate 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 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.
 - 6. Curved Partitions:
 - a. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
 - b. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of no fewer than two studs at ends of arcs, place studs 6 inches o.c.
- E. Direct Furring:
 - 1. Screw to wood framing.
 - 2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
- F. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch 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 o.c.
 - 2. Carrying Channels (Main Runners): 48 inches o.c.
 - 3. Furring Channels (Furring Members): 16 inches 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. 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.
- F. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 092216

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SECTION 09 2900 - 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. Tile backing panels.

1.3 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. 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.
 - 3. Product Data: For adhesives and sealants, indicating VOC content.
 - 4. Laboratory Test Reports: For adhesives and sealants, indicating compliance with requirements for low-emitting materials.
 - 5. Laboratory Test Reports: For ceiling and wall materials, indicating compliance with requirements for low-emitting materials.
- C. Samples: For the following products:
 - 1. Trim Accessories: 12-inch long samples of each trim accessory indicated.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store materials inside under cover and keep them dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack panels flat to prevent sagging.

1.5 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 interior products 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.
- 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.
- C. Ceiling and wall materials 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."

2.2 GYPSUM BOARD, GENERAL

- A. Regional Materials: 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.
- B. Regional Materials: Products shall be manufactured within 500 miles of Project site.
- C. 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. Basis of Design Product: Subject to compliance with requirements, provide products as manufactured by USG Corporation, or comparable product by one of the following:
 - 1. CertainTeed Corp.
 - 2. Georgia-Pacific Gypsum LLC.

- 3. Lafarge/Continental Building products.
- 4. National Gypsum Company.
- B. Gypsum Wallboard: ASTM C 1396/C 1396M.
 - 1. Thickness: As indicated
 - 2. Long Edges: Tapered.
- C. Gypsum Board, Type X: ASTM C 1396/C 1396M.
 - 1. Thickness: As indicated
 - 2. Long Edges: Tapered.
- D. Gypsum Ceiling Board: ASTM C 1396/C 1396M.
 - 1. Thickness: 1/2 inch.
 - 2. Long Edges: Tapered.
- E. Abuse-Resistant Gypsum Board: ASTM C 1629/C 1629M, Level 3 Impact Resistant.
 - 1. Basis of Design Product: USG Corporation, Fiberock VHI Abuse-Resistant Interior Panel
 - 2. Core: Fiberglass mesh, 5/8 inch, Type X.
 - 3. Long Edges: Tapered.
 - 4. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
- F. Moisture- and Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.
 - 1. Core: 5/8 inch, Type X.
 - 2. Long Edges: Tapered.

2.4 SPECIALTY GYPSUM BOARD

- A. Gypsum Board, Type C: ASTM C 1396/C 1396M. Manufactured to have increased fire-resistive capability.
 - 1. Basis of Design Product: Subject to compliance with requirements, provide USG Corporation; Firecode C Core, or comparable product by one of the following:
 - a. CertainTeed Corp.; ProRoc Type C.
 - b. Georgia-Pacific Gypsum LLC; Fireguard C.
 - c. Lafarge/Continental Building Products; Firecheck Type C.
 - d. National Gypsum Company; Gold Bond Fire-Shield C.
 - 2. Thickness: As required by fire-resistance-rated assembly indicated on Drawings.
 - 3. Long Edges: Tapered.

2.5 TILE BACKING PANELS

- A. Cementitious Backer Units: ANSI A118.9 and ASTM C 1288 or 1325, with manufacturer's standard edges.
 - 1. Basis of Design Product: Subject to compliance with requirements, provide USG Corporation; DUROCK Cement Board, or comparable product by one of the following:
 - a. C-Cure; C-Cure Board 990.

- b. CertainTeed Corp.; FiberCement BackerBoard.
- c. Custom Building Products; Wonderboard.
- d. FinPan, Inc.; Util-A-Crete Concrete Backer Board.
- e. James Hardie Building Products, Inc.; Hardiebacker.
- f. National Gypsum Company, Permabase Cement Board.
- 2. Thickness: As indicated on Drawings.
- 3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.6 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.
 - 1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized steel sheet.
 - 2. Shapes:
 - a. Cornerbead.
- B. Aluminum Trim: Extruded accessories of profiles and dimensions 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. 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, Alloy 6063-T5.
 - 3. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.
- C. Edge Trim (at gypsum board ceiling locations)
 - 1. Acceptable manufacturers:
 - a. Armstrong : Axiom Classic
 - b. Certainteed : Cloud Perimeter Trim
 - c. USG: Compasso
 - d. Rockfon (formerly Chicago Metallic): Infinity R Perimeter Trim

2.7 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
 - 1. Interior Gypsum Wallboard: Paper.
 - 2. Tile Backing Panels: As recommended by panel manufacturer.

- C. Joint Compound for Interior Gypsum Wallboard: 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 drying-type, all-purpose compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
 - 3. Fill Coat: For second coat, use drying-type, all-purpose compound.
 - 4. Finish Coat: For third coat, use drying-type, all-purpose compound.
- D. Joint Compound for Tile Backing Panels:
 - 1. Cementitious Backer Units: As recommended by backer unit manufacturer.

2.8 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. 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. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
 - 1. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- 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 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. 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. Thermal Insulation: As specified in Section 072100 "Thermal Insulation."
- G. 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 thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
- 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 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. 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- wide joints to install sealant.

- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch- 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. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
- J. 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: Where required for fire-resistance-rated assembly.
 - 3. Ceiling Type: Ceiling surfaces.
 - 4. Foil-Backed Type: As indicated on Drawings.
 - 5. Abuse-Resistant Type: Up to 48" AFF in all corridors and public spaces.
 - 6. Mold-Resistant Type: High-humidity or wet locations, wallboard installed at building perimeter, and any wallboard furred to concrete or masonry construction.
 - 7. Glass-Mat Interior Type: As indicated on Drawings.
 - 8. Acoustically Enhanced Type: At CTE classroom ceilings.
- 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 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 instructions and temporarily brace or fasten gypsum panels until fastening adhesive has set.

3.4 APPLYING EXTERIOR GYPSUM PANELS FOR CEILINGS AND SOFFITS

- A. Apply panels perpendicular to supports, with end joints staggered and located over supports.
 - 1. Install with 1/4-inch open space where panels abut other construction or structural penetrations.
 - 2. Fasten with corrosion-resistant screws.

3.5 APPLYING TILE BACKING PANELS

- A. Glass-Mat, Water-Resistant Backing Panels: Comply with manufacturer's written installation instructions and install at locations indicated to receive tile. Install with 1/4-inch gap where panels abut other construction or penetrations.
- B. Water-Resistant Backing Board: Install where indicated with 1/4-inch gap where panels abut other construction or penetrations.
- C. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.6 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 and in specific locations approved by Architect for visual effect.
- C. Interior Trim: Install in the following locations:
 - 1. Cornerbead: Use at outside corners.
 - 2. LC-Bead: Use at exposed panel edges.
 - 3. U-Bead: Use at exposed panel edges.

3.7 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 Section 099123 "Interior Painting."
 - 5. Level 5: Where indicated on Drawings.
 - a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."

3.8 **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

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SECTION 093013 - 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 mosaic tile.
 - 2. Stone thresholds.
- B. Related Requirements:
 - 1. Section 079200 "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.
 - 2. Section 092900 "Gypsum Board" for cementitious backer units.

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. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in its "Specifications for Installation of Ceramic Tile."
- C. Module Size: Actual tile size plus joint width indicated.
- D. Face Size: Actual tile size, excluding spacer lugs.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- 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 sealers, indicating compliance with requirements for lowemitting materials.
- C. 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.
- 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.
 - 3. Stone thresholds in 6-inch lengths.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.
- C. Product Certificates: For each type of product.
- D. Product Test Reports: For tile-setting and -grouting products.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- 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.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Installer employs Ceramic Tile Education Foundation Certified Installers or installers recognized by the U.S. Department of Labor as Journeyman Tile Layers.
- 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 mockup of wall tile installation.
 - 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. 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.

1.9 FIELD 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.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Tile: Obtain tile from single 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 single manufacturer and each aggregate from single source or producer.
 - 1. Obtain setting and grouting materials, except for unmodified Portland cement and aggregate, from single manufacturer.
- C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer:
 - 1. Stone thresholds.

2.2 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.
- 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 TCNA 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.

2.3 TILE PRODUCTS

- A. Ceramic Tile Type: Factory-mounted glazed ceramic mosaic tile.
 - 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 Olean; a division of Dal-Tile Corporation.
 - b. Daltile.
 - c. Summitville Tile, Inc.
 - d. United States Ceramic Tile Co.
 - 2. Composition: Vitreous or impervious natural clay or porcelain.
 - 3. Module Size: 2 by 2 inches.
 - 4. Thickness: 1/4 inch.
 - 5. Face: Plain with cushion edges.
 - 6. Surface: Smooth, without abrasive admixture.
 - 7. Finish: Bright, opaque glaze.
 - 8. Tile Color and Pattern: As selected by Architect from manufacturer's full range.
 - 9. Grout Color: As selected by Architect from manufacturer's full range.
 - 10. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:
 - a. Base Cove: Cove, module size 2 by 1 inch.
 - b. Wainscot Cap for Thinset Mortar Installations: Surface bullnose, module size 2 by 2 inches.
 - c. External Corners for Thinset Mortar Installations: Surface bullnose, module size 2 by 2 inches.
 - d. Internal Corners: Field-butted square corners. For coved base and cap, use angle pieces designed to fit with stretcher shapes.
 - e. Tapered Transition Tile: Shape designed to effect transition between thickness of tile floor and adjoining floor finishes of different thickness, tapered to provide reduction in thickness from 1/2 to 1/4 inch across nominal 4-inch dimension.

2.4 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. Marble Thresholds: ASTM C 503/C 503M, with a minimum abrasion resistance of 12 according to ASTM C 1353 or ASTM C 241/C 241M and with honed finish.
 - 1. Description: Uniform, fine- to medium-grained white stone with gray veining.

2.5 SETTING MATERIALS

- A. Modified Dry-Set Mortar (Thinset): ANSI A118.4.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Boiardi Products Corporation; a QEP company.
 - b. Bonsal American, an Oldcastle company.
 - c. Bostik, Inc.
 - d. Laticrete International, Inc.
 - e. MAPEI Corporation.
 - 2. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
 - 3. Provide prepackaged, dry-mortar mix combined with acrylic resin or styrene-butadienerubber liquid-latex additive at Project site.
 - 4. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.

2.6 GROUT MATERIALS

- A. Sand-Portland Cement Grout: ANSI A108.10, consisting of white or gray cement and white or colored aggregate as required to produce color indicated.
- B. Standard Cement Grout: ANSI A118.6.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Boiardi Products Corporation; a QEP company.
 - b. Bostik, Inc.
 - c. Custom Building Products.
 - d. Laticrete International, Inc.
 - e. MAPEI Corporation.

2.7 MISCELLANEOUS MATERIALS

A. 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.

2.8 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 the Work.
 - 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 installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
 - 3. 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. 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.

3.3 CERAMIC TILE INSTALLATION

- A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA 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 TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
- 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. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.
- E. Where accent tile differs in thickness from field tile, vary setting-bed thickness so that tiles are flush.
- F. 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.
- G. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
 - 1. Ceramic Mosaic Tile: 1/16 inch.
- H. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.
- I. 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 modified dry-set mortar (thinset).

3.4 ADJUSTING AND CLEANING

- A. Remove and replace tile that is damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.
- B. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
 - 1. Remove 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.

3.5 **PROTECTION**

1.

- A. 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.
- B. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.6 INTERIOR CERAMIC TILE INSTALLATION SCHEDULE

- A. Interior Wall Installations, Masonry or Concrete:
 - Ceramic Tile Installation: TCNA W202; thinset mortar.
 - a. Ceramic Tile Type: Wall tile on CMU substrate.
 - b. Thinset Mortar: Modified dry-set mortar.
 - c. Grout: Standard unsanded cement grout.
- B. Interior Wall Installations, Wood or Metal Studs or Furring:
 - 1. Ceramic Tile Installation: TCNA W244C or TCNA W244F; thinset mortar on cementitious backer units or fiber-cement backer board.
 - a. Ceramic Tile Type: Wall tile on cement board substrate.
 - b. Thinset Mortar: Modified dry-set mortar.
 - c. Grout: Standard unsanded cement grout.

END OF SECTION 093013

SECTION 095113 - 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. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

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. Laboratory Test Reports: For ceiling products, indicating compliance with requirements for low-emitting materials.
- C. Samples: For each exposed product and for each color and texture specified, 6 inches in size.
- D. 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. Items penetrating finished ceiling including the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
 - c. Speakers.
 - d. Sprinklers.
 - e. Access panels.
- B. Qualification Data: For testing agency.
- C. Product Test Reports: For each acoustical panel ceiling, for tests performed by a qualified testing agency.
- D. Evaluation Reports: For each acoustical panel ceiling suspension system and anchor and fastener type, from ICC-ES.
- E. Field quality-control reports.

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: Full-size panels equal to 2 percent of quantity installed.
 - 2. Suspension-System Components: Quantity of each exposed component equal to 2 percent of quantity installed.
 - 3. Hold-Down Clips: Equal to 2 percent of quantity installed.
 - 4. Impact Clips: Equal to 2 percent of quantity installed.

1.8 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to NVLAP for testing indicated.
- 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 mockup of typical ceiling area 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.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical 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. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.10 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. Ceiling 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. 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.

2.2 ACOUSTICAL PANELS, GENERAL

- A. Source Limitations:
 - 1. Acoustical Ceiling Panel: Obtain each type from single source from single manufacturer.
 - 2. Suspension System: Obtain each type from single source from single manufacturer.
- B. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system from single source from single manufacturer.
- C. Glass-Fiber-Based Panels: Made with binder containing no urea formaldehyde.
- D. 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.
- E. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.

1. Where appearance characteristics of acoustical panels are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.

2.3 ACOUSTICAL PANELS AT-1

- A. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 50% percent.
- B. Basis-Of-Design Product: Subject to conformance with the specification provide Rockfon Artic SQ 600 as the basis of design or an equivalent product by one of the following manufacturers:
 - 1. Armstrong Cirrus 574 HRC
 - 2. Certainteed
 - 3. USG Interiors, Inc.
- C. Color: White.
- D. Light Reflectance (LR): Not less than 0.85.
- E. Ceiling Attenuation Class (CAC): Not less than 23.
- F. Noise Reduction Coefficient (NRC): Not less than 0.70.
- G. Edge/Joint Detail: Square.
- H. Thickness: 5/8 inch, minimum.
- I. Modular Size: 24 inch by 24 inch.
- 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.

2.4 ACOUSTICAL PANELS AT-2

- A. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 50% percent.
- B. Basis-Of-Design Product: Subject to conformance with the specification provide Armstrong World Industries, Cirrus 533 HRC as the basis of design or an equivalent product by one of the following manufacturers:
 - 1. Certainteed
 - 2. USG Interiors, Inc.
- C. Color: White.
- D. Light Reflectance (LR): Not less than 0.85.
- E. Ceiling Attenuation Class (CAC): Not less than 35.
- F. Noise Reduction Coefficient (NRC): Not less than 0.70.
- G. Edge/Joint Detail: Square.
- H. Thickness: 3/4 inch, minimum.
- I. Modular Size: 24 inch by 48 inch.
- 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.

2.5 ACOUSTICAL PANELS AT-3

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Armstrong World Industries, Inc., Ceramaguard 605, basis of design
 - 2. CertainTeed Corporation.
 - 3. United States Gypsum Company.
- B. Acoustical Panel Standard: Provide manufacturer's standard panels according to ASTM E 1264 and designated by type, form, pattern, acoustical rating, and light reflectance unless otherwise indicated.
- C. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 50% percent.
- D. Classification: Provide panels as follows:
 - 1. Type and Form: Type XX, high-density, ceramic- and mineral-base panels with scrubbable finish, resistant to heat, moisture, and corrosive fumes.
 - 2. Pattern: G (smooth) and as indicated by manufacturer's designation.
- E. Color: White.
- F. Light Reflectance (LR): Not less than 0.80.
- G. Ceiling Attenuation Class (CAC): Not less than 40.
- H. Edge/Joint Detail: Square.
- I. Thickness: 5/8 inch.
- J. Modular Size: 24 by 48 inches.
- K. Antimicrobial Treatment: Manufacturer's standard broad spectrum, 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, ASTM D 3274, or ASTM G 21 and evaluated according to ASTM D 3274 or ASTM G 21.

2.6 ACOUSTICAL PANELS AT-4

- A. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 50% percent.
- B. Basis-Of-Design Product: Subject to conformance with the specification provide Armstrong World Industries, Cirrus 574 HRC as the basis of design or an equivalent product by one of the following manufacturers:
 - 1. Certainteed
 - 2. USG Interiors, Inc.
- C. Color: White.
- D. Light Reflectance (LR): Not less than 0.85.
- E. Ceiling Attenuation Class (CAC): Not less than 35.
- F. Noise Reduction Coefficient (NRC): Not less than 0.70.
- G. Edge/Joint Detail: Square.
- H. Thickness: 3/4 inch, minimum.
- I. Modular Size: 24 inch by 24 inch.
- 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.

2.7 DIFFUSING ACOUSTICAL PANELS AT-5

- A. Basis-Of-Design Product: Subject to conformance with the specification provide Wenger Corporation Pyramidal and Convex Ceiling Diffusers as the basis of design or an equivalent product by one of the following manufacturers:
 - 1. Certainteed
 - 2. USG Interiors, Inc.
- B. Impact resistant, offset pyramidal shape, suitable for support by standard acoustical ceiling grid suspension system.
- C. Thermo-molded PVC/Acrylic plastic, 1/8" thick, paintable surface.
 - 1. Meet Class A flame spread and smoke developed requirements.
- D. Color: White.
- E. Sound absorption coefficient E 400 mounting: 0.12 at 500 Hz, 0.10 at 1000 Hz, 0.16 at 2000 Hz.
- F. Modular Size: As shown on drawings.

2.8 METAL SUSPENSION SYSTEMS, GENERAL

- A. 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.
- B. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- 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.
 - 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 0.106-inch- diameter wire.
- E. Angle Hangers: Angles with legs not less than 7/8 inch wide; formed with 0.04-inch- thick, galvanized-steel sheet complying with ASTM A 653/A 653M, G90 coating designation; with bolted connections and 5/16-inch- diameter bolts.
- F. Stabilizer Bars: Manufacturer's standard perimeter stabilizers.

2.9 METAL SUSPENSION SYSTEM

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Armstrong World Industries, Inc.
 - 2. CertainTeed Corporation.
 - 3. Chicago Metallic Corporation.
 - 4. United States Gypsum Company.
- B. Metal Suspension-System Standard: Provide manufacturer's standard, direct-hung, metal suspension system and accessories according to ASTM C 635/C 635M and designated by type, structural classification, and finish indicated.
 - 1. High-Humidity Finish: Where indicated, provide coating tested and classified for "severe environment performance" according to ASTM C 635/C 635M.
- C. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- D. 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, G30 coating designation; with prefinished 15/16-inch- wide metal caps on flanges.
 - 1. Structural Classification: Intermediate-duty system.
 - 2. End Condition of Cross Runners: Override (stepped) or butt-edge type.
 - 3. Face Design: Flat, flush.
 - 4. Cap Material: Cold-rolled steel.
 - 5. Cap Finish: Painted white.

2.10 METAL EDGE MOLDINGS AND TRIM

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Armstrong World Industries, Inc.
 - 2. Chicago Metallic
 - 3. Fry Reglet Corporation.
 - 4. United States Gypsum Company.
- 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. Edge moldings shall fit acoustical panel edge details and suspension systems indicated and match width and configuration of exposed runners unless otherwise indicated.
- 2. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.
- C. Extruded-Aluminum Transition Trim: Where indicated, provide manufacturer's extrudedaluminum edge moldings and trim of profile indicated or referenced by manufacturer's designations, including splice plates, corner pieces, and attachment and other clips, complying with seismic design requirements.
 - 1. Baked-Enamel or Powder-Coat Finish: Minimum dry film thickness of 1.5 mils. Comply with ASTM C 635/C 635M and coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
 - 2. Color: Selected by Architect from Manufacturers standard colors.

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 unless otherwise indicated, and comply with layout shown on reflected ceiling plans.
- B. Layout openings for penetrations centered on the penetrating items.

3.3 INSTALLATION

- A. Install acoustical panel ceilings according to ASTM C 636/C 636M and manufacturer's written instructions.
- 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 to structure 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. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
- 6. 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.
- 7. 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.
- 8. Do not attach hangers to steel deck tabs.
- 9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
- 10. 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.
- 11. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
- 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. 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 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. 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.

3.4 ERECTION TOLERANCES

- A. Suspended Ceilings: Install main and cross runners level to a tolerance of 1/8 inch in 12 feet, non-cumulative.
- B. Moldings and Trim: Install moldings and trim to substrate and level with ceiling suspension system to a tolerance of 1/8 inch in 12 feet, non-cumulative.

3.5 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.
- B. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095113

SECTION 095133 - ACOUSTICAL METAL PAN 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 metal pans and associated suspension system for interior ceilings.
- B. Related Requirements:
 - 1. Section 095113 "Acoustical Panel Ceilings" for ceilings consisting of mineral-base and glass-fiber-base acoustical panels and exposed suspension 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 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

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. 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.
 - 4. Laboratory Test Reports: For ceiling products, indicating compliance with requirements for low-emitting materials.
 - 5. Laboratory Test Reports: For Insulation, indicating compliance with requirements for low-emitting materials.
- C. Samples: For each exposed product and for each color and texture specified, 6 inches in size.
- D. Samples for Initial Selection: For units with factory-applied finishes.
- E. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below:

ACOUSTICAL METAL PAN CEILINGS

- 1. Exposed Suspension-System Members, Moldings, and Trim: Set of 6-inch- long Samples of each type, finish, and color.
- 2. Sound Absorber: Sample of each type matching size of Sample metal pan.

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 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.
- B. Product Test Reports: For each acoustical metal pan ceiling, for tests performed by manufacturer and witnessed by a qualified testing agency.
- C. Evaluation Reports: For each acoustical metal pan ceiling suspension system and anchor and fastener type.

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 Metal Pans: Full-size units equal to 2 percent of quantity installed.
 - 2. Suspension-System Components: Quantity of each grid, exposed molding, and trim equal to 2 percent of quantity installed.
 - 3. Hold-Down Clips: Equal to 2 percent of quantity installed.

1.8 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to NVLAP for testing indicated.
- 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 mockup of typical ceiling area 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.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical metal pans, suspension-system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they are protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Handle acoustical metal pans, suspension-system components, and accessories carefully to avoid damaging units and finishes in any way.

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 METAL PANS, GENERAL

- A. Source Limitations: Obtain each type of acoustical metal ceiling pan and supporting suspension system from single source from single manufacturer.
- B. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- C. Recycled Content of Insulation: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- D. 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."
- E. Acoustical Panel Standard: Provide manufacturer's standard pans 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.
- F. Sheet Metal Characteristics: For metal components 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, roughness, stains, or discolorations.
 - 1. Aluminum Sheet: Rolled aluminum sheet, complying with ASTM B 209; alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

- G. Sound-Absorbent Fabric Layer: Provide fabric layer, sized to fit concealed surface of pan, and consisting of black, nonwoven, nonflammable, sound-absorbent material with surface-burning characteristics for flame-spread index of 25 or less and smoke-developed index of 50 or less, as determined by testing according to ASTM E 84.
 - 1. Bond fabric layer to panels in the factory with manufacturer's standard nonflammable adhesive.
- H. Sound-Absorbent Pads: Provide width and length to completely fill concealed surface of pan, with surface-burning characteristics for flame-spread index of 25 or less and smoke-developed index of 50 or less, as determined by testing according to ASTM E 84, and to comply with the following requirements:
 - 1. Plastic Sheet-Wrapped, Mineral-Fiber Insulation: Pads consisting of nonrigid, PVC plastic sheet encapsulating unfaced mineral-fiber insulation complying with ASTM C 553, Type I, Type II, or Type III, and as follows:
 - a. Mineral-Fiber Type and Thickness: Glass fiber; 1-1/2 inches.
 - b. Mineral-Fiber Density: 3/4 lb/cu. ft..
 - c. Plastic Sheet Thickness and Color: Not less than 0.003 inch; flat black.
 - 2. Spacer Grids: Provide manufacturer's standard aluminum grid units that provide an air cushion between metal pans and insulation pads and that act to improve sound absorption.
- I. Adhesive: Manufacturer's standard nonflammable adhesive for sound-absorbent pads.
 - 1. Adhesives shall have a VOC content of 70 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."

2.3 ALUMINUM PANS FOR ACOUSTICAL METAL PAN CEILING

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong World Industries, Inc.; Serpentina Vault or comparable product by one of the following:
 - 1. Ceilings Plus.
 - 2. United States Gypsum Company.
- B. Classification: Units complying with ASTM E 1264 for Type XX, other types described as perforated aluminum facing (pan) units with sound-absorbent fabric backing.
 - 1. Pattern: Pattern C (perforated, small holes) regularly spaced, with uniform perforations of dimension, holes per square foot or inch, and percent open area as [specified by product designation] [selected from manufacturer's full range].
- C. Pan Fabrication: Manufacturer's standard units of size, profile, and edge treatment indicated, formed from metal indicated and finished to comply with requirements indicated.
 - 1. Clip-in Pans: Designed to clip in and be securely retained in exposed suspension grid by formed edges or accessory clips provided by manufacturer.
- D. Pan Thickness: Not less than 0.025 inch.

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- E. Pan Edge Detail: Manufacturer's standard edge detail.
- F. Pan Joint Detail: Wide reveal, not less than 15/16 inch wide.
- G. Pan Size: As indicated on Drawings.
- H. Pan Face Finish: Painted in color selected from manufacturer's full range <Insert finish>.
- I. NRC: Not less than 0.85.
- J. CAC: Not less than 35.

2.4 METAL SUSPENSION SYSTEMS, GENERAL

- A. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Metal Suspension System Standard: Provide manufacturer's standard metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable ASTM C 635/C 635M requirements.
- C. Suspension Systems: Provide systems complete with carriers, runners, splice sections, connector clips, alignment clips, leveling clips, hangers, molding, trim, retention clips, load-resisting struts, and other suspension components required to support ceiling units and other ceiling-supported construction.
- D. Attachment Devices: Size for 5 times the design load indicated in ASTM C 635/C 635M, Table 1, Direct Hung, unless otherwise indicated. Comply with seismic design requirements.
- E. 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 3 times the hanger design load indicated in ASTM C 635/C 635M, Table 1, Direct Hung, is less than yield stress of wire, but provide not less than 0.106-inch- diameter wire.
- F. Exposed Metal Edge Moldings and Trim: Provide exposed members as indicated or as required to comply with seismic requirements of authorities having jurisdiction, to conceal edges of and penetrations through ceiling, to conceal edges of pans and runners, for fixture trim and adapters, for fasciae at changes in ceiling height, and for other conditions; of metal and finish matching acoustical metal pan ceiling units unless otherwise indicated.

2.5 DIRECT-HUNG, STANDARD-GRID, METAL SUSPENSION SYSTEM FOR ACOUSTICAL METAL PAN CEILING

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Armstrong World Industries, Inc.

ACOUSTICAL METAL PAN CEILINGS

- 2. United States Gypsum Company.
- 3. Ceilings Plus.
- B. Suspension System: For clip-in pans.
- C. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, prepainted, electrolytic zinc-coated or hot-dip galvanized according to ASTM A 653/A 653M, G30 coating designation, with prefinished, cold-rolled, 15/16-inch- wide sheet metal caps on flanges.
 - 1. Structural Classification: Intermediate-duty system.
 - 2. End Condition of Cross Runners: Override (stepped) or butt-edge type.
 - 3. Face Design: Flat, flush.
 - 4. Cap Material: aluminum cold-rolled sheet.
- D. Suspension System for Torsion-Spring-Hinged Metal Pans: Provide runners with factory-cut slots fabricated to accept torsion-spring-hinged attachment.

2.6 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical 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.

2.7 ALUMINUM FINISHES

A. Color-Coated Finish: Manufacturer's standard powder-coat baked paint complying with coating manufacturer's written instructions for surface preparation, pretreatment, application, baking, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing to which acoustical metal pan 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 metal pan ceilings.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical metal pans to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width pans at borders, and comply with layout shown on reflected ceiling plans and coordination drawings.

3.3 INSTALLATION

- A. General: Install acoustical metal pan 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 do 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. 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. 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 metal pans.
 - 1. 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. Cut acoustical metal pan units for accurate fit at borders and at interruptions and penetrations by other work through ceilings. Stiffen edges of cut units as required to eliminate evidence of buckling or variations in flatness exceeding referenced standards for stretcher-leveled metal sheet.
- G. Install acoustical metal pans in coordination with suspension system and exposed moldings and trim. Comply with installation tolerances according to CISCA's "Metal Ceilings Technical Guidelines."
 - 1. For clip-in pans, position pans according to manufacturer's written instructions.
 - 2. Align joints in adjacent courses to form uniform, straight joints parallel to room axis in both directions unless otherwise indicated.
 - 3. Fit adjoining units to form flush, tight joints.
- H. Install sound attenuation panels in areas indicated by reflected ceiling plans or room finish schedules. Lay panels directly on ceiling system and close major openings to form complete coverage in required areas. Lay second sound-absorbent pads on sound attenuation panels.
- I. Install hold-down clips where indicated.

3.4 CLEANING

A. Clean exposed surfaces of acoustical metal pan ceilings, including trim and edge moldings, after removing strippable, temporary protective covering, if any. Comply with manufacturer's written instructions for stripping of temporary protective covering, 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, including dented and bent units.

END OF SECTION 095133

SECTION 096413 - WOOD FLOORING REFINISHING

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. Complete removal of existing finish at wood gymnasium floor to remain at Level L1 in A-Building.
 - 2. Complete refinishing of existing wood gymnasium floor to remain as shown at Level L1 in A-Building.
 - a. Three coats of wood floor sealer.
 - b. One coat of wood floor finish.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product to be applied.
- 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.
 - 4. Product Data: For adhesives, indicating VOC content.
 - 5. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
 - 6. Product Data: For coatings, indicating VOC content.
 - 7. Laboratory Test Reports: For coatings, indicating compliance with requirements for lowemitting materials.
 - 8. Laboratory Test Reports: For flooring products, indicating compliance with requirements for low-emitting materials.
 - 9. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.
 - 10. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.

- C. Samples for Initial Selection: Manufacturer's color charts showing the full range of stain colors and finishes available for existing type of wood flooring.
- D. Samples for Verification: For each type of wood flooring, with stain color and finish required, approximately 12 inches long and of same thickness and material indicated for the Work and showing the full range of normal color and texture variations expected. Contractor to obtain material for sample from existing gymnasium wood flooring to be demolished.
- E. Documentation of existing conditions: Provide photo documentation of areas of damage (gouges, mars, split boards, uneven joints, etc.) to existing floor that the Contractor does not expect would be remedied by refinishing work.

1.4 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Contractor shall have not less than 10 years of successful experience in finishing/refinishing wood gymnasium floors.
 - 2. Contractor shall be an accredited member of the Maple Floor Manufacturers Association (MFMA).

1.5 DELIVERY, STORAGE, AND HANDLING

- A. All materials and products to be applied shall be delivered to the job site unopened in manufacturer's original packaging and containers..
- B. All products delivered to the job site must be within the shelf-life approved by the manufacturer.
- C. Delivery tickets for all materials shall be provided to the CM upon request.

1.6 FIELD CONDITIONS

- A. Environmental Requirements: Contractor must maintain ambient temperature between 65 and 70 degrees F during entire refinishing process.
- B. Follow all manufacturer recommendations regarding hand ling of dust and oil-soaked rags All materials that may pose hazard of spontaneous combustion must be removed from the building and properly disposed of by the Contractor on a daily basis with no exceptions.

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."

2.2 ACCEPTABLE MANUFACTURERS

- A. Manufacturers of the products indicated as acceptable are as follows;
 - 1. Sika Corporation (Sika US) Lyndhurst, NJ
 - 2. BonaKemi USA, Inc. Aurora, CO
 - 3. Hillyard Industries, Inc. St. Joseph, MO
 - 4. PoloPlaz, Inc. Jacksonville, AR
- B. Wood Floor Sealer and Wood Floor Finish products selected for use by the Contractor shall be by a single manufacturer. Other products and accessories selected for use by the Contractor must be approved by the manufacturer of the sealer and finish products used on the Project.

2.3 WOOD FLOOR SEALER

- A. Description: Maple Floor Manufacturers Association approved, low VOC (350 g/L VOC maximum) oil-modified sanding sealer formulated to seal wood and provide surface for finish coating.
- B. Acceptable Products:
 - 1. Sikafloor WP-11.1 Sports Floor Sealer
 - 2. Bona Sport Seal 350
 - 3. Hillyard 350 Wood Seal
 - 4. PoloPlaz Low VOC Sealer
- C. Product Requirements:
 - 1. VOC Content: Provide coating with VOC content of 350 g/L or less.
 - 2. 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."

2.4 HARDWOOD FLOOR FINISH

- A. Description: Maple Floor Manufacturers Association approved, low VOC (350 g/L VOC maximum) oil-modified urethane varnish formulated to provide durable, solid and protective film.
- B. Acceptable Products:
 - 1. Sikafloor WP-8.1 Sports Floor 350 Finish
 - 2. Bona Sport Poly 350
 - 3. Hillyard 350 Gym Finish
 - 4. PoloPlaz Magnum Low VOC
- C. Product Requirements:
 - 1. VOC Content: Provide coating with VOC content of 350 g/L or less.

2. 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."

2.5 FINISHING ACCESSORIES

- A. As recommended by manufacturer and required by installer for complete installation, including but not limited to;
 - 1. Lambswool and/or synthetic foam applicators.
 - 2. Tack rags with manufacturers recommended cleaners.
 - 3. Screens and sanding paper in grits as recommended by manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements affecting performance of wood flooring refinishing.
- B. Inspect floor with CM to identify split boards or other damage to floor surface requiring repairs beyond the scope of refinishing.
- C. Verify that surfaces and working conditions are in accordance with manufacturer's recommendations.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove all miscellaneous debris from floor.
- B. Seal off any new supply or return air ductwork if installed during the refinishing process. Contractor to provide adequate ventilation and air exhaust.

3.3 **PROTECTION DURING WORK**

- A. Protect floor from moisture at all times.
- B. Do not permit traffic on floor after sanding and before completion of finish sy7 stem, except for installers.
- C. Protect sanded floor with heavy kraft paper to provide access for application of first coats. Do not use materials that might cause condensation beneath cover.
- D. Prohibit traffic on floors until work is complete. Upon completion protect floor with heavy kraft paper (repair as required) until completion of construction work

3.4 COMPLETE REFINISHING PROCESS

- A. Initial sanding and finish removal;
 - 1. Schedule sanding operations such that the first coat of sealer is completely applied on the same day that sanding is completed.
 - 2. Machine-sand existing flooring down to bare wood with 3 grades of sandpaper (coarse, medium, fine) to remove offsets and non-level conditions, ridges, cups, and sanding machine marks which would be noticeable in any manner after finishing. Screen floor using orbital disc sander with fine grit screen after sanding.
 - 3. Use edge sander for areas of floor that cannot be reached with drum sander. Use hand sanders for areas that cannot be reached with the edge sander.
 - 4. Floor shall be completely smooth after initial sanding process. Contractor shall provide additional cuts if floor is not smooth after three cuts.
- B. Dust removal;
 - 1. Thoroughly vacuum entire floor and areas around, including doors, windows, sills and corners to completely remove dust.
 - 2. Perform final dust removal using a tack rag. Remove all traces of dust from floor, doors, window sills, etc.
 - 3. Inspect floor to ensure that surfaces are free of drum stop marks, gouges, streaks or shiners, are clean and completely free from sanding dust, and are acceptable for finishing.
- C. Seal coats;
 - 1. Apply first coat of sealer on the same day that sanding is completed.
 - 2. Apply coats within the time limits for recoating recommended by manufacturer and at manufacturers recommended rates.
 - 3. Application;
 - a. Apply first coat of sealer per manufacturer's recommendations.
 - b. Allow sealer to dry a minimum of 12 hours before proceeding unless manufacturer recommends otherwise. Allow additional dry time if recommended by manufacturer or if ambient conditions require.
 - c. Perform a buffing/sanding operation over entire floor with an orbital buffer and fine grade screen sanding disc.
 - d. Remove dust from floor using vacuum and tack rag as described under Dust removal.
 - e. Apply second and third coats of sealer to floor per manufacturer's instructions, allowing sealer to dry and performing buffing/sanding operation and dust removal after each seal coat.
- D. Finish coat;
 - 1. Apply coat within the time limits for coating recommended by the manufacturer. If time limits are exceeded provide additional sanding/buffing and dust removal as required by manufacturer.
 - 2. Do not begin application of finish coat until dust removal is complete.
 - 3. Do not allow product to puddle.
 - 4. Typically apply in direction of wood grain.
 - 5. Apply finish per manufacturer's instructions and rates of application.
 - 6. Allow finish to dry a minimum of 72 hours prior to allowing any foot traffic.

3.5 **PROTECTION**

A. Protect installed wood flooring during remainder of construction period with covering of heavy kraft paper or other suitable material. Do not use plastic sheet or film that might cause condensation.

3.6 CLEAN-UP AND FINAL CLEANING

A. Just prior to Substantial Completion, remove all protective coverings and tape, remove all traces of dust and dirt, and buff floors.

END OF SECTION 096413

SECTION 096466 - WOOD 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. This Section includes wood athletic flooring.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for wood athletic flooring.
- B. Sustainable Design Submittals:
 - 1. Chain-of-Custody Certificates: For certified wood products. Include statement of costs.
 - 2. Chain-of-Custody Qualification Data: For manufacturer and vendor.
 - 3. Product Data: For adhesives, indicating VOC content.
 - 4. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
 - 5. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.
 - 6. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.
 - 7. Laboratory Test Reports: For finish system, indicating compliance with requirements for low-emitting materials.
- C. Shop Drawings: For each type of floor assembly and accessory. Include plans, elevations, sections, details, and attachments to other work. Include the following:
 - 1. Expansion provisions and trim details.
 - 2. Layout, colors, widths, and dimensions of game lines and markers.
 - 3. Locations of floor inserts for athletic equipment installed through flooring assembly.
- D. Samples for Verification: For each type of wood athletic flooring and accessory required; approximately 12 inches and of same thickness and material indicated for the Work.
 - 1. Include sample sets showing the full range of normal color and texture variations expected in wood flooring.
 - 2. Include Sample sets showing finishes and game-line and marker paint colors applied to wood flooring.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for wood athletic flooring system.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For wood athletic flooring and finish systems to include in maintenance manuals.

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.
- C. Installer Qualifications: An experienced Installer who has completed wood athletic flooring installations similar in material, design, and extent to that indicated for this Project and whose work has resulted in installations with a record of successful in-service performance.
 - 1. Installer responsibilities include installation and field finishing of wood athletic flooring components and accessories, and application of game lines and markers.
- D. Maple Flooring: Comply with MFMA grading rules for species, grade, and cut.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver assembly materials in unopened cartons or bundles.
- B. Protect wood from exposure to moisture. Do not deliver wood components until after concrete, masonry, plaster, ceramic tile, and similar wet work is complete and dry.
- C. Store wood components in a dry, warm, well-ventilated, weathertight location and in a horizontal position.

1.8 FIELD CONDITIONS

- A. Conditioning period begins not less than seven days before wood athletic flooring installation, is continuous through installation, and continues not less than seven days after installation.
 - 1. Environmental Conditioning: Maintain an ambient temperature between 65 and 75 degree F and relative humidity planned for building occupants, but not less than 35 percent or more than 50 percent, in spaces to receive wood athletic flooring during the conditioning period.

- 2. Wood Conditioning: Move wood components into spaces where they will be installed, no later than beginning of the conditioning period.
 - a. Do not install wood athletic flooring until wood components adjust to relative humidity of, and are at same temperature as, spaces where they are to be installed.
 - b. Open sealed packages to allow wood components to acclimatize immediately on moving wood components into spaces in which they will be installed.
- B. After conditioning period, maintain relative humidity and ambient temperature planned for building occupants.
- C. Install wood athletic flooring after other finishing operations, including painting, have been completed.

1.9 COORDINATION

A. Coordinate layout and installation of wood athletic flooring systems with floor inserts for gymnasium equipment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Air Channel Star Floor System manufactured by Robbins Sports Surfaces or comparable product by one of the following:
 - 1. Aacer Flooring, LLC.
 - 2. Horner Flooring Company, Inc.

2.2 FLOORING MATERIALS

- A. Random-Length Strip Flooring (Provide at Gymnasium Floor): White hard maple, kiln dried, random length, tongue and groove, and end matched.
 - 1. Grade: Second and Better.
 - 2. Thickness: 33/32 inch.
 - 3. Face Width: 2-1/4 inches.

2.3 SUBFLOOR MATERIALS

- A. Plywood Underlayment: One layer of 15/32 inch thick fir or Southern Pine plywood, APA rated sheathing, exposure 1.
- B. Sleeper: 7/8" thick plywood, 4" wide.
- C. Resilient Pads: 7/16" thick, 4"x4" neoprene pads; 24" o.c. in each direction

2.4 FINISHES

- A. Floor-Finish System: System of compatible components recommended in writing by flooring manufacturer, and MFMA approved.
 - 1. Floor-Sealer Formulation: Pliable, penetrating type. MFMA Group 1, Sealers.
 - 2. Finish-Coat Formulation: Formulated for gloss finish indicated and multicoat application. a. Type: MFMA Group 3, Gymnasium-Type Surface Finishes.
 - 3. Game-Line and Marker Paint: Industrial enamel compatible with finish coats and recommended in writing by manufacturers of finish coats, and paint for this use.
 - 4. 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. Vapor Retarder: ASTM D 4397, polyethylene sheet not less than 6 mils thick.
- C. Resilient Wall Base: Molded, vented, rubber or vinyl cove base; 4 by 3 by 48 inches; with premolded outside corners and neatly mitered inside corners.
 - 1. Basis of Design: Vent-Cove by Johnsonite.
 - 2. Color: As selected.
- D. Fasteners: Type and size recommended by manufacturer, but not less than those recommended by MFMA for application indicated.
- E. Trowelable Leveling and Patching Compound: Latex-modified, hydraulic-cement-based formulation approved by wood athletic flooring manufacturer.
- F. Adhesives: Manufacturer's standard for application indicated.
 - 1. Adhesive shall have a VOC content of 100 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."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Concrete Slabs: Verify that concrete substrates are dry and moisture-vapor emissions are within acceptable levels according to manufacturer's written instructions.

- 1. Moisture Testing: Perform tests so that each test area does not exceed 1000 sq. ft., 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 4.5 lb of water/1000 sq. ft. in 24 hours.
 - b. Relative Humidity Test: Using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 80 percent relative humidity level measurement.
 - c. Perform additional moisture tests recommended by manufacturer. Proceed with installation only after substrates pass testing.

3.2 PREPARATION

- A. Concrete Slabs:
 - 1. Grind high spots and fill low spots on concrete substrates to produce a maximum 1/8-inch deviation in any direction when checked with a 10-foot straight edge.
 - 2. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, and depressions in substrates.
 - 3. Remove coatings including curing compounds and other substances on substrates that are incompatible with installation adhesives and that contain soap, wax, oil, or silicone; use mechanical methods recommended by manufacturer. Do not use solvents.
- B. Broom and vacuum clean substrates to be covered immediately before product installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION

- A. Comply with wood athletic flooring manufacturer's written instructions, but not less than written recommendations of MFMA applicable to flooring type indicated.
- B. Pattern: Lay flooring parallel with long dimension of space to be floored unless otherwise indicated.
- C. Expansion Spaces: Provide as indicated, but not less than that required by manufacturer's written instructions and MFMA's written recommendations at walls and other obstructions, and at interruptions and terminations of flooring.
 - 1. Cover expansion spaces with base molding, trim, and saddles, as indicated on Drawings.
- D. Vapor Retarder: Cover entire slab area beneath wood flooring. Install with joints lapped a minimum of 6 inches and sealed.
- E. Underlayment: Install perpendicular to direction of flooring, staggering end joints in adjacent rows.
- F. Sleepers:

- 1. Install sleepers perpendicular to direction of flooring, staggering end joints a minimum of 24 inches.
- 2. Space at spacing recommended by manufacturer for system components indicated.
- 3. Anchor predrilled sleepers through resilient pads.
- G. Strip Flooring: Mechanically fasten perpendicular to supports.
- H. Installation Tolerances: 1/8 inch in 10 feet of variance from level.

3.4 SANDING AND FINISHING

- A. Allow installed flooring to acclimate to ambient conditions before sanding.
- B. Follow applicable recommendations in MFMA's "Industry Recommendations for Sanding, Sealing, Court Lining, Finishing, and Resurfacing of Maple Gym Floors."
- C. Machine sand with coarse, medium, and fine grades of sandpaper to achieve a level, smooth, uniform surface without ridges or cups. Remove sanding dust by tack or vacuum.
- D. Finish: Apply seal and finish coats of finish system according to finish manufacturer's written instructions. Provide no fewer than four coats total and no fewer than two finish coats.
 - 1. Water-Based Finishes: Use finishing methods recommended by finish manufacturer to reduce grain raise and sidebonding effect.
 - 2. Game-Line and Marker Paint: Apply game-line and marker paint between final seal coat and first finish coat according to paint manufacturer's written instructions.
 - a. Mask flooring at game lines and markers, and apply paint to produce lines and markers with sharp edges.
 - b. Where game lines cross, break minor game line at intersection; do not overlap lines.
 - c. Apply game lines and markers in widths and colors according to requirements indicated on Drawings.
 - d. Apply finish coats after game-line and marker paint is fully cured.

3.5 **PROTECTION**

- A. Protect wood athletic flooring during remainder of construction period to allow finish to cure and to ensure that flooring and finish are without damage or deterioration at time of Substantial Completion.
 - 1. Do not cover flooring after finishing until finish reaches full cure and not before seven days after applying last finish coat.
 - 2. Do not move heavy and sharp objects directly over flooring. Protect fully cured floor finishes and surfaces with plywood or hardboard panels to prevent damage from storing or moving objects over flooring.

END OF SECTION 096466

SECTION 096513 - 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.
 - 3. Resilient stair accessories.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- 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 resilient base and stair accessories, indicating compliance with requirements for low-emitting materials.
- C. Samples for Verification: For each type of product indicated and for each color, texture, and pattern required in manufacturer's standard-size Samples, but not less than 12 inches long.
- D. Product Schedule: For resilient base and accessory products. Use same designations indicated on Drawings.

1.4 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. Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.5 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. Coordinate mockups in this Section with mockups specified in other Sections.

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 or more than 90 deg F.

1.7 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, 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. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Resilient base and stair accessories 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."

2.2 RESILIENT BASE

- A. ASTM F1861, Type TS Rubber, Vulcanized thermoset, top set Style B, Cover.
- B. Thickness: .0125 inch thick.
- C. Lengths: Coils in manufacturer's standard length.
- D. Heights: 4" standard unless otherwise noted on drawings.
- E. Outside Corners: Job formed.

RESILIENT BASE AND ACCESSORIES

F. Inside Corners: Job formed.

2.3 RUBBER STAIR ACCESSORIES

- A. 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.
- B. 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. Burke Mercer Flooring Products, Division of Burke Industries Inc.
 - 2. Tarkett.
 - 3. Johnsonite; a Tarkett Company.
 - 4. Nora Systems, Inc.
 - 5. Roppe Corporation, USA.
- C. Stair Treads: ASTM F 2169.
 - 1. Type: TS (rubber, vulcanized thermoset) or TP (rubber, thermoplastic).
 - 2. Class: 2 (pattern; embossed, grooved, or ribbed).
 - 3. Group: 1 (embedded abrasive strips).
 - 4. Nosing Style: Combined tread and riser; hammered texture tread with contrasting color abrasive grit strips, full width of nosing.
 - 5. Tapered Nosing: Not less than 1-5/8 inches deep.
 - 6. Thickness: 0.1875 inch and tapered to back edge.
 - 7. Size: Lengths and depths to fit each stair tread in one piece.
 - 8. Integral Risers: Smooth, flat; in height that fully covers substrate.
- D. Rubber stair-tread nosing.
 - 1. Profile and Dimensions: Undercut carpet nosing 2-1/4" tread, similar to Roppe #17.
- E. Locations: Provide rubber stair accessories in areas indicated.
- F. Colors and Patterns: As selected by Architect from full range of industry colors.

2.4 RESILIENT MOLDING ACCESSORY

A. Refer to Finish Schedule on Drawings for manufacturers, products, colors, and finishes.

2.5 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.

- 1. Adhesives shall have a VOC content of 50 g/L or less and 60 g/L or less for rubber stair treads.
- 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. Stair-Tread Nose Filler: Two-part epoxy compound recommended by resilient stair-tread manufacturer to fill nosing substrates that do not conform to tread contours.
- D. Floor Polish: Provide protective, liquid floor-polish products recommended by resilient stairtread manufacturer.

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 products.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
 - 1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates for Resilient Stair Accessories: Prepare horizontal surfaces 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. 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 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. in 24 hours.
- b. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have 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 products until they are the same temperature as the space where they are to be installed.
 - 1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.
- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

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 practical 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 and form with returns not less than 3 inches in length.
 - a. Form without producing discoloration (whitening) at bends.
 - 2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.
 - a. Miter or cope corners to minimize open joints.

3.4 RESILIENT ACCESSORY INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient accessories.
- B. Resilient Stair Accessories:
 - 1. Use stair-tread-nose filler to fill nosing substrates that do not conform to tread contours.
 - 2. Tightly adhere to substrates throughout length of each piece.

- 3. For treads installed as separate, equal-length units, install to produce a flush joint between units.
- C. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting 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 horizontal surfaces thoroughly.
 - 3. Damp-mop horizontal 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 subject to wear and foot traffic until Substantial Completion.

END OF SECTION 096513

SECTION 096519 - RESILIENT TILE FLOORING

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. Rubber floor tile.
 - 2. Sustainable tile.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- 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. Product Data: For chemical-bonding compounds, indicating VOC content.
 - 4. Laboratory Test Reports: For chemical-bonding compounds, indicating compliance with requirements for low-emitting materials.
 - 5. Product Data: For sealants, indicating VOC content.
 - 6. Laboratory Test Reports: For sealants, indicating compliance with requirements for lowemitting materials.
 - 7. Laboratory Test Reports: For flooring products, indicating compliance with requirements for low-emitting materials.
- C. Shop Drawings: For each type of floor tile. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
 - 1. Show details of special patterns.
- D. Samples for Verification: Full-size units of each color and pattern of floor tile required.
- E. Product Schedule: For resilient products. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of floor tile to include in maintenance manuals.

1.6 MATERIALS MAINTENANCE 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. Floor Tile: Furnish 1 box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

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 floor tile installation indicated.
- 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 floor tile including resilient base and accessories.
 - a. Size: Minimum 100 sq. ft. for each type, color, and pattern in locations directed by Architect.
 - 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.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store floor tile, resilient base, 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 or more than 90 deg F. Store floor tiles on flat surfaces.

1.9 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive floor tile and resilient base 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 or more than 95 deg F.
- C. Close spaces to traffic during floor tile installation.
- D. Close spaces to traffic for 48 hours after floor tile installation.

E. Install floor tile after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For resilient tile 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.
- B. Flooring products shall meet FloorScore Standard requirements and 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."

2.2 SUSTAINABLE FLOOR TILE (Drawing designation: VST) (Base Bid)

- A. Basis-of-Design Product: Subject to compliance with requirements, provide bio-based floor tile manufactured by Armstrong Commercial Flooring, unless indicated otherwise on Drawings.
 - 1. Bio-based tile: Striations
 - a. Size: 12" x 24"
 - b. Colors:
 - 1) Field 50% per room
 - 2) Accent color 1 20% per room
 - 3) Accent color 2 15% per room
 - 4) Accent color 3 15% per room
 - 2. Manufacturers:
 - a. Armstrong Commercial Flooring
 - b. Johnsonite Inc., Optima iQ Tile

2.3 VINYL COMPOSITION FLOOR TILE (Alternate A-A1 and A-A2)

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Armstrong World Industries, Inc.
 - 2. Congoleum Corporation.
 - 3. Mannington Mills, Inc.
- B. Tile Standard: ASTM F 1066, Class 2, through-pattern tile.
- C. Wearing Surface: Smooth.
- D. Thickness: 0.125 inch.
- E. Size: 12 by 12 inches.
- F. Colors and Patterns: As selected by Architect from full range of industry colors.
 - 1. Colors:
 - a. Field 50% per room
 - b. Accent color 1 20% per room

- c. Accent color 2 15% per room
- d. Accent color 3 15% per room

2.4 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 floor tile and substrate conditions indicated.
 - 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. Floor Polish: Provide protective liquid floor polish products as recommended by manufacturer.

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 floor tile.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.
- 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 floor tile manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile 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 floor tile 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. 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. Access Flooring Panels: Remove protective film of oil or other coating using method recommended by access flooring manufacturer.
- D. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- E. Do not install floor tiles until they are the same temperature as the space where they are to be installed.
 - 1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.
- F. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.3 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tile.
- B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
 - 1. Lay tiles square with room axis.
- C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
 - 1. Lay tiles with grain running in one direction.
- D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.

- G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.
- H. Adhere floor tiles to flooring 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.
 - 2. Chemically Bonded Seams: Bond seams with chemical-bonding compound to permanently fuse sections into a seamless flooring. Prepare seams and apply compound to produce tightly fitted seams without gaps, overlays, or excess bonding compound on flooring surfaces.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.
- B. Perform the following operations immediately after completing floor tile 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 floor tile 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 floor tile surfaces before applying liquid floor polish.
 - 1. Apply three coats.
- E. Joint Sealant: Apply sealant to resilient terrazzo floor tile perimeter and around columns, at door frames, and at other joints and penetrations.
- F. Sealers and Finish Coats: Remove soil, visible adhesive, and surface blemishes from resilient terrazzo floor tile surfaces before applying liquid cleaners, sealers, and finish products.
 - 1. Sealer: Apply two base coats of liquid sealer.
 - 2. Finish: Apply three coats of liquid floor finish.
- G. Cover floor tile until Substantial Completion.

END OF SECTION 096519

SECTION 096614 – RESTORATION OF TERRAZZO FLOORS

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. Regrinding and refinishing existing terrazzo floors (and integral treads, risers and base) in A Building Stair A-2 and B Building Stairs B1 and B2.
 - 2. Repairing chips in terrazzo surface especially in stair treads and the nosing of stair treads.

1.3 REFERENCE STANDARDS

A. NTMA – Terrazzo Specifications; The National Terrazzo and Mosaic Association, Inc.; current edition located at www.ntma.com

1.4 SUBMITTALS

- A. Product Data: Provide data for sealer and cleaner and grout.
- B. Cleaning and maintenance data.
- C. Provide grout color samples to match existing terrazzo floor matrix.
- D. Provide sample crushed marble chips of size gradation and color to match existing intact materials and patterns.
- E. Provide site sample grouted crack (12" length) for approval of grout match. Provide additional samples until approved by Architect.
- F. Provide site sample (min. 20 sf) at beginning of fine grinding process for Architect's approval before proceeding with fine grinding.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing the work of this section with not fewer than 5 years of documented experience.

1. Installer shall be a contractor member of NTMA and shall perform all work in accordance with NTMA standards.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cleaner: potable water, free of iron.
- B. Portland Cement: ASTM C150, Type I except as modified to comply with NTMA requirement for compressive strength. Provide non-staining white cement for terrazzo matrix.
- C. Sand: ASTM C33.
- D. Clean potable water.
- E. Aggregate: Natural, sound, crushed marble chips without excessive flats or flakes, complying with NTMA requirements. Colors and gradation of aggregate sizes as required to match original existing intact materials and patterns. Aggregate colors should be matched after cleaning or taken from the interior of core samples of existing work to be demolished.
- F. Matrix Pigments: Pure mineral or synthetic pigments, resistant to alkalies and non-fading. Mix pigments with matrix to provide required colors.
- G. Sealer: Colorless, slip and stain resistant penetrating liquid type with Ph factor between 7 and 10 that does not affect color or physical properties of terrazzo surface.
- H. Grout: Cement acrylic grout with color added to match the matrix of the original terrazzo.

2.2 EQUIPMENT

- A. All work shall be executed with conventional terrazzo grinding equipment according to trade practice. No lighter type machines, such as floor scrubbing machines, will be accepted.
 - 1. Grinding Stones: Fine grit emery stones manufactured specifically for restorative type grinding and surfacing of terrazzo surfaces (#40 and #80 grit stones).
 - 2. Resurfacing Screens: A fine grit screen manufactured specifically for restorative type grinding and resurfacing terrazzo surfaces.

PART 3 - EXECUTION

- 3.1 General
 - A. Perform work in accordance with NTMA recommendations as posted on their website at www.ntma.com.

3.2 Preparation

- A. Cover and protect all adjacent finished surfaces during restoration process.
- 3.3 Crack Repair
 - A. Clean cracks by mechanical means (using metal dental pick of fine "dremel" tooling) to remove dirt, debris and sealers "V" shape routing our or significant widening is not permitted. Prior to proceeding provide sample for Architect's approval.
 - B. Grout cracks to match existing matrix prior to initial grinding.

3.4 Chip Repair

- A. Surface Preparation
 - 1. With a power saw or hand tools, cur a vertical perimeter wall around the area to be patched. If the patch is smaller than an inch square, slightly undercut this edge.
 - 2. Clean surface of debris. Saturate void with water to prevent quick surface drying. Ensure that water penetrates into the surface in order to achieve a proper bond. Clean surfaces until any obstructing material has been removed.
- B. Installation of Terrazzo Composition
 - 1. Apply cement paste and work into the surface. Do not allow cement past to dry before placing the terrazzo composition.
 - 2. Mix two parts blended marble chips with one part Portland Cement and add enough water to make this mix plastic.
 - 3. Place mixture over chip or crack and level with a trowel.
 - 4. Seed additional marble chips of the same blend over the patch, as required to establish a uniform coverage.
 - 5. Compact patch, removing all excess water and cement from the surface.
 - 6. Cover the patch with paper or polyethylene sheeting to prevent quick hydration. Cure until topping develops sufficient strength to prevent lifting or pulling of terrazzo chips during grinding.
 - 7. Sand surfaced with a hand sander or small grinding tool, using fine stones to achieve desired finish. Use a #40 of finer grit stone for the initial grinding, exposing the marble chips. Follow with a fine #80 grit stone before grouting with cement to fill all pinholes.
 - 8. Cover grouted surface with paper or polyethylene for at least 72 hours.
 - 9. Thoroughly rinse the surface with clean, clear water.
 - 10. Remove excess rinse water and machine or hand apply grout using identical Portland cement, color and pigments as used in topping taking care to fill all vids completely.
 - 11. Final polish with a #80 or finer grit stone. Care should be taken to limit grinding and polishing to a small distance beyond the perimeter of the patch.
 - 12. Seal patch with a penetrating type terrazzo sealer.

- 3.5 Initial Grinding
 - A. Grind with 60-80 grit stone all in the presence of water.
- 3.6 Grouting
 - A. Cleanse floor with ample clean water and rinse.
 - B. Remove excess rinse water and machine or hand-apply grout (approved color match) to the terrazzo floor taking care to fill all voids.
- 3.7 Curing Grout
 - A. The grout shall remain on the surface until fully cured, commonly a minimum of 12 hours or so at 70 deg. F.
- 3.8 Fine Grinding
 - A. Grind with 120 grit stones until all grout has been removed from the terrazzo surface.
- 3.9 Cleaning and Sealing
 - A. Rinse with clean water and allow to thoroughly dry.
 - B. Seal: Apply penetrating sealer per manufacturer's directions.
 - C. Upon completion, this work shall be ready for final inspection and acceptance by the Owner.
 - D. Remove protection and clean any adjacent surfaces effected by the refinishing process.
- 3.10 Protection
 - A. General Contractor shall protect the finish floor from all site activity until Substantial Completion.

END OF SECTION 096614

SECTION 09 6623 - RESINOUS MATRIX TERRAZZO 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. Thin-set, epoxy-resin terrazzo flooring.

1.3 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. Product Data: For adhesives, indicating VOC content.
 - 3. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
 - 4. Laboratory Test Reports: For sealers, indicating compliance with requirements for lowemitting materials.
- C. Shop Drawings: Include terrazzo installation requirements. Include plans, elevations, sections, component details, and attachments to other work. Show layout of the following:
 - 1. Divider strips.
 - 2. Control-joint strips.
 - 3. Accessory strips.
 - 4. Terrazzo patterns.
- D. Samples: For each type, material, color, and pattern of terrazzo and accessory required showing the full range of color, texture, and pattern variations expected. Label each terrazzo sample to identify manufacturer's matrix color and aggregate types, sizes, and proportions. Prepare Samples of same thickness and from same material to be used for the Work, in size indicated below:
 - 1. Terrazzo: 6-inchsquare Samples.
 - 2. Accessories: 6-inch long Samples of each exposed strip item required.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Material Certificates: For each type of terrazzo material or product, from manufacturer.
- C. Installer Certificates: Signed by manufacturers certifying that installers comply with requirements.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For terrazzo to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Engage an installer who is a contractor member of NTMA.
- B. Source Limitations: Obtain primary terrazzo materials from single source from single manufacturer. Provide secondary materials including patching and fill material, joint sealant, and repair materials of type and from source recommended by manufacturer of primary materials.
- C. Source Limitations for Aggregates: Obtain each color, grade, type, and variety of granular materials from single source with resources to provide materials of consistent quality in appearance and physical properties.

1.7 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in supplier's original wrappings and containers, labeled with source's or manufacturer's name, material or product brand name, and lot number if any.
- B. Store materials in their original, undamaged packages and containers, inside a well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting terrazzo installation.Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during terrazzo installation.

- B. Close spaces to traffic during terrazzo application and for not less than 24 hours after application unless manufacturer recommends a longer period.
- C. Control and collect water and dust produced by grinding operations. Protect adjacent construction from detrimental effects of grinding operations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. NTMA Standards: Comply with NTMA's "Terrazzo Specifications and Design Guide" and with written recommendations for terrazzo type indicated unless more stringent requirements are specified.
- B. 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."

2.2 EPOXY-RESIN TERRAZZO

- A. Epoxy-Resin Terrazzo: Comply with NTMA's "Terrazzo Specifications and Design Guide" and manufacturer's written instructions for matrix and aggregate proportions and mixing.
 - 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. Crossfield Products Corp., Dex-O-Tex Division; Cheminert.
 - b. General Polymers; Sherwin Williams; Terrazzo 1100.
 - c. Key Resin Company; Key Epoxy Terrazzo.
 - d. Master Terrazzo Technologies LLC; Morricite.
 - e. Quadrant Chemical Corporation; Quadset Epoxy Terrazzo.
 - f. TEC Specialty; H.B. Fuller Construction Products Inc; Tuff-Lite Epoxy Terrazzo.
 - g. Terrazzo & Marble Supply Companies; Terroxy Resin Systems.
 - 2. Thickness: 1/4 inchnominal.
 - 3. Custom Mix Color and Pattern: Match Architect's sample.
- B. Materials:
 - 1. Flexible Reinforcing Membrane: Manufacturer's resinous membrane for substrate-crack preparation and reflective-crack reduction.
 - a. Reinforcement: Fiberglass scrim.
 - 2. Primer: Manufacturer's product recommended for substrate and use indicated.
 - 3. Epoxy-Resin Matrix: Manufacturer's standard recommended for use indicated and in color required for mix indicated.
 - a. Two component resin and epoxy hardener with mineral filler and color pigment, non-volatile, thermosetting.
 - b. Aggregate: Crushed marble, size in accordance with NTMA Plate of Standard Gradation and uniform coloration.
 - c. Physical Properties without Aggregates:
 - 1) Hardness: 60 to 85 per ASTM D 2240, Shore D.

- 2) Minimum Tensile Strength: 3000 psi per ASTM D 638 for a 2-inch specimen made using a "C" die per ASTM D 412.
- 3) Minimum Compressive Strength: 10,000 psi per ASTM D 695, Specimen B cylinder.
- 4) Chemical Resistance: No deleterious effects by contaminants listed below after seven-day immersion at room temperature per ASTM D 1308.
 - a) Distilled water.
 - b) Mineral water.
 - c) Isopropanol.
 - d) Ethanol.
 - e) 0.025 percent detergent solution.
 - f) 1.0 percent soap solution.
 - g) 10 percent sodium hydroxide.
 - h) 10 percent hydrochloric acid.
 - i) 30 percent sulfuric acid.
 - j) 5 percent acetic acid.
- d. Physical Properties with Aggregates: For resin blended with Georgia white marble, ground, grouted, and cured per requirements in NTMA's "Terrazzo Specifications and Design Guide"; comply with the following:
 - 1) Flammability: Self-extinguishing, maximum extent of burning 1/4 inch per ASTM D 635.
 - 2) Thermal Coefficient of Linear Expansion: 0.0025 inch/inch per deg F for temperature range of minus 12 to plus 140 deg F per ASTM D 696.
- 4. Aggregates: Comply with NTMA gradation standards for mix indicated and contain no deleterious or foreign matter.
 - a. Abrasion and Impact Resistance: Less than 40 percent loss per ASTM C 131.
 - b. 24-Hour Absorption Rate: Less than 0.75 percent.
 - c. Dust Content: Less than 1.0 percent by STRIP MATERIALS
- 5. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- 6. Finishing Grout: Resin based.
- C. Stairs: Epoxy matrix, aggregate size No. 0-1. Treads minimum of 3/8" thick.
- D. Thin-Set Divider Strips: L-type angle, 1/4 inch deep.
 - 1. Material: Zinc.
 - 2. Top Width: 1/8 inch thick.
- E. Heavy-Top Divider Strips: L-type angle in depth required for topping thickness indicated.
 - 1. Bottom-Section Material: Zinc coated steel.
 - 2. Top-Section Material: Zinc.
 - 3. Top-Section Width: 1/8 inch thick.
- F. Control-Joint Strips: Separate, double L-type angles, positioned back to back, that match material and color of divider strips and in depth required for topping thickness indicated.
- G. Accessory Strips: Match divider-strip width, material, and color unless otherwise indicated. Use the following types of accessory strips as required to provide a complete installation:
 - 1. Base-bead strips for exposed top edge of terrazzo base.
 - 2. Edge-bead strips for exposed edges of terrazzo.

2.3 MISCELLANEOUS ACCESSORIES

- 1. Crack Isolation Membrane: Manufacturer's resinous membrane for substrate-crack preparation and reflective-crack reduction. Reinforcement: Fiberglas Scrim
- B. Strip Adhesive: Epoxy-resin adhesive recommended by adhesive manufacturer for this use.
 - 1. Adhesives shall have a VOC content of 70 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. Anchoring Devices:
 - 1. Strips: Provide mechanical anchoring devices or adhesives for strip materials as recommended by manufacturer and required for secure attachment to substrate.
- D. Patching and Fill Material: Terrazzo manufacturer's resinous product approved and recommended by manufacturer for application indicated.
- E. Joint Compound: Terrazzo manufacturer's resinous product approved and recommended by manufacturer for application indicated.
- F. Resinous Matrix Terrazzo Cleaner: Chemically neutral cleaner with pH factor between 7 and 10 that is biodegradable, phosphate free, and recommended by sealer manufacturer for use on terrazzo type indicated.
- G. Sealer: Colorless, non-yellowing, penetrating, liquid type to completely seal matrix surface. Slip- and stain-resistant, penetrating-type sealer that is chemically neutral; does not affect terrazzo color or physical properties; is recommended by sealer manufacturer; and complies with NTMA's "Terrazzo Specifications and Design Guide" for terrazzo type indicated.
 - 1. Surface Friction: Not less than 0.6 according to ASTM D 2047.
 - 2. Acid-Base Properties: With pH factor between 7 and 10.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and 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, including levelness tolerances, have been corrected.

3.2 PREPARATION

A. Clean substrates of substances, including oil, grease, and curing compounds, that might impair terrazzo bond. Provide clean, dry, and neutral substrate for terrazzo application.

- B. Concrete Slabs:
 - 1. Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with terrazzo.
 - a. Shot-blast surfaces with an apparatus that abrades the concrete surface, contains the dispensed shot within the apparatus, and recirculates the shot by vacuum pickup.
 - b. Repair damaged and deteriorated concrete according to terrazzo manufacturer's written recommendations.
 - c. Use patching and fill material to fill holes and depressions in substrates according to terrazzo manufacturer's written instructions.
- C. Verify that concrete substrates are dry and moisture-vapor emissions are within acceptable levels according to manufacturer's written instructions.
 - 1. Moisture Testing: Perform tests indicated below.
 - a. Calcium Chloride Test: Perform anhydrous calcium chloride test per ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
 - 1) Perform tests so that each test area does not exceed 200 sq. ft., and perform not less than two tests in each installation area and with test areas evenly spaced in installation areas.
 - b. In-Situ Probe Test: Perform relative-humidity test using in-situ probes per ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative-humidity-level measurement.
 - c. Test Method: Test for moisture content by method recommended in writing by terrazzo manufacturer. Proceed with installation only after substrates pass testing.
- D. Protect other work from water and dust generated by grinding operations. Control water and dust to comply with environmental protection regulations.
 - 1. Erect and maintain temporary enclosures and other suitable methods to limit water damage and dust migration and to ensure adequate ambient temperatures and ventilation conditions during installation.

3.3 EPOXY-RESIN TERRAZZO INSTALLATION

- A. Comply with NTMA's written recommendations for terrazzo and accessory installation.
- B. Place, rough grind, grout, cure grout, fine grind, and finish terrazzo according to manufacturer's written instructions and NTMA's "Terrazzo Specifications and Design Guide."
- C. Installation Tolerance: Limit variation in terrazzo surface from level to 1/4 inch in 10 feet; noncumulative.
- D. Ensure that matrix components and fluids from grinding operations do not stain terrazzo by reacting with divider and control-joint strips.
- E. Delay fine grinding until heavy trade work is complete and construction traffic through area is restricted.

- F. Flexible Reinforcing Membrane:
 - 1. Prepare and prefill substrate cracks with membrane material.
 - 2. Install membrane at substrate cracks in areas to receive terrazzo.
 - 3. Reinforce membrane with fiberglass scrim.
 - 4. Prepare membrane according to manufacturer's written instructions before applying substrate primer.
- G. Primer: Apply to terrazzo substrates according to manufacturer's written instructions.

H. Strip Materials:

- 1. Divider and Control-Joint Strips:
 - a. Locate divider strips in locations indicated.
 - b. Install control-joint strips back to back directly above concrete-slab control joints.
 - c. Install control-joint strips with 1/4-inch gap between strips, and install sealant in gap.
 - d. Install strips in adhesive setting bed without voids below strips, or mechanically anchor strips as required to attach strips to substrate, as recommended by strip manufacturer.
- 2. Accessory Strips: Install as required to provide a complete installation in locations indicated.

3.4 REPAIR

A. Cut out and replace terrazzo areas that evidence lack of bond with substrate. Cut out terrazzo areas in panels defined by strips and replace to match adjacent terrazzo, or repair panels according to NTMA's written recommendations, as approved by Architect.

3.5 CLEANING AND PROTECTION

- A. Cleaning:
 - 1. Remove grinding dust from installation and adjacent areas.
 - 2. Wash surfaces with cleaner according to NTMA's written recommendations and manufacturer's written instructions; rinse surfaces with water and allow them to dry thoroughly.
- B. Sealing:
 - 1. Seal surfaces according to NTMA's written recommendations.
 - 2. Apply sealer according to sealer manufacturer's written instructions.
- C. Protection: Provide final protection and maintain conditions, in a manner acceptable to Installer, that ensure that terrazzo is without damage or deterioration at time of Substantial Completion.

END OF SECTION 096623

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SECTION 096723 - RESINOUS 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 resinous flooring systems.
- B. Related Sections:
 1. Section 096623 "Resinous Matrix Terrazzo Flooring" for thinset, epoxy-matrix terrazzo.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 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. Samples for Initial Selection: For each type of exposed finish required.
- D. Samples for Verification: For each resinous flooring system required, 6 inches square, applied to a rigid backing by Installer for this Project.

1.5 INFORMATIONAL SUBMITTALS

- A. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.
- B. Material Certificates: For each resinous flooring component, from manufacturer.
- C. Material Test Reports: For each resinous flooring system, by a qualified testing agency.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For resinous flooring to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.
- B. Engage an installer who is certified in writing by resinous flooring manufacturer as qualified to apply resinous flooring systems indicated.
- 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 on 96-inch- square floor area selected by Architect.
 - a. Include 96-inch 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.

1.8 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.

1.9 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.

PART 2 - PRODUCTS

2.1 PERORMANCE 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 RESINOUS FLOORING

- A. Resinous Flooring System: Abrasion-, impact-, and chemical-resistant, aggregate-filled, and resin-based monolithic floor surfacing designed to produce a seamless floor and integral cove base.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Crossfield Products Corp.
 - b. Dex-O-Tex.
 - c. Sherwin-Williams Company, General Polymers.
 - d. Stonhard, Inc.
- C. System Characteristics:
 - 1. Color and Pattern: As selected by Architect from manufacturer's full range.
 - 2. Wearing Surface: Textured for slip resistance.
 - 3. Overall System Thickness: 1/8 inch.
- D. Primer: Type recommended by resinous flooring manufacturer for substrate and resinous flooring system indicated.
- E. Waterproofing Membrane: Type recommended by resinous flooring manufacturer for substrate and resinous flooring system indicated.
- F. Reinforcing Membrane: Flexible resin formulation that is recommended by resinous flooring manufacturer for substrate and resinous flooring system indicated and that inhibits substrate cracks from reflecting through resinous flooring.
 - 1. Formulation Description: High solids.

- a. Provide fiberglass scrim embedded in reinforcing membrane.
- G. Patching and Fill Material: Resinous product of or approved by resinous flooring manufacturer and recommended by manufacturer for application indicated.
- H. Body Coats:
 - 1. Resin: Epoxy.
 - 2. Type: Clear.
 - 3. Application Method: Self-leveling slurry with broadcast aggregates Troweled or screeded.
 - 4. Number of Coats: Two.
 - 5. Thickness of Coats: 1/16 inch.
 - 6. Aggregates: Manufacturer's standard.
- I. Grout Coat:
 - 1. Resin: Epoxy.
 - 2. Type: Clear.
- J. Topcoats: Sealing or finish coats.
 - 1. Resin: Epoxy.
 - 2. Type: Clear.
 - 3. Number of Coats: One.
 - 4. Thickness of Coats: 1/16 inch.
 - 5. Finish: Gloss.
- K. System Physical Properties: Provide resinous flooring system with the following minimum physical property requirements when tested according to test methods indicated:
 - 1. Tensile Strength: 1,500psi minimum according to ASTM C 307.
 - 2. Flexural Modulus of Elasticity: 6,000psi minimum according to ASTM C 580.
 - 3. Impact Resistance: No chipping, cracking, or delamination and not more than 1/16-inch permanent indentation according to MIL-D-3134J.
 - 4. Hardness: 40, Shore D according to ASTM D 2240.

PART 3 - EXECUTION

3.1 PREPARATION

- A. 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.
 - 1. Roughen concrete substrates as follows:
 - a. Shot-blast surfaces with an apparatus that abrades the concrete surface, contains the dispensed shot within the apparatus, and recirculates the shot by vacuum pickup.

- b. Comply with ASTM C 811 requirements unless manufacturer's written instructions are more stringent.
- 2. Repair damaged and deteriorated concrete according to resinous flooring manufacturer's written instructions.
- 3. Verify that concrete substrates are dry and moisture-vapor emissions are within acceptable levels according to manufacturer's written instructions.
 - a. 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. of slab area in 24 hours.
 - b. Plastic Sheet Test: ASTM D 4263. Proceed with application only after testing indicates absence of moisture in substrates.
 - c. Relative Humidity Test: Use in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
- 4. 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. Patching and Filling: Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.
 - 1. Control Joint Treatment: Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer's written instructions.
- D. Resinous Materials: Mix components and prepare materials according to resinous flooring manufacturer's written instructions.

3.2 APPLICATION

- A. 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. Expansion and Isolation Joint Treatment: At substrate expansion and isolation joints, comply with resinous flooring manufacturer's written instructions.
- B. Primer: Apply primer over prepared substrate at manufacturer's recommended spreading rate.
- C. Waterproofing Membrane: Apply waterproofing membrane at slab on grade, in manufacturer's recommended thickness.
 - 1. Apply waterproofing membrane to integral cove base substrates.
- D. Reinforcing Membrane: Apply reinforcing membrane to substrate cracks.
- E. Integral Cove Base: Apply cove base mix to wall surfaces before applying flooring. Apply according to manufacturer's written instructions and details, including those for taping, mixing, priming, troweling, sanding, and topcoating of cove base. Round internal and external corners.

- 1. Integral Cove Base: 4 inches high.
- F. Self-Leveling Body Coats: Apply self-leveling slurry body coats in thickness indicated for flooring system.
 - 1. Aggregates: Broadcast aggregates at rate recommended by manufacturer and, after resin is cured, remove excess aggregates to provide surface texture indicated.
- G. Troweled or Screeded Body Coats: Apply troweled or screeded body coats in thickness indicated for flooring system. Hand or power trowel and grout to fill voids. When body coats are cured, remove trowel marks and roughness using method recommended by manufacturer.
- H. Grout Coat: Apply grout coat, of type recommended by resinous flooring manufacturer, to fill voids in surface of final body coat.
- I. Topcoats: Apply topcoats in number indicated for flooring system and at spreading rates recommended in writing by manufacturer and to produce wearing surface indicated.

3.3 FIELD QUALITY CONTROL

- A. 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.

3.4 **PROTECTION**

A. Protect resinous flooring from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by resinous flooring manufacturer.

END OF SECTION 096723

SECTION 097200 – PRESENTATION DRY ERASE WALL COVERING

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. Magnetic receptive dry erase wall covering.
 - 2. Tray, Trim, and presentation rails.
 - 3. Accessories.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include data on physical characteristics, durability, fade resistance, and fire-test-response characteristics.
- 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 wall materials, indicating compliance with requirements for low-emitting materials.
- C. Samples for Initial Selection: For each type of wall covering.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each wall covering, for tests performed by a qualified testing agency.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For wall coverings to include in maintenance manuals.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install wall coverings 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 levels intended for occupants after Project completion during the remainder of the construction period.

- B. Lighting: Do not install wall covering until lighting that matches conditions intended for occupants after Project completion is provided on the surfaces to receive wall covering.
- C. Ventilation: Provide continuous ventilation during installation and for not less than the time recommended by wall-covering manufacturer for full drying or curing.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Wall materials 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. Fire-Test-Response Characteristics: As determined by testing identical wall coverings applied with identical adhesives to substrates according to test method indicated below by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. 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: 450 or less.

2.2 DRY ERASE WALL COVERING

- A. Manufacturer: Walltalkers Wallcoverings by RJF International Corporation or approved equal.
 - 1. Walltalkers mag*rite II or approved equal. Magnetic, receptive, moderate gloss vinyl surface for dry erase markers.
 - a. 47/48 width, woven backing
 - b. 2 inch by 2 inch grid, 47/48 inch width, woven backing.

2.3 TRIM

- A. J Cap Walcovering Trim
 - 1. Clear satin, anodized aluminum, low profile trim.
- B. Plastic Marker Dispenser:
 - 1. Black plastic marker dispenser.

2.4 ACCESSORIES

- A. Adhesive: Mildew-resistant, nonstaining adhesive, for use with specific wall covering and substrate application indicated and as recommended in writing by wall-covering manufacturer.
 - 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."
- B. Primer/Sealer: Mildew resistant, complying with requirements in Section 099123 "Interior Painting" and recommended in writing by primer/sealer and wall-covering manufacturers for intended substrate.
- C. Seam Tape: As recommended in writing by wall-covering manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for levelness, wall plumbness, maximum moisture content, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions for surface preparation.
- B. Clean substrates of substances that could impair bond of wall covering, including dirt, oil, grease, mold, mildew, and incompatible primers.
- C. Prepare substrates to achieve a smooth, dry, clean, structurally sound surface free of flaking, unsound coatings, cracks, and defects.
 - 1. Moisture Content: Maximum of 5 percent on new plaster, concrete, and concrete masonry units when tested with an electronic moisture meter.
 - 2. Gypsum Board: Prime with primer as recommended in writing by primer/sealer manufacturer and wall-covering manufacturer.
 - 3. Painted Surfaces: Treat areas susceptible to pigment bleeding.
- D. Check painted surfaces for pigment bleeding. Sand gloss, semigloss, and eggshell finish with fine sandpaper.
- E. Remove hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.

F. Acclimatize wall-covering materials by removing them from packaging in the installation areas not less than 24 hours before installation.

3.3 WALL-COVERING INSTALLATION

- A. Comply with wall-covering manufacturers' written installation instructions applicable to products and applications indicated.
- B. Cut wall-covering strips in roll number sequence. Change the roll numbers at partition breaks and corners.
- C. Install strips in same order as cut from roll.
 1. For solid-color, even-texture, or random-match wall coverings, reverse every other strip.
- D. Install wall covering without lifted or curling edges and without visible shrinkage.
- E. Install seams vertical and plumb at least 6 inches from outside corners and 3 inches from inside corners unless a change of pattern or color exists at corner. Horizontal seams are not permitted.
- F. Trim edges and seams for color uniformity, pattern match, and tight closure. Butt seams without overlaps or gaps between strips.
- G. Fully bond wall covering to substrate. Remove air bubbles, wrinkles, blisters, and other defects.

3.4 CLEANING

- A. Remove excess adhesive at seams, perimeter edges, and adjacent surfaces.
- B. Use cleaning methods recommended in writing by wall-covering manufacturer.
- C. Replace strips that cannot be cleaned.
- D. Reinstall hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.

END OF SECTION 097200

SECTION 098433 - 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, fabric-wrapped panel units tested for acoustical performance, including:
 - 1. Sound-absorbing wall panels.
 - 2. Sound diffusing wall panels.

1.3 DEFINITIONS

- A. NRC: Noise Reduction Coefficient.
- B. SAA: Sound Absorption Average.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of fabric facing, panel edge, core material, and mounting indicated.
- B. Sustainable Design Submittals:
 - 1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
 - 2. 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.
 - 3. Chain-of-Custody Certificates: For certified wood products. Include statement of costs.
 - 4. Chain-of-Custody Qualification Data: For manufacturer and vendor.
 - 5. Product Data: For adhesives, indicating VOC content.
 - 6. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
 - 7. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.
 - 8. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.
- C. Shop Drawings: For unit assembly and installation.

- 1. Include mounting devices and details; details at panel head, base, joints, and corners; and details at ceiling, floor base, and wall intersections. Indicate panel edge and core materials.
- 2. Include elevations showing panel sizes and direction of fabric weave and pattern matching.
- D. Samples for Initial Selection: For each type of fabric facing from sound-absorbing wall unit manufacturer's full range.
- E. Samples for Verification: For the following products, prepared on Samples of size indicated below:
 - 1. Fabric: Full-width by approximately 36-inch long Sample, but not smaller than required to show complete pattern repeat, from dye lot to be used for the Work, and with specified treatments applied. Mark top and face of fabric.
 - 2. Panel Edge: 12-inch- long Sample(s) showing each edge profile, corner, and finish.
 - 3. Core Material: 12-inch- square Sample at corner.
 - 4. Mounting Devices: Full-size Samples.

1.5 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 sound-absorbing wall units including the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
 - c. Speakers.
 - d. Alarms.
 - e. Sprinklers.
 - f. Access panels.
 - 3. Show operation of hinged and sliding components covered by or adjacent to soundabsorbing wall units.
- B. Product Certificates: For each type of sound-absorbing wall unit, from manufacturer.
- C. Warranty: Sample of special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For sound-absorbing wall units to include in maintenance manuals. Include fabric manufacturers' written cleaning and stain-removal recommendations.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials from same production run that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

- 1. Fabric: For each fabric, color, and pattern installed, provide length equal to 10 percent of amount installed, but no fewer than 10 yards.
- 2. Mounting Devices: Full-size units equal to 5 percent of amount installed, but no fewer than five devices, including unopened adhesives.

1.8 QUALITY ASSURANCE

- A. Source Limitations:
 - 1. Obtain sound-absorbing wall units from single source from single manufacturer.
 - 2. Obtain sound diffusing units from same manufacturer as ceiling mounted diffusing units specified in 095113 "Acoustical Panel Ceilings".
- B. Fire-Test-Response Characteristics: Provide sound-absorbing wall units meeting the following as determined by testing identical products by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - 1. Surface-Burning Characteristics: As determined by testing per ASTME84.
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 200 or less.
- C. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.
- D. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.
- E. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials, fabrication, and installation.
 - 1. Build mockup of typical wall area as directed by Architect.
 - 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.
- F. Preinstallation Conference: Conduct conference at Project site.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Comply with fabric and sound-absorbing wall unit manufacturers' written instructions for minimum and maximum temperature and humidity requirements for shipment, storage, and handling.
- B. Deliver materials and units in unopened bundles and store in a temperature-controlled dry place with adequate air circulation.

1.10 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install sound-absorbing wall 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 sound-absorbing wall 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 locations of sound-absorbing wall units and actual dimensions of openings and penetrations by field measurements before fabrication.

1.11 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of sound-absorbing wall units that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to the following:
 - a. Acoustical performance.
 - b. Fabric sagging, distorting, or releasing from panel edge.
 - c. Warping of core.
 - 2. Warranty Period: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain wall units specified in this Section and ceiling units specified in Section 095113 "Acoustical Panel Ceilings" from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Wall materials 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. 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. Basis of Design Product: Subject to compliance with requirements, provide Armstrong World Industries, Inc.; Soundsoak Acoustical Walls, or comparable product by one of the following:
 - 1. Acoustical Panel Systems (APS, Inc.).
 - 2. Acoustical Solutions, Inc.
 - 3. Benton Brothers Solutions, Inc.

- 4. Decoustics Limited; a CertainTeed Ceilings company.
- 5. Kinetics Noise Control, Inc.
- 6. MBI Products Company, Inc.
- 7. Panel Solutions, Inc.
- 8. Sound Management Group LLC.
- 9. Wall Technology, Inc.; an Owens Corning company.
- 10. Working Walls, Inc.
- B. Sound-Absorbing Wall Panels: Manufacturer's standard panel construction consisting of facing material laminated to front face, edges, and back edge border of core.
 - 1. Mounting: Back mounted with manufacturer's standard metal clips or bar hangers, secured to substrate.
 - 2. Core: Manufacturer's standard glass-fiber board.
 - 3. Edge Construction: Manufacturer's standard chemically hardened core with no frame.
 - 4. Edge Profile: As indicated on Drawings. Square
 - 5. Corner Detail in Elevation: As indicated on Drawings with continuous edge profile indicated.
 - 6. Reveals between Panels: As indicated on Drawings.
 - 7. Facing Material: Fabric as indicated on Drawings.
 - 8. Acoustical Performance: Sound absorption NRC of not less than 1.05 according to ASTM C 423 for Type A mounting according to ASTM E 795.
 - 9. Nominal Thickness: 2 inches.
 - 10. Panel Width: As indicated on Drawings.
 - 11. Panel Height: As indicated on Drawings.

2.4 SOUND-DIFFUSING AND -REFLECTING WALL UNITS

- A. Sound-Diffusing Wall Panel: Manufacturer's standard panel construction.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Conwed Designscape; an Owens Corning company.
 - 2. Sound Concepts Canada, Inc.
 - 3. Wall Technology, Inc.; an Owens Corning company.
 - 4. Wenger Corporation.
- C. Description:
 - 1. Panel Shape: Radially curved flat panel As indicated on Drawings.
 - 2. Mounting: Back mounted with manufacturer's standard metal clips or bar hangers, secured to substrate.
 - 3. Core: Manufacturer's standard, prepared for required acoustical performance.
 - 4. Edge Construction: Manufacturer's standard.
 - 5. Reveals between Panels: reveals as indicated on Drawings.
 - 6. Facing Material: Owner-furnished material.
 - 7. Acoustical Performance: Sound absorption coefficient: 0.14 at 500 Hz, 0.11 at 1000 Hz, and 0.11 at 2000 Hz of according to ASTM C 423 for Type A mounting according to ASTM E 795.
 - 8. Panel Width: As indicated on Drawings.
 - 9. Panel Height: As indicated on Drawings.

2.5 MATERIALS

- A. Composite Wood Products: Products shall be made without urea formaldehyde.
- B. 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."
- C. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- D. Regional Materials: Products shall be manufactured within 500 miles of Project site.
- E. 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.
- F. Core Materials:
 - 1. Glass-Fiber Board: ASTM C 612, Type standard with manufacturer; nominal density of 6 to 7 lb/cu. ft., unfaced, and dimensionally stable, molded rigid board; and with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.
 - 2. Fire-Retardant Formed Plastic: Manufacturer's standard formed plastic with flame-spread index of 25 or less and smoke-developed index of 25 or less according to ASTM E 84 or UL 723.
- G. Facing Material (FWC-1, FWC-2): Refer to Finish Schedule Legend on Drawings.
- H. Mounting Devices: Concealed on back of unit, recommended by manufacturer to support weight of unit, type as indicated on Drawings.
 - 1. Adhesives shall have a VOC content of 70 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."
 - 3. Metal Clips or Bar Hangers: Manufacturer's standard two-part metal "Z" clips, with one part of each clip mechanically attached to back of unit and the other part to substrate, designed to permit unit removal.

2.6 FABRICATION

- A. General: Use manufacturer's standard construction except as otherwise indicated; with facing material applied to face, edges, and back border of dimensionally stable core; and with rigid edges to reinforce panel perimeter against warpage and damage.
 - 1. Glass-Fiber Board Cores: Chemically harden core edges and areas of core where mounting devices are attached.
- B. Facing Material: Apply fabric facing fully covering visible surfaces of unit; with material stretched straight, on the grain, tight, square, and free from puckers, ripples, wrinkles, sags, blisters, seams, adhesive, or other visible distortions or foreign matter.
- C. Dimensional Tolerances of Finished Units: Plus or minus 1/16 inch 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. Examine fabric, fabricated units, substrates, areas, and conditions for compliance with requirements, installation tolerances, and other conditions affecting unit performance.
- B. 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.
- C. Align fabric pattern and grain with adjacent units.

3.3 INSTALLATION TOLERANCES

- A. Variation from Plumb and Level: Plus or minus 1/16 inch in 48 inches, noncumulative.
- B. Variation of Joint Width: Not more than 1/16-inch variation from reveal line in 48 inches, noncumulative.

3.4 CLEANING

- A. Clip loose threads; remove pills and extraneous materials.
- B. Clean panels on completion of installation to remove dust and other foreign materials according to manufacturer's written instructions.

END OF SECTION 098433

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SECTION 099113 - EXTERIOR 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 exterior substrates:
 - 1. Steel and iron.
- B. Related Requirements:
 - 1. Section 051200 "Structural Steel Framing" for shop priming of metal substrates.
 - 2. Section 055000 "Metal Fabrications" for shop priming metal fabrications.
 - 3. Section 055213 "Pipe and Tube Railings" for shop priming pipe and tube railings.

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 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- C. 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.
- D. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
- E. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- F. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.4 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. Samples for Verification: For each type of paint system and each color and gloss of topcoat.
 - 1. Submit Samples on rigid backing, 8 inches 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.
- C. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Paint: 5 percent, but not less than 1 gal. of each material and color applied.

1.6 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.
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F 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 one of the following:
 - 1. Benjamin Moore & Co.
 - 2. Duron, Inc.
 - 3. Glidden Professional.
 - 4. PPG Architectural Finishes, Inc.
 - 5. Sherwin-Williams Company (The).
- B. Products: Subject to compliance with requirements, provide one of the products listed in the Exterior Painting Schedule for the paint category indicated.

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. Colors: Match Architect's samples.
 - 1. Ten 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

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. Fiber-Cement Board: 12 percent.
 - 3. Masonry (Clay and CMUs): 12 percent.
 - 4. Wood: 15 percent.
 - 5. Portland Cement Plaster: 12 percent.
 - 6. Gypsum Board: 12 percent.
- C. Portland Cement Plaster Substrates: Verify that plaster is fully cured.

- D. Exterior Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- 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 Architectural Painting Specification Manual" applicable to substrates and paint 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.
- 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. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:
 1. SSPC-SP 7/NACE No. 4.
- E. 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.
- F. 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 paints.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."
 - 1. Use applicators and techniques suited for paint and substrate indicated.
 - 2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
 - 3. Paint both sides and edges of exterior doors and entire exposed surface of exterior door frames.
 - 4. Paint entire exposed surface of window frames and sashes.
 - 5. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

- 6. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. Tint undercoats same color as topcoat, but tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. 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.

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 EXTERIOR PAINTING SCHEDULE

- A. Steel and Iron Substrates:
 - 1. Water-Based Light Industrial Coating System MPI EXT 5.1C:
 - a. Prime Coat: Primer, alkyd, anti-corrosive for metal, MPI #79.
 - b. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat.

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- c. Topcoat: Light industrial coating, exterior, water based (MPI Gloss Level 3), MPI #161.
- B. Galvanized-Metal Substrates:
 - Water-Based Light Industrial Coating System MPI EXT 5.3J:
 - a. Prime Coat: Primer, galvanized, water based, MPI #134.
 - b. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat.
 - c. Topcoat: Light industrial coating, exterior, water based (MPI Gloss Level 3), MPI #161.

END OF SECTION 099113

SECTION 099123 - 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:
 - 1. Concrete.
 - 2. Concrete masonry units (CMUs).
 - 3. Steel and iron.
 - 4. Galvanized metal.
 - 5. Gypsum board.
 - 6. Plaster.
 - 7. Cotton or canvas 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 055213 "Pipe and Tube Railings" for shop priming pipe and tube railings.
 - 5. Section 099600 "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 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 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. 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.
- D. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.5 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. Paint: 5 percent, but not less than 1 gal. of each material and color applied.

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..
 - 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.
 - 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.
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F 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 one of the following:
 - 1. Benjamin Moore & Co.
 - 2. Duron, Inc.
 - 3. Glidden Professional.
 - 4. PPG Architectural Coatings.
 - 5. Sherwin-Williams Company (The).
- B. Products: Subject to compliance with requirements, provide one of the products listed in the Interior Painting Schedule for the paint category indicated.

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. Low-Emitting Materials: Interior paints and 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."
- E. Colors: Match Architect's samples.
 - 1. Ten 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

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. Fiber-Cement Board: 12 percent.
 - 3. Masonry (Clay and CMUs): 12 percent.
 - 4. Wood: 15 percent.
 - 5. Gypsum Board: 12 percent.
 - 6. 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 Architectural Painting Specification Manual" applicable to substrates and paint 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 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 exceeds that permitted in manufacturer's written instructions.
- F. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:
 1. SSPC-SP 7/NACE No. 4.
- 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 paints.
- I. Aluminum Substrates: Remove loose surface oxidation.

J. 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. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- C. 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.
- D. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
 - 1. Paint the following work where exposed in equipment rooms:
 - a. Uninsulated metal piping required to be painted for safety reasons.
 - b. Tanks that do not have factory-applied final finishes.
 - c. 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. Institutional Low-Odor/VOC Latex System MPI INT 3.1M:
 - a. Prime Coat: Primer sealer, interior, institutional low odor/VOC, MPI #149.
 - b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
 - c. Topcoat: Latex, interior, institutional low odor/VOC (MPI Gloss Level 3), MPI #145.
- B. Concrete Substrates, Traffic Surfaces:
 - Latex Floor Enamel System MPI INT 3.2A:
 - a. Prime Coat: Floor paint, latex, matching topcoat.
 - b. Intermediate Coat: Floor paint, latex, matching topcoat.
 - c. Topcoat: Floor paint, latex, low gloss (maximum MPI Gloss Level 3), MPI #60.
 - 2. Concrete Stain System MPI INT 3.2E:
 - a. First Coat: Stain, interior, for concrete floors, matching topcoat.
 - b. Topcoat: Stain, interior, for concrete floors, MPI #58.
- C. CMU Substrates:

1.

- 1. High-Performance Architectural Latex System MPI INT 4.2D:
 - a. Block Filler: Block filler, latex, interior/exterior, MPI #4.
 - b. Prime Coat: Primer, alkali resistant, water based, MPI #3.

- c. Intermediate Coat: Latex, interior, high performance architectural, matching topcoat.
- d. Topcoat: Latex, interior, high performance architectural (MPI Gloss Level 3), MPI #139.
- D. Steel Substrates:
 - 1. High-Performance Architectural Latex System MPI INT 5.1R:
 - a. Prime Coat: Shop primer specified in Section where substrate is specified.
 - b. Intermediate Coat: Latex, interior, high performance architectural, matching topcoat.
 - c. Topcoat: Latex, interior, high performance architectural, semi-gloss (MPI Gloss Level 5), MPI #141.
- E. Galvanized-Metal Substrates:
 - 1. High-Performance Architectural Latex System MPI INT 5.3M:
 - a. Prime Coat: Primer, galvanized, water based, MPI #134.
 - b. Intermediate Coat: Latex, interior, high performance architectural, matching topcoat.
 - c. Topcoat: Latex, interior, high performance architectural, semi-gloss (MPI Gloss Level 5), MPI #141.
- F. Wood Substrates: Wood trim.
 - 1. High-Performance Architectural Latex System MPI INT 6.3A:
 - 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, semi-gloss (MPI Gloss Level 5), MPI #141.
- G. Gypsum Board and Plaster Substrates:
 - 1. High-Performance Architectural Latex System MPI INT 9.2B:
 - 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 (MPI Gloss Level 3), MPI #139.
- H. Cotton or Canvas and ASJ Insulation-Covering Substrates: Including pipe and duct coverings.
 - Institutional Low-Odor/VOC Latex System MPI INT 10.1D:
 - a. Prime Coat: Primer sealer, latex, interior, MPI #50.
 - b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
 - c. Topcoat: Latex, interior, institutional low odor/VOC, flat (MPI Gloss Level 1), MPI #143.

END OF SECTION 099123

1.

SECTION 099600 - 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. Interior Substrates:
 - a. Concrete, horizontal surfaces.
 - b. Concrete masonry units (CMUs).
- B. Related Requirements:
 - 1. Section 099123 "Interior Painting" for general field painting.

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 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 Verification: For each type of coating system and each color and gloss of topcoat indicated.
 - 1. Submit Samples on rigid backing, 8 inches square.
 - 2. Apply coats on Samples in steps to show each coat required for system.
 - 3. Label each coat of each Sample.

HIGH-PERFORMANCE COATINGS

- 4. Label each Sample for location and application area.
- D. Product List: Cross-reference to coating system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Coatings: 5 percent, but not less than 1 gal. of each material and color applied.

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..
 - 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.
 - 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.
- B. Do not apply coatings when relative humidity exceeds 85 percent; at temperatures less than 5 deg F 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 one of the following:
 - 1. Benjamin Moore & Co.
 - 2. PPG Architectural Finishes, Inc.
 - 3. Sherwin-Williams Company (The).
- B. Products: Subject to compliance with requirements, provide one of the products listed in the Exterior High-Performance Coating Schedule or Interior High-Performance Coating Schedule for the coating category indicated.

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. Low-Emitting Materials: Interior paints and 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."
- E. Colors: Match Architect's samples.

2.3 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.
 - 3. Gypsum Board: 12 percent.
 - 4. Plaster: 12 percent.
- C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- D. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
- E. 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 at 6 to 12 inches.
- 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 at 6 to 12 inches.

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. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance.
- C. 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 INTERIOR HIGH-PERFORMANCE COATING SCHEDULE

- A. Concrete Substrates, Horizontal Surfaces.
 - 1. Epoxy System MPI INT 3.2C:
 - a. Prime Coat: Epoxy, matching topcoat.
 - b. Intermediate Coat: Epoxy, matching topcoat.
 - c. Topcoat: Epoxy, low gloss, MPI #108.
- B. CMU Substrates:
 - 1. Epoxy System MPI INT 4.2G:
 - a. Block Filler: Block filler, epoxy, MPI #116.
 - b. Intermediate Coat: Epoxy, matching topcoat.
 - c. Topcoat: Epoxy, gloss, MPI #77.

END OF SECTION 099600

SECTION 099726 – EXTERIOR CEMENTITIOUS COATING ON EXISTING CONCRETE

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 field surface preparation and field coating of existing, previously painted, site cast-in-place concrete retaining walls indicated to remain on civil and landscape drawings.
 - 1. Exterior Substrates:
 - a. All exposed horizontal and vertical surfaces.
 - b. Field surface preparation and field coating applications of filler, sealer and finish.
- B. Surface Preparation includes;
 - 1. Remove all wall paint and graphics.
 - 2. Remove all vegetation.
 - 3. Remove all unsound, loose, flaking and spalling concrete and wall surface.
 - 4. Refer to Structural Drawings for repair of spalls, cracks, and loose sections of concrete.
 - 5. Comply with manufacturer's surface preparation instructions.
- C. Related Sections include the following:
 - 1. Division 1 Section "LEED Green Building Summary, Requirements, and Goals" for additional LEED requirements.
 - 2. Products shall meet LEED v3, EQ 4.2. & OTC & CARB/VOC requirements
 - 3. Division 5 Sections for shop priming of metal substrates with primers specified in this Section.
 - 4. Division 9 Section "Painting" for general field painting.

1.3 REFERENCES

- A. Publications listed herein are part of this specification to extent referenced.
- B. American Society for Testing and Materials:
 - 1. ASTM B 117: Salt Spray (Fog)
 - 2. ASTM C 308: Working, Setting, and Service Strength Times
 - 3. ASTM C 496: Splitting Tensile Strength
 - 4. ASTM C 531: Linear Shrinkage
 - 5. ASTM C 580: Flexural Strength
 - 6. ASTM C596: Compressive Strength:
 - 7. ASTM C882: Bond Strength
 - 8. ASTM D1653: Vapor Permeance

- 9. ASTM D2246: Freeze Thaw
- 10. ASTM D2370: Elongation Percentage
- 11. ASTM D3273: Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber
- 12. ASTM D3359: Measuring Adhesion by Tape Test.
- 13. ASTM D3363: Hardness (Pencil)
- 14. ASTM D4263: Method for Indicating Moisture in Concrete by the Plastic Sheet Method.
- 15. ASTM D4541: Pull-Out Strength of Coatings Using Portable Adhesion-Testers.
- 16. ASTM D4585: Humidity
- 17. ASTM E2178: Air Permeance Rate
- 18. ASTM G 53: QUV
- C. Federal Test Standards
 - 1. TT-C-555B: Resistance to Wind Driven Rain.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Initial Selection: For each type of finish-coat product indicated.
- C. Samples for Verification: For each type of coating system and in each color and gloss of finish coat indicated.
 - 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. Cross-reference products to coating system and locations of application areas. Use same designations indicated on Drawings and in schedules.
- E. LEED Submittals: For Credit EQ 4.2, manufacturers' product data for coatings, including printed statement of VOC content and chemical components.

1.3 QUALITY ASSURANCE

- A. Material Performance Criteria:
 - 1. Products: Provide certified test reports when submitting products other than those specified herein the specification. Test reports shall indicate the test method, system and requirements for those products being submitted, and shall meet or exceed the test criteria and performance values of the specified coatings herein.
- B. Applicator Qualifications:
 - 1. Preparation and Workmanship: A firm or individual with a minimum of (5) years experienced in applying coatings similar in material design, and extent to those indicated for a particular

project, whose work has resulted in applications with a record of successful in-service performance.

- C. Pre-Installation Meeting:
 - 1. Schedule a conference and inspection to be held on-site before field application of coating system herein begins.
 - 2. Conference shall be attended by Contractor, Owner's Representative, Architect, Coating Applicator, and product representative.
- D. Field Samples:
 - 1. Prepare a step down mockup of the full coating system. Apply benchmark samples 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.
 - 2. Architect will select one surface to represent surfaces and conditions for application of each type of coating and substrate.
 - a. Wall Surfaces: Provide two samples of at least 50 sq. ft. each.
 - b. Other Items: Architect will designate items or areas required.
 - 3. Final approval of color selections will be based on benchmark samples.
 - 4. If preliminary color selections are not approved, apply additional benchmark samples of additional colors selected by Architect at no added cost to Owner.
 - 5. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- D. Single Source Responsibility
 - 1. Materials shall be products of a single manufacturer or items standard with manufacturer of specified coating materials.
 - 2. Provide secondary materials which are produced or are specifically recommended by coating system manufacturer to ensure compatibility of system.
- E. Regulatory Requirements:
 - 1. Conform to applicable codes and ordinances for flame, fuel, smoke, and volatile organic compound (VOC) ratings requirements for finishes at time of application.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label and the following information.
 - 1. Product name or title of material.
 - 2. Product description (generic classification or binder type)
 - 3. Manufacturer's stock number and date of manufacture.
 - 4. Contents by volume, for pigment and vehicle constituents.
 - 5. Thinning instructions.
 - 6. Application instructions.

- 7. Color name and number.
- 8. VOC content.
- B. 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.
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste from storage areas daily.

1.5 PROJECT CONDITIONS

- A. Apply coatings only when temperature of surfaces to be coated and surrounding air temperatures are between 40 and 95 degrees F.
- B. Do not apply coatings in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

1.7 SEQUENCING

- A. Coordination:
 - 1. Perform work in proper sequence with work of other trades to avoid damage to finished work.

1.8 PRODUCT WARRANTY

A. Provide manufacturer's (10) year crack, check, peel warranty at the completion of the project.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Materials specified are those that have been evaluated for the specific service on this project. Products of the Tnemec Company, Inc. are listed to establish a standard of quality. Equivalent materials of other manufacturer's may be submitted a minimum ten days prior to bid date on written approval of the Architect.
- B. Materials specified herein shall not preclude consideration of equivalent or superior materials. Requests for substitution shall be submitted to the architect a minimum ten days prior to bid date in accordance with the general construction documents and in compliance with substitution procedures in Section 016000 of this Project Manual.
 - 1. Requests for substitution shall include evidence of satisfactory past performance on substrates that are listed herein.
 - 2. Substitutions will not be considered that change the generic type, number of coats or do not meet specified total dry film thickness.
- C. Colors: As selected by Architect from manufacturer's full range.

2.2 HIGH PERFORMANCE COATINGS GENERAL

- A. Materials Compatibility: Provide shop and field primers, and finish-coat materials that are single source and compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
- B. Requirements: USGBC Version LEED 3 (v3), and EQ 4.2 Low-Emitting Materials; Paints & Coatings.

2.3 MASONRY SEALER

- A. Tnemec Series 151-1051 Elasto-Grip
 - 1. Generic Type: Waterborne Modified Polyamine Epoxy.
 - 2. Color: Green
 - 3. Properties:
 - a. Solids by Volume: 17.0 +/- 2%
 - b. Volatile Organic Compound: 1.42 lbs/gallon (170 grams/litre)
- B. Tnemec Series 130 Envirofill (Concrete Sealer)
 - 1. Generic Type: Waterborne Cementitious Acrylic.
 - 2. Colors: 130-6602: Off-White
 - 3. Properties:
 - a. Solids by Volume: 68%
 - b. Volatile Organic Compound: 0.64 lbs/gallon
 - 4. Curing Times: at 75 degF
 - a. To touch: ¹/₄ hour
 - b. To recoat: 18 hours
 - 5. Performance Criteria
 - a. Adhesion: ASTM D3359, (Method B, Crosshatch) No less than a rating of 5 out of 5 (5 being the best adhesion).
 - b. Exterior Exposure: Exposed at 45 degrees facing south. Light industrial area. No blistering, cracking or loss of adhesion after three years exposure.
 - c. Freeze/Thaw: ASTM D2246. No blistering, cracking or loss of adhesion over concrete after 30 cycles.
 - d. Humidity: ASTM D4585. No blistering, cracking or visible damage after 1,500 hours exposure.
 - e. Steam Pressure Test: Pressure Pot @ 250 degF and 15 to 17 psi. No blistering or cracking after 4 hours continuous exposure.
 - f. Wind Driven Rain: TT-C-555B, 4.4.7.3, No cracking, blistering or visible damage to the substrate or coating. No visible dampness on the backside of test specimen after 24 hours of exposure.

2.4 EXTERIOR MASONRY COATING

- A. Tnemec Series 156 Enviro Crete
 - 1. Generic Type: Modified Waterborne Acrylate.
 - 2. Finishes: Series 156 (smooth)

- 3. Properties:
 - a. Solids by Volume:
 - i) Series 156: 50.9 +/- 2.0%
 - ii) VOC: Unthinned -- Series 156: 0.41 lbs/gallon (49 grams/litre)

4. Performance Criteria:

- a. Adhesion: ASTM D3359, (Method B, Crosshatch) No less than a rating of 5 out of 5 (5 being the best adhesion).
- b. Freeze/Thaw: ASTM D2246. No cracking over concrete after 20 cycles.
- c. Fungal Resistance: ASTM D 3273 90⁰F (32⁰C); 95 98% relative humidity, suspended 3" (75 mm) above soil containing aspergillus niger, aspergillus oryzae and an unknown species of penicillium. No more than slight mold growth after five weeks exposure.
- d. Humidity: ASTM D4585. No blistering, cracking or visible damage after 2,000 hours exposure.
- e. Moisture Vapor Transmission: ASTM D1653 (Method B), Wet Cup, Condition C at 100 degrees F (38 degrees C):
 - i) Average 125 grams/meter² in 24 hours (smooth)
 - ii) Average 305 grams/meter² in 24 hours (textured)
- f. QUV Exposure: ASTM G53 (FS-40 lamps; four hours UV/60 degrees C, four hours CON/50 degrees C). No blistering, cracking or chalking. No more than 3.0 Mac Adam units color change after 4,000 hours exposure.
- g. Salt Spray (Fog): ASTM B 117. No blistering, cracking or delamination of film. No visible damage to coating or substrate after 5,000 hours.
- h. Tensile Strength & Elongation: ASTM D 2370. Elongation no less than 200 percent average of five tests. Tensile strength no less than 250 psi (1.7 MPa), avearge of three tests.
- i. Wind Driven Rain: TT-C-555B, Section 4.4.7.3. No damage to coating or substrate. No visible moisture on the back of lightweight block after 48 hours exposure.
- j. Air Permeance Rate: ASTM E2178-01. 0.01 to 0.0002 perms @ 12-14 mils DFT.
- k. Vapor Permeance: ASTM D 1653 Wet Method. 3.9 perms @ 16 mils DFT

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 work.
 - 1. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
 - 2. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
 - 3. Coating application indicates acceptance of surfaces and conditions.

3.2 FIELD PREPARATION

- A Comply with manufacturer's written instructions and recommendations.
- B. Concrete (previously painted):
 - 1. SSPC SP13 High Pressure water blast cleaning (4000 psi) with a zero tip to remove all loose and marginally adhering paint. Feather paint edges to a smooth transition with a power sander.
 - 2. Clean & Dry. Remove all loose material, dirt, coatings, grease, etc. that might compromise adhesion of new coating system. Patch all construction joints, cracks, spalls etc.
- C. Remove all vegetation from wall and trim back to expose margins of adjacent grade to allow maximum cover of new coating system.

3.3 APPLICATION

- A. Apply high-performance coatings according to manufacturer's written instructions.
 - 1. Use applicators and techniques suited for coating and substrate indicated.
- D. 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.
- E. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance.
- F. Apply coatings by spray application to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp color breaks.

3.4 FIELD QUALITY CONTROL

A. Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when coatings are being applied:

- 1. Owner will engage the services of a qualified testing agency to sample coating material being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
- 2. Testing agency will perform tests for compliance with specified requirements.
- 3. Owner may direct Contractor to stop applying coatings if test results show materials being used do not comply with specified 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.

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 areas 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.
- E. Protect all adjacent site improvements including planting, fencing and non-painted concrete and masonry construction.

3.6 HIGH-PERFORMANCE COATING SCHEDULE

- A. Exterior Existing Previously Painted Concrete Retaining Walls
 - 1. Detail Coat: Series 130-6602 Envirofill (apply to bare concrete areas only)
 - a. Apply at 85 to 115 square feet per gallon
 - 2. Primer Coat: Series151-1051 Elasto-Grip
 - a. Spread Rate: 250 to 400 sq ft per gallon
 - b. Dry Film Thickness: 1.0 to 1.5 mils DFT
 - 2. First Coat: Series 156-color Enviro-Crete
 - a. Spread Rate: 98 to 196 square feet per gallon
 - b. Dry Film Thickness: 4.0 to 8.0 mils
 - 2. Second Coat: Series 156-color Enviro-Crete
 - a. Spread Rate: 98 to 196 square feet per gallon
 - b. Dry Film Thickness: 4.0 to 8.0 mils
 - 3. Total Dry Film Thickness: 9.0 to 17.5 mils

END OF SECTION 099726

SECTION 101100 - VISUAL DISPLAY 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. Markerboards (Whiteboards).
 - 2. Tackboards.
 - 3. Display cases.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Sustainable Design Submittals:
 - 1. Product Data: For installation adhesives, indicating VOC content.
 - 2. Laboratory Test Reports: For installation adhesives, indicating compliance with requirements for low-emitting materials.
 - 3. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.
 - 4. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.
- C. Shop Drawings: For visual display surfaces. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Show locations of panel joints.
 - 2. Include sections of typical trim members.
- D. Samples: For each exposed product and for each color and texture specified. Lined Markerboards (markerboards with permanent "staff" lines).

1.4 INFORMATIONAL SUBMITTALS

- A. Product test reports.
- B. Sample warranties.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.6 WARRANTY

- A. Special Warranty for Porcelain-Enamel Face Sheets: Manufacturer agrees to repair or replace porcelain-enamel face sheets that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Life of the building.
- B. Special Warranty for Tackboards: Manufacturer agrees to repair or replace porcelain-enamel face sheets that fail in materials or workmanship within specified warranty period.
 1. Warranty Period: 10 years from date of Substantial Completion.

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: 25 or less.

2.2 MARKERBOARD (WHITEBOARD) ASSEMBLIES

- A. Porcelain-Enamel Magnetic Markerboard Panels: Balanced, high-pressure, factory-laminated markerboard assembly of three-ply construction, consisting of moisture-barrier backing, core material, and porcelain-enamel face sheet with High-gloss finish. Laminate panels under heat and pressure with manufacturer's standard, flexible waterproof adhesive.
 - 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. Claridge Products and Equipment, Inc.
 - b. Marsh Industries, Inc.; Visual Products Group.
 - c. Polyvision Corporation (Nelson Adams)
 - 2. Manufacturer's Standard Core: Minimum 1/4 inch thick, with manufacturer's standard moisture-barrier backing.
 - 3. Laminating Adhesive: Manufacturer's standard, moisture-resistant thermoplastic type.
 - 4. Refer to Drawings for Music Rooms. Markerboard Assemblies in music rooms to be lined with appropriate music lines (staff).
- B. Aluminum Frames and Trim: Fabricated from not less than 0.062-inch thick, extruded aluminum; of size and shape indicated on Drawings.
 - 1. Aluminum Finish: Clear anodic finish.
 - a. Color: As selected by Architect from full range of industry colors and color densities.
 - 2. Concealed Fasteners

- C. Chalktray: Manufacturer's standard; continuous.
 - 1. Solid Type: Extruded aluminum with ribbed section and smoothly curved exposed ends.
- D. Display Rail: Manufacturer's standard, extruded-aluminum display rail with plastic-impregnatedcork insert, end stops, designed to hold accessories.
 - 1. Size: Length indicated on Drawings.
 - 2. Map Hooks: Two map hooks for every 48 inches of display rail or fraction thereof.
 - 3. Map Hooks and Clips: Two map hooks with flexible metal clips for every 48 inches of display rail or fraction thereof.
 - 4. Flag Holder: One for each room.
 - 5. Tackboard Insert Color: As selected by Architect from full range of industry colors.
 - 6. Aluminum Color: Match finish of visual display assembly trim.
- E. Paper Holder Display Rail: Extruded aluminum; designed to hold paper by clamping action.

2.3 TACKBOARD ASSEMBLIES

- 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. Claridge Products and Equipment, Inc.
 - 2. Marsh Industries, Inc.; Visual Products Group.
 - 3. Polyvision Corporation (Nelson Adams)
- B. Tackboard Panels:
 - 1. Facing: 1/4-inch thick, natural cork.
 - 2. Core: Manufacturer's standard.
- C. Aluminum Frames and Trim: Fabricated from not less than 0.062-inch thick, extruded aluminum; of size and shape indicated on Drawings.
 - 1. Aluminum Finish: Clear anodic finish.
 - a. Color: As selected by Architect from full range of industry colors and color densities.
- D. Chalktray: Manufacturer's standard; continuous.
 - 1. Box Type: Extruded aluminum with slanted front, grooved tray, and cast-aluminum end closures.
 - 2. Solid Type: Extruded aluminum with ribbed section and smoothly curved exposed ends.
- E. Display Rail: Manufacturer's standard, extruded-aluminum display rail with plastic-impregnated-cork insert, end stops, designed to hold accessories.
 - 1. Size: Length indicated on Drawings.
 - 2. Map Hooks: Two map hooks for every 48 inches of display rail or fraction thereof.
 - 3. Map Hooks and Clips: Two map hooks with flexible metal clips for every 48 inches of display rail or fraction thereof.
 - 4. Tackboard Insert Color: As selected by Architect from full range of industry colors.
 - 5. Aluminum Color: Match finish of visual display assembly trim.
- F. Paper Holder Display Rail: Extruded aluminum; designed to hold paper by clamping action.

2.4 DISPLAY CASES

- A. 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 Sizes: As indicated on Drawings.
- B. Manufacturers: Subject to compliance with requirements, provide product by one of the following:
 - 1. Aarco.
 - 2. Claridge Products and Equipment.
 - 3. Helmut Guenshel, Inc.
 - 4. Marsh Industries.
 - 5. Poblocki & Sons.
- C. Display Case Cabinet: Manufacturer's standard core board covered all sides and edges with laminate plastic.
 - 1. Laminate Plastic Patterns, Colors and Finish: As selected by Architect.
- D. Face Frame: Constructed and finished same as cabinet.
- E. Glazed Sliding Doors: Tempered 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 5 mm thick.
 - 2. Number of Doors: As indicated on Drawings.
- F. Shelves: 6-mm-thick tempered glass; supported on adjustable shelf standards and supports.
 1. Number of Shelves: As indicated on Drawings.
- G. 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.
- H. Lighting: Fluorescent lighting mounted inside of the box. Voltage: 277 volts.
- I. Display case Sizes: As shown on drawings.

2.5 MATERIALS

- A. Porcelain-Enamel Face Sheet: PEI-1002, with face sheet manufacturer's standard two- or three-coat process.
- B. Plastic-Impregnated Cork Sheet: Seamless, homogeneous, self-sealing sheet consisting of granulated cork, linseed oil, resin binders, and dry pigments that are mixed and calendared onto fabric backing; with washable vinyl finish and integral color throughout with surface-burning characteristics indicated.
- C. Extruded Aluminum: ASTM B 221, Alloy 6063.
- D. Composite Wood Products: Products shall be made without urea formaldehyde.

- E. Clear Tempered Glass: ASTM C 1048, Kind FT, Condition A, Type I, Class 1, Quality Q3, with exposed edges seamed before tempering.
- F. High-Pressure Plastic Laminate: NEMA LD 3.
- G. 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.
- H. Adhesives for Field Application: Mildew-resistant, nonstaining adhesive for use with specific type of panels, sheets, or assemblies; and for substrate application; as recommended in writing by visual display unit manufacturer.
 - 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."

2.6 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA611, AA-M12C22A31, Class II, 0.010 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance of the Work.
- B. Examine walls and partitions for proper preparation and backing for visual display units.
- C. Examine walls and partitions for suitable framing depth where sliding visual display units will be installed.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions for surface preparation.
- B. Clean substrates of substances, such as dirt, mold, and mildew, that could impair the performance of and affect the smooth, finished surfaces of visual display boards.
- C. Prepare surfaces to achieve a smooth, dry, clean surface free of flaking, unsound coatings, cracks, defects, projections, depressions, and substances that will impair bond between visual display units and wall surfaces.
- D. Prime wall surfaces indicated to receive visual display units and as recommended in writing by primer/sealer manufacturer and visual display unit manufacturer.
- E. Prepare recesses for sliding visual display units as required by type and size of unit.

3.3 INSTALLATION

- A. General: Install visual display surfaces 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.
- B. Field-Assembled Visual Display Board Assemblies: Coordinate field-assembled units with grounds, trim, and accessories indicated. Join parts with a neat, precision fit.
 - 1. Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, as indicated on approved Shop Drawings.
 - 2. Where size of visual display board assemblies or other conditions require support in addition to normal trim, provide structural supports or modify trim as indicated or as selected by Architect from manufacturer's standard structural support accessories to suit conditions indicated.
- C. Factory-Fabricated Visual Display Board Assemblies: Attach concealed clips, hangers, and grounds to wall surfaces and to visual display board assemblies with fasteners at not more than 16 inches o.c. Secure tops and bottoms of boards to walls.
- D. Visual Display Board Assembly Mounting Heights: Install visual display units at mounting heights indicated on Drawings, or if not indicated, at heights indicated below.
 - 1. Mounting Height: 36 inches above finished floor to top of chalktray.
- E. Display Rails: Install rails at mounting heights indicated on Drawings, or if not indicated, at height indicated below. Attach to wall surface with fasteners at not more than 16 inches o.c.
 - 1. Mounting Height: 72 inches above finished floor to top of rail.
- F. Rail Support System: Install horizontal support rail at mounting heights indicated on Drawings, or if not indicated, at height indicated below. Attach to wall with fasteners at 12 inches o.c.
 - 1. Mounting Height: 72 inches above finished floor to top of rail.
 - 2. Hang visual display units on rail support system.

3.4 CLEANING AND PROTECTION

- A. Clean visual display units according to manufacturer's written instructions. Attach one removable cleaning instructions label to visual display unit in each room.
- B. Touch up factory-applied finishes to restore damaged or soiled areas.
- C. Cover and protect visual display units after installation and cleaning.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain motorized, sliding visual display units.

END OF SECTION 101100
SECTION 101419 - DIMENSIONAL LETTER 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. Section Includes:
 - 1. Cast dimensional characters.

1.3 COORDINATION

A. Furnish templates for placement of electrical service embedded in permanent construction by other installers.

1.4 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. 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 dimensional letter signs.
 - 1. Include fabrication and installation details and attachments to other work.
 - 2. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
 - 3. Show message list, typestyles, graphic elements, and layout for each sign at least half size.
- D. Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.
 - 1. Include representative Samples of available typestyles and graphic symbols.

E. Sign Schedule: Use same designations specified or indicated on Drawings or in a sign schedule.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and manufacturer.
- B. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For signs 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.

1.8 FIELD CONDITIONS

A. Field Measurements: Verify locations of electrical service embedded in permanent construction by other installers by field measurements before fabrication, and indicate measurements on Shop Drawings.

1.9 WARRANTY

- A. Special Warranty: 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 finishes beyond normal weathering.
 - b. Separation or delamination of sheet materials and components.
 - 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 DIMENSIONAL CHARACTERS

- A. Cast Characters: Characters with uniform faces, sharp corners, and precisely formed lines and profiles, and as follows:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. A.R.K. Ramos.
 - b. Gemini Incorporated.
 - c. Metal Arts.
 - d. Metallic Arts.

- 2. Character Material: Cast aluminum.
- 3. Character Height: As indicated.
- 4. Thickness: Manufacturer's standard for size of character.
- 5. Finishes:
 - a. Integral Aluminum Finish: Anodized color as selected by Architect from full range of industry colors and color densities.
- 6. Mounting: Concealed studs.
- 7. Typeface: Times Roman.

2.2 DIMENSIONAL CHARACTER MATERIALS

A. Aluminum Castings: ASTM B 26/B 26M, alloy and temper recommended by sign manufacturer for casting process used and for type of use and finish indicated.

2.3 ACCESSORIES

- A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signage, noncorrosive and compatible with each material joined, and complying with the following:
 - 1. Use concealed fasteners and anchors unless indicated to be exposed.
 - 2. For exterior exposure, furnish stainless-steel devices unless otherwise indicated.
 - 3. Exposed Metal-Fastener Components, General:
 - a. Fabricated from same basic metal and finish of fastened metal unless otherwise indicated.
 - 4. Sign Mounting Fasteners:
- B. Adhesive: As recommended by sign manufacturer.
 - 1. Adhesives shall have a VOC content of 70 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."

2.4 FABRICATION

- A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.
 - 1. Preassemble signs and assemblies in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
 - 2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
 - 3. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
 - 4. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.

- 5. Provide rebates, lugs, and brackets necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.
- 6. Castings: Fabricate castings free of warp, cracks, blowholes, pits, scale, sand holes, and other defects that impair appearance or strength. Grind, wire brush, sandblast, and buff castings to remove seams, gate marks, casting flash, and other casting marks before finishing.

2.5 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical 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.
- C. Directional Finishes: Run grain with long dimension of each piece and perpendicular to long dimension of finished trim or border surface unless otherwise indicated.
- D. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

2.6 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, Class I, 0.018 mm or thicker.

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 signage work.
- B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.
- C. Verify that electrical service is correctly sized and located to accommodate signs.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.

DIMENSIONAL LETTER SIGNAGE

- 1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
- 2. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
- 3. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
- B. Mounting Methods:
 - 1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
 - a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place sign in position and push until flush to surface, embedding studs in holes. Temporarily support sign in position until adhesive fully sets.
 - b. Thin or Hollow Surfaces: Place sign in position and flush to surface, install washers and nuts on studs projecting through opposite side of surface, and tighten.
 - 2. Projecting Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
 - a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place spacers on studs, place sign in position, and push until spacers are pinched between sign and substrate, embedding the stud ends in holes. Temporarily support sign in position until adhesive fully sets.
 - b. Thin or Hollow Surfaces: Place spacers on studs, place sign in position with spacers pinched between sign and substrate, and install washers and nuts on stud ends projecting through opposite side of surface, and tighten.
 - 3. Through Fasteners: Drill holes in substrate using predrilled holes in sign as template. Countersink holes in sign if required. Place sign in position and flush to surface. Install through fasteners and tighten.
 - 4. Back Bar and Brackets: Remove loose debris from substrate surface and install backbar or bracket supports in position so that signage is correctly located and aligned.
 - 5. Adhesive: Clean bond-breaking materials from substrate surface and remove loose debris. Apply linear beads or spots of adhesive symmetrically to back of sign and of suitable quantity to support weight of sign after cure without slippage. Keep adhesive away from edges to prevent adhesive extrusion as sign is applied and to prevent visibility of cured adhesive at sign edges. Place sign in position, and push to engage adhesive. Temporarily support sign in position until adhesive fully sets.
 - 6. Two-Face Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position, and push to engage tape adhesive.

3.3 ADJUSTING AND CLEANING

- A. Remove and replace damaged or deformed characters and signs that do not comply with specified requirements. Replace characters with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.
- B. Remove temporary protective coverings and strippable films as signs are installed.
- C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

SECTION 101423 - PANEL 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. Section Includes:
 - 1. Panel signs.
 - 2. Room-identification signs.
- B. Related Requirements:
 - 1. Section 015000 "Temporary Facilities and Controls" for temporary Project identification signs and for temporary information and directional signs.
 - 2. Section 015639 "Temporary Tree and Plant Protection" for temporary protection-zone signage.
 - 3. Section 142123 "Machine-Roomless Electric Traction Elevators" for code-required conveying equipment signage.
 - 4. Section 220553 "Identification for Plumbing Piping and Equipment" for labels, tags, and nameplates for plumbing systems and equipment.
 - 5. Section 230553 "Identification for HVAC Piping and Equipment" for labels, tags, and nameplates for HVAC systems and equipment.
 - 6. Section 260553 "Identification for Electrical Systems" for labels, tags, and nameplates for electrical equipment.

1.3 DEFINITIONS

A. Accessible: In accordance with the accessibility standard.

1.4 COORDINATION

A. Furnish templates for placement of sign-anchorage devices embedded in permanent construction by other installers.

1.5 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. 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 panel signs.
 - 1. Include fabrication and installation details and attachments to other work.
 - 2. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
 - 3. Show message list, typestyles, graphic elements, including raised characters and Braille, and layout for each sign at least half size.
- D. Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.
 - 1. Include representative Samples of available typestyles and graphic symbols.
- E. Samples for Verification: For each type of sign assembly showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:
 1. Room-Identification Signs: Full-size Sample.
- F. Sign Schedule: Use same designations specified or indicated on Drawings or in a sign schedule.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For signs 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.

1.8 FIELD CONDITIONS

A. Field Measurements: Verify locations of anchorage devices embedded in permanent construction by other installers by field measurements before fabrication, and indicate measurements on Shop Drawings.

1.9 WARRANTY

A. Special Warranty: 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 finishes beyond normal weathering.
 - b. Deterioration of embedded graphic image.
 - c. Separation or delamination of sheet materials and components.
- 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PANEL SIGNS, GENERAL

A. Regional Materials: Products shall be manufactured within 500 miles of Project site.

2.2 PERFORMANCE REQUIREMENTS

A. 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 signs.

2.3 SIGNS

- A. Subject to conformance with the specification provide products by one of the following:
 - 1. Gemini, Inc.
 - 2. Poblicki & Sons
 - 3. Signs & Wonders, Inc.
 - 4. The Supersine Company
- B. Room-Identification Sign: Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:
 - 1. Basis-of-Design Product: Indicated on Drawings.
 - 2. Laminated-Sheet Sign: Photopolymer face sheet with raised graphics laminated to acrylic backing sheet to produce composite sheet.
 - a. Composite-Sheet Thickness: Manufacturer's standard for size of sign.
 - b. Surface-Applied Graphics: Applied paint.
 - c. Color(s): As selected by Architect from manufacturer's full range.
 - 3. Sign-Panel Perimeter: Finish edges smooth.
 - a. Edge Condition: Square cut.
 - b. Corner Condition in Elevation: Square.
 - 4. Mounting: Manufacturer's standard method for substrates indicated with.
 - 5. Text and Typeface: Accessible raised characters and Braille typeface as selected by Architect from manufacturer's full range and variable content as scheduled. Finish raised

characters to contrast with background color, and finish Braille to match background color.

2.4 ACCESSORIES

- A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signage, noncorrosive and compatible with each material joined, and complying with the following:
 - 1. Use concealed fasteners and anchors unless indicated to be exposed.
 - 2. Inserts: Furnish inserts to be set by other trades into concrete or masonry work.
- B. Adhesive: As recommended by sign manufacturer.
 - 1. Adhesives shall have a VOC content of 70 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. Two-Face Tape: Manufacturer's standard high-bond, foam-core tape, 0.045 inch thick, with adhesive on both sides.

2.5 FABRICATION

- A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.
 - 1. Preassemble signs and assemblies in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
 - 2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
 - 3. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
- B. Surface-Engraved Graphics: Machine engrave characters and other graphic devices into panel surface indicated to produce precisely formed copy, incised to uniform depth.
 - 1. Engraved Opaque Acrylic Sheet: Fill engraved graphics with manufacturer's standard enamel.
 - 2. Face-Engraved Clear Acrylic Sheet: Fill engraved copy with manufacturer's standard enamel. Apply manufacturer's standard opaque background color coating to back face of acrylic sheet.

2.6 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical 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.
- C. Directional Finishes: Run grain with long dimension of each piece and perpendicular to long dimension of finished trim or border surface unless otherwise indicated.
- D. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

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 signage work.
- B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.
- C. Verify that anchor inserts are correctly sized and located to accommodate signs.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.
 - 1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
 - 2. Install signs so they do not protrude or obstruct according to the accessibility standard.
 - 3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
- B. Room-Identification Signs and Other Accessible Signage: Install in locations on walls as indicated and according to accessibility standard.
- C. Mounting Methods:
 - 1. Adhesive: Clean bond-breaking materials from substrate surface and remove loose debris. Apply linear beads or spots of adhesive symmetrically to back of sign and of

suitable quantity to support weight of sign after cure without slippage. Keep adhesive away from edges to prevent adhesive extrusion as sign is applied and to prevent visibility of cured adhesive at sign edges. Place sign in position, and push to engage adhesive. Temporarily support sign in position until adhesive fully sets.

- 2. Two-Face Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position, and push to engage tape adhesive.
- D. Signs Mounted on Glass: Provide opaque sheet matching sign material and finish onto opposite side of glass to conceal back of sign.

3.3 ADJUSTING AND CLEANING

- A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.
- B. Remove temporary protective coverings and strippable films as signs are installed.
- C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

SECTION 102113 - TOILET 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-plastic toilet compartments configured as toilet enclosures and urinal screens.

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 toilet compartments.
- B. Sustainable Design Submittals:
 - 1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
- C. Shop Drawings: For toilet compartments.
 - 1. Include plans, elevations, sections, details, and attachment details.
 - 2. Show locations of cutouts for compartment-mounted toilet accessories.
 - 3. Show locations of centerlines of toilet fixtures.
 - 4. Show locations of floor drains.
 - 5. Show overhead support or bracing locations.
- D. Samples for Initial Selection: For each type of toilet compartment material indicated.
 1. Include Samples of hardware and accessories involving material and color selection.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of toilet compartment, from manufacturer.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For toilet compartments 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 and source.
 - 1. Door Hinges: One hinge(s) with associated fasteners.
 - 2. Latch and Keeper: One latch(es) and keeper(s) with associated fasteners.
 - 3. Door Bumper: One bumper(s) with associated fasteners.
 - 4. Door Pull: One door pull(s) with associated fasteners.
 - 5. Fasteners: Ten fasteners of each size and type.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication.

1.8 WARRANTY

A. Furnish manufacturer's warranty for a minimum of 15 years against defect in materials or workmanship and rusting of hardware, accessories or other metal items and breakage of door hinges. Provide special warranty against staining by permanent marker.

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: 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 50 percent.
- C. Regulatory Requirements: 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 toilet compartments designated as accessible.

2.2 SOLID-PLASTIC TOILET COMPARTMENTS

- 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. Scranton Products (Santana or Comtec).
 - 2. Bradley Corporation; Mills Partitions.
 - 3. Hadrian.
 - 4. Global Partitions.

- B. Toilet-Enclosure Style: Overhead braced floor anchored.
- C. Urinal-Screen Style: Wall hung.
- D. Door, Panel, and Pilaster Construction: Solid, high-density polyethylene (HDPE) panel material, not less than 1 inch thick, seamless, with eased edges, and with homogenous color and pattern throughout thickness of material.
 - 1. Heat-Sink Strip: Manufacturer's standard continuous, extruded-aluminum strip fastened to exposed bottom edges of solid-polymer components to prevent burning.
 - 2. Color and Pattern: As selected by Architect from manufacturer's full range.
- E. Pilaster Shoes: Manufacturer's standard design; stainless steel.
- F. Brackets (Fittings):
 - 1. Full-Height (Continuous) Type: Manufacturer's standard design; extruded aluminum.

2.3 HARDWARE AND ACCESSORIES

- A. Hardware and Accessories: Manufacturer's standard operating hardware and accessories.
 - 1. Material: Stainless steel.
 - 2. Hinges: Manufacturer's standard continuous, self-closing type that can be adjusted to hold door open at any angle up to 90 degrees.
 - 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. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent in-swinging door from hitting compartment-mounted accessories.
 - 5. Door Bumper: Manufacturer's standard rubber-tipped bumper at out-swinging doors.
 - 6. Door Pull: Manufacturer's standard unit at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible.
- B. Overhead Bracing: Heavy duty anti-grip bright anodized design and of type 6063 aluminum alloy secured with tamper resistant "torx" stainless steel screws.
- C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel or chrome-plated steel or brass, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless steel, hot-dip galvanized steel, or other rust-resistant, protective-coated steel.

2.4 MATERIALS

- A. Aluminum Castings: ASTM B 26/B 26M.
- B. Aluminum Extrusions: ASTM B 221.
- C. Stainless-Steel Sheet: ASTM A 666, Type 304, stretcher-leveled standard of flatness.
- D. Stainless-Steel Castings: ASTM A 743/A 743M.

2.5 FABRICATION

A. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.

B. Door Size and Swings: Unless otherwise indicated, provide 24-inch- wide, in-swinging doors for standard toilet compartments and 36-inch- wide, out-swinging doors with a minimum 32-inch- wide, clear opening for compartments designated as accessible.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for fastening, support, alignment, operating clearances, and other conditions affecting performance of the Work.
 - 1. Confirm location and adequacy of blocking and supports required for installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
 - 1. Maximum Clearances:
 - a. Pilasters and Panels: 1/2 inch.
 - b. Panels and Walls: 1 inch.
 - 2. Full-Height (Continuous) Brackets: Secure panels to walls and to pilasters with fullheight 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. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than 1-3/4 inches into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels, and adjust so tops of doors are parallel with overhead brace when doors are in closed position.
- C. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

3.3 ADJUSTING

A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

SECTION 102123 - CUBICLE CURTAINS AND TRACK

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. Cubicle-curtain tracks and carriers.
 - 2. Cubicle curtains.
- B. Related Requirements:
 - 1. Section 061000 "Rough Carpentry" for supplementary wood framing and blocking for mounting items requiring anchorage.
 - 2. Section 092216 "Non-Structural Metal Framing" for supplementary metal framing and blocking for mounting items requiring anchorage.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. For each type of curtain fabric indicated, include durability, laundry temperature limits, fade resistance, applied curtain treatments, and fire-test-response characteristics.
- B. Shop Drawings: For curtains and tracks.
 - 1. Show layout and types of cubicles, sizes of curtains, number of carriers, anchorage details, and conditions requiring accessories. Indicate dimensions taken from field measurements.
 - 2. Include details of blocking for track support.
- C. Samples: For each exposed product and for each color and texture specified, 10 inches in size.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For curtains, tracks, and hardware to include in operation and maintenance manuals.

1.5 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. Curtain Carriers and Track End Caps: Full-size units equal to 3 percent of amount installed for each size indicated, but no fewer than 10 units.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Cubicle Curtains: Provide curtain fabrics with the following characteristics:
 - 1. Laundering: Launderable to a water temperature of not less than 160 deg F.
 - 2. Flame Resistance: Provide fabrics identical to those that have passed NFPA 701 when tested by a qualified testing agency acceptable to authorities having jurisdiction.
 - a. Identify fabrics with appropriate markings of a qualified testing agency.

2.2 CUBICLE-CURTAIN SUPPORT SYSTEMS

- 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. A. R. Nelson Co.
 - 2. Imperial Fastener Company, Inc.
 - 3. Salsbury Industries.
- B. Extruded-Aluminum Curtain Track: Not less than 1-1/4 inches wide by 3/4 inch high.
 - 1. Track Minimum Wall Thickness: Manufacturer's standard.
 - 2. Curved Track: Factory-fabricated, 12-inch- radius bends.
 - 3. Finish: Clear anodized.
- C. Curtain Track Accessories: Fabricate splices, end caps, connectors, end stops, coupling and joining sleeves, wall flanges, brackets, ceiling clips, and other accessories from same material and with same finish as track.
 - 1. End Stop: Nonremovable.
- D. Curtain Roller Carriers: Two nylon rollers and nickel plated brass axle with chrome-plated steel hook.
- E. Exposed Fasteners: Stainless steel.
- F. Concealed Fasteners: Hot-dip galvanized.

2.3 CURTAINS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. A. R. Nelson Co.
 - 2. Imperial Fastener Company, Inc.
 - 3. Salsbury Industries.

- B. Fabric: Curtain manufacturer's standard, 100 percent trevira polyester; inherently and permanently flame resistant, stain resistant, and antimicrobial.
 - 1. Proprietary Fiber:
 - a. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1) Trevira.
 - 2. Weight: 13.5 oz per yard minimum.
 - 3. Color: As selected by Architect from manufacturer's full range.
- C. Curtain Grommets: Two-piece, rolled-edge, rustproof, nickel-plated brass; spaced not more than 6 inches o.c.; machined into top hem.
- D. Mesh Top: Not less than 20-inch- high mesh top.1. Mesh: No. 50 nylon mesh.
- E. Snap Attachments: Provide manufacturer's standard nickel-plated brass snap attachments for modular panels.
- F. Curtain Tieback: Nickel-plated brass chain; one at each curtain termination.

2.4 CURTAIN FABRICATION

- A. Continuous Curtain Panels:
 - 1. Width: Equal to track length from which curtain is hung plus 10 percent of added fullness, but not less than 12 inches of added fullness.
 - 2. Length: Equal to floor-to-ceiling height, minus depth of track and carrier at top, and minus clearance above the finished floor of 12 inches.
 - 3. Top Hem: Not less than 1 inch and not more than 1-1/2 inches wide, triple thickness, reinforced with integral web, and double lockstitched.
 - 4. Mesh Top: Top hem of mesh not less than 1 inch and not more than 1-1/2 inches wide, triple thickness, reinforced with integral web, and double lockstitched. Double lockstitch bottom of mesh directly to 1/2-inch triple thickness, top hem of curtain fabric.
 - 5. Bottom Hem: Not less than 1 inch and not more than 1-1/2 inches wide, double thickness and double lockstitched.
 - 6. Side Hems: Not less than 1/2 inch and not more than 1-1/4 inches wide, with double turned edges, and single lockstitched.
 - 7. Vertical Seams: Not less than 1/2 inch wide, double turned and double stitched.

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. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install tracks level and plumb, according to manufacturer's written instructions.
- B. For tracks of up to 20 feet in length, provide track fabricated from single, continuous length.
 1. Curtain-Track Mounting: Surface.
- C. Surface-Track Mounting: Fasten tracks to ceilings at intervals recommended by manufacturer.
 Fasten tracks to structure at each splice and tangent point of each corner. Center fasteners in track to ensure unencumbered carrier operation. Attach track to ceiling as follows:
 Mechanically fasten to suspended ceiling grid with screws.
- D. Curtain Carriers: Provide curtain carriers adequate for 6-inch spacing along full length of curtain plus an additional carrier.
- E. Cubicle Curtains: Hang curtains on each curtain track. Secure with curtain tieback.

SECTION 102800 - 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. Public-use washroom accessories.
 - 2. Public-use shower room accessories
 - 3. Private-use bathroom accessories.
 - 4. Underlavatory guards.
 - 5. Custodial accessories.
- B. Related Requirements:
 - 1. Section 088300 "Mirrors" for frameless mirrors.
 - 2. Section 093013 "Ceramic Tiling" for ceramic toilet and bath accessories.

1.3 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.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include the following:
 - 1. Construction details and dimensions.
 - 2. Anchoring and mounting requirements.
 - 3. Material and finish descriptions.
 - 4. Manufacturer's warranty.
- B. Samples: Full size, for each accessory item to verify design, operation, and finish requirements.
 1. Approved full-size Samples will be returned and may be used in the Work.
- C. 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.

1.5 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Source Limitations: For products listed together in the same Part 2 articles, obtain products from single source from single manufacturer.

1.8 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.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch minimum nominal thickness unless otherwise indicated.
- B. 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.

2.2 TOILET AND BATH ACCESSORIES (PUBLIC & PRIVATE)

- 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 Specialties, Inc.
 - 2. A&J Washroom Accessories, Inc.
 - 3. Bobrick Washroom Equipment, Inc.

TOILET AND BATH ACCESSORIES

- 4. Bradley Corporation
- B. Source Limitations: Obtain washroom accessories from single source from single manufacturer.
- C. Toilet Tissue (Jumbo-Roll) Dispenser (Drawing #7):
 - 1. Basis of Design: Bobrick B-2890
 - 2. Description: One-roll unit.
 - 3. Mounting: Surface mounted.
 - 4. Capacity: 9- or 10-inch- diameter rolls.
 - 5. Material and Finish: Stainless steel, No. 4 finish (satin).
 - 6. Lockset: Tumbler type.
 - 7. Refill Indicator: Pierced slots at front.
- D. Paper Towel (Roll) Dispenser (Drawing #9):
 - 1. Basis of Design Bobrick B-2860
 - 2. Description: Mechanism permitting controlled delivery of paper rolls in preset lengths per stroke.
 - 3. Mounting: Surface mounted.
 - 4. Minimum Capacity: 8-inch- wide, 800-foot- long roll.
 - 5. Material and Finish: Stainless steel, No. 4 finish (satin).
 - 6. Lockset: Tumbler type.
- E. Paper Towel (Roll) Dispenser and Waste Receptacle (Drawing #8):
 - 1. Basis of Design Bobrick B-3961
 - 2. Description: Mechanism permitting controlled delivery of paper rolls in preset lengths per stroke.
 - 3. Unit includes integral 12 gallon capacity waste receptacle.
 - 4. Mounting: Semi-recessed mounted.
 - 5. Minimum Capacity: 8-inch- wide, 800-foot- long roll.
 - 6. Material and Finish: Stainless steel, No. 4 finish (satin).
 - 7. Lockset: Tumbler type.
- F. Liquid-Soap Dispenser (Drawing #6):
 - 1. Basis of Design: Bobrick B-2111.
 - 2. Description: Designed for dispensing antibacterial soap in liquid or lotion form.
 - 3. Mounting: Vertically oriented, surface mounted.
 - 4. Capacity: 40 **oz.**
 - 5. Materials: lack molded plstic push button and spout. 22 gauge stainless steel with satin finish container
 - 6. Lockset: Tumbler type.
 - 7. Refill Indicator: Window type.
- G. Grab Bar (Drawing #1, #2):
 - 1. Mounting: Flanges with concealed fasteners.
 - 2. Material: Stainless steel, 0.05 inch thick.
 - a. Finish: Smooth, No. 4 finish (satin) on ends and slip-resistant texture in grip area.
 - 3. Outside Diameter: 1-1/2 inches.
 - 4. Configuration and Length: As indicated on Drawings.
- H. Sanitary-Napkin Disposal Unit (Drawing #13):

- 1. Basis of Design: Bobrick B-270.
- 2. Mounting: Surface mounted.
- 3. Door or Cover: Self-closing, disposal-opening cover.
- 4. Receptacle: Removable.
- 5. Material and Finish: Stainless steel, No. 4 finish (satin).
- I. Mirror Unit (Drawing #3, 4):
 - 1. Frame: Stainless-steel channel.
 - a. Corners: Manufacturer's standard.
 - 2. Integral Shelf: 5 inches deep.
 - 3. Mirror: ¹/₄" quality laminated polished safety glass, silver coated and hermetically sealed with uniform coating of electrolytic copper plating.
 - 4. 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.
 - 5. Size: As indicated on Drawings.
- J. Coat Hook (Drawing #10):
 - 1. Description: Single-prong unit.
 - 2. Material and Finish: Stainless steel, No. 4 finish (satin).

2.3 SHOWER ROOM ACCESSORIES

- A. Source Limitations: Obtain shower room accessories from single source from single manufacturer.
- B. Shower Curtain Rod (Drawing #5):
 - 1. Description: 1-inch OD; fabricated from nominal 0.0375-inch- thick stainless steel.
 - 2. Mounting Flanges: Stainless-steel flanges designed for exposed fasteners.
 - 3. Finish:Stainless steel, No. 4 finish (satin).
 - 4. Location: At each shower stall.
- C. Shower Curtain (Drawing #5):
 - 1. Size: Minimum 6 inches wider than opening by 72 inches high.
 - 2. Material: Nylon-reinforced vinyl, minimum 10 oz. or 0.008-inch- thick vinyl, with integral antibacterial agent.
 - 3. Color: White.
 - 4. Grommets: Corrosion resistant at minimum 6 inches o.c. through top hem.
 - 5. Shower Curtain Hooks: Chrome-plated or stainless-steel, spring wire curtain hooks with snap fasteners, sized to accommodate specified curtain rod. Provide one hook per curtain grommet.
 - 6. Location: At each shower stall.
- D. Folding Shower Seat (Drawing #11):
 - 1. Basis of Design: Bobrick B-5181
 - 2. Configuration: L-shaped seat, designed for wheelchair access.

- 3. Seat: Phenolic or polymeric composite of slat-type or one-piece construction in color as selected by Architect.
- 4. Mounting Mechanism: Stainless steel, No. 4 finish (satin).
- E. Soap Dish (Provide at each shower):
 - 1. Description: Without washcloth bar.
 - 2. Mounting: Surface mounted.
 - 3. Material and Finish: Stainless steel, No. 4 finish (satin).

2.4 CUSTODIAL ACCESSORIES

- A. Source Limitations: Obtain custodial accessories from single source from single manufacturer.
- B. Mop and Broom Holder (Provide at each Janitor's Closet Drawing #12):
 - 1. Description: Unit with shelf, hooks, holders, and rod suspended beneath shelf.
 - 2. Length: 34 inches.
 - 3. Hooks: Four.
 - 4. Mop/Broom Holders: Three, spring-loaded, rubber hat, cam type.
 - 5. Material and Finish: Stainless steel, No. 4 finish (satin).
 - a. Shelf: Not less than nominal 0.05-inch- thick stainless steel.

2.5 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. IPS Corporation; Truebro® Lav Guard 2 Series.
 - 2. Plumberex Specialty Products, Inc.; Pro-Extreme.
- 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. Material and Finish: Antimicrobial, molded plastic, white.

2.6 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 six 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 250 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.

SECTION 104413 - 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.

1.3 PREINSTALLATION CONFERENCE

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to fire-protection cabinets including, but not limited to, the following:
 - a. Schedules and coordination requirements.

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. 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 decals or 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.

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. J. L. Industries, Inc.;
 - b. Larsen's Manufacturing Company;
 - c. Potter Roemer LLC;
 - d. Watrous; Division of American Specialties, Inc.
- B. Cabinet Construction: Non-rated.
- C. Cabinet Material: Cold-rolled steel sheet.
 - 1. Shelf: Same metal and finish as cabinet.
- D. Recessed Cabinet:
 - 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. Semi-recessed Cabinet (Where fully recessed cabinet is not possible): One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).
 - 1. Square-Edge Trim: 1-1/4- to 1-1/2-inch backbend depth.
- F. Cabinet Trim Material: Same material and finish as door.
- G. Door Material: Aluminum sheet.
- H. Door Style: Horizontal duo panel with frame.
- I. Door Glazing: Tempered float glass (clear)
- J. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
 - 1. Provide projecting door pull and friction latch.

- 2. Provide continuous hinge, of same material and finish as trim, permitting door to open 180 degrees.
- K. 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: Cam lock that allows door to be opened during emergency by pulling sharply on door handle.
 - 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 location indicated on Drawings.
 - 2) Application Process: Silk-screened.
 - 3) Lettering Color: As indicated.
 - 4) Orientation: As indicated on Drawings.
- L. Materials:
 - 1. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.
 - a. Finish: Baked enamel or powder coat.
 - b. Color: As selected by Architect from full range of industry colors and color densities.

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 thick.
 - 2. 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: 54 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 factoryfinished appearance. Use only materials and procedures recommended or furnished by fireprotection 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.

SECTION 104416 - 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 and mounting brackets for fire extinguishers.

1.3 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.
- B. Product Schedule: For fire extinguishers. Coordinate final fire-extinguisher schedule with fireprotection cabinet schedule to ensure proper fit and function.

1.4 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

1.6 COORDINATION

A. Coordinate type and capacity of fire extinguishers with fire protection cabinets to ensure fit and function.

1.7 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:

FIRE EXTINGUISHERS

- a. Failure of hydrostatic test according to NFPA 10.
- b. Faulty operation of valves or release levers.
- 2. Warranty Period: Six 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.

2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

- A. Fire Extinguishers: Type, size, and capacity for each fire protection cabinet and mounting bracket 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. Buckeye Fire Equipment Company.
 - e. Fire End & Croker Corporation.
 - f. J. L. Industries, Inc.; a division of Activar Construction Products Group.
 - g. Larsen's Manufacturing Company.
 - h. Potter Roemer LLC.
 - 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 and bar coding for documenting fire extinguisher location, inspections, maintenance, and recharging.
- B. Multipurpose Dry-Chemical Type in Steel Container: UL-rated 4-A:60-B:C, 10-lb nominal capacity, with mono-ammonium phosphate-based dry chemical in enameled-steel container.

2.3 MOUNTING BRACKETS

- A. Mounting Brackets: Manufacturer's standard 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.

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- b. Ansul Incorporated; Tyco International Ltd.
- c. Badger Fire Protection; a Kidde company.
- d. Buckeye Fire Equipment Company.
- e. Fire End & Croker Corporation.
- f. J. L. Industries, Inc.; a division of Activar Construction Products Group.
- g. Larsen's Manufacturing Company.
- h. Potter Roemer LLC.
- 2. Mounting Locations:
 - a. Public area mounting: Cabinet mounted.
 - b. Service area mounting: Metal brackets.
- 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: As indicated.

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: 54 inches (1372 mm) above finished floor to top of fire extinguisher.
- B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

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SECTION 105113 - 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. Knocked-down corridor lockers.
 - 2. Knocked-down athletic lockers.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. 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. Include plans, elevations, sections, details, and attachments to other work.
 - 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 Initial Selection: For units with factory-applied color finishes.
- D. Qualification Data: For qualified Installer.
- E. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms to include in maintenance manuals.
- F. Warranty: Sample of special warranty.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Source Limitations: Obtain metal lockers and accessories from single source from single manufacturer.

C. Regulatory Requirements: Where metal lockers are indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities" and] ICC/ANSI A117.1.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver metal lockers until spaces to receive them are clean, dry, and ready for their installation.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of recessed openings by field measurements before fabrication.

1.7 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.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which 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 Knocked-Down Metal Lockers: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B, suitable for exposed applications.
- B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with A60 zinc-iron, alloy (galvannealed) coating designation.
- C. Extruded Aluminum: ASTM B 221, alloy and temper recommended by aluminum producer and manufacturer for type of use and finish indicated.
- D. Steel Tube: ASTM A 500, cold rolled.
- E. Fasteners: Zinc- or nickel-plated steel, slotless-type, exposed bolt heads; with self-locking nuts or lock washers for nuts on moving parts.
- F. 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.

2.2 KNOCKED-DOWN CORRIDOR LOCKERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. List Industries Inc.
 - 2. Lyon Workspace Products, LLC.
 - 3. Penco Products, Inc.
 - 4. Republic Storage Systems, LLC.
- B. 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. Stiffeners: Manufacturer's standard full-height stiffener fabricated from 0.048-inch nominal-thickness steel sheet; welded to inner face of doors.
 - 3. Sound-Dampening Panels: Manufacturer's standard, designed to stiffen doors and reduce sound levels when doors are closed, of die-formed metal with full perimeter flange and sound-dampening material; welded to inner face of doors.
 - 4. Door Style: Vented panel as follows:
 - a. Concealed Vents: Slotted perforations in top and bottom horizontal door return flanges.
- C. Body: Assembled by riveting or bolting body components together. Fabricate from unperforated steel sheet with thicknesses as follows:
 - 1. Tops and Bottoms: 0.0359 inch nominal thickness.
 - 2. Intermediate Dividers: 0.024-inch nominal thickness, with single bend at sides.
 - 3. Backs and Sides: 0.024-inch nominal thickness, with full-height, double-flanged connections.
 - 4. Shelves: 0.024-inch nominal thickness, with double bend at front and single bend at sides and back.

- D. 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, full-height door strikes on vertical main frames.
 - 1. Cross Frames between Tiers: Channel formed and fabricated from same material as main frames; welded to vertical main frames.
 - 2. Frame Vents: Fabricate face frames with vents.
- E. 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. Knuckle Hinges: Steel, full loop, five or seven knuckles, tight pin; minimum 2 inches high. Provide no fewer than three hinges for each door more than 42 inches high.
- F. Recessed Door Handle and Latch: Stainless-steel cup with integral door pull, recessed so locking device does not protrude beyond door face; pry and vandal resistant.
 - 1. Multipoint Latching: Finger-lift latch control designed for use with built-in combination locks, built-in key locks, 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 0.105-inch nominal-thickness steel sheet; welded or riveted 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.
- G. Identification Plates: Manufacturer's standard, etched, embossed, or stamped aluminum plates, with numbers and letters at least 3/8 inch high.
- H. Hooks: Manufacturer's standard ball-pointed type hooks, aluminum or steel; zinc plated.
- I. Continuous Sloping Tops: Fabricated from 0.0598 inch nominal-thickness steel sheet.
 - 1. Closures: Vertical-end type.
 - 2. Sloping-top corner fillers, mitered.
- J. Recess Trim: Fabricated from 0.048-inch nominal-thickness steel sheet.
- K. Filler Panels: Fabricated from 0.048-inch nominal-thickness steel sheet.
- L. Boxed End Panels: Fabricated from 0.060-inch nominal-thickness steel sheet.
- M. Center Dividers: Fabricated from 0.024-inch nominal-thickness steel sheet.
- N. Materials:
 - 1. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B, suitable for exposed applications.
 - 2. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with A60 zinc-iron, alloy (galvannealed) coating designation.
- O. Finish: Baked enamel or powder coat.
 - 1. Color: Match Architect's sample.

2. Provide anti-graffiti coating.

2.3 KNOCKED-DOWN ATHLETIC LOCKERS

- A. Perforated Doors: One piece; fabricated from 0.075-inch nominal-thickness steel sheet with manufacturer's standard diamond perforations; formed into channel shape with double bend at vertical edges and with right-angle single bend at horizontal edges and latch point (bottom) and right-angle single bend at remaining edges for box lockers.
 - 1. Reinforcement: Manufacturer's standard reinforcing angles, channels, or stiffeners for doors more than 15 inches wide; welded to inner face of doors.
- B. Body: Assembled by riveting or bolting body components together. Fabricate from unperforated steel sheet with thicknesses as follows:
 - 1. Tops and Bottoms: 0.060-inch nominal thickness, with single bend at edges.
 - 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.
- C. Unperforated Sides: Fabricated from 0.048-inch nominal-thickness steel sheet.
- D. Frames: Channel formed; fabricated from 0.060-inch nominal-thickness steel sheet or 0.097inch nominal-thickness steel angles; lapped and factory welded at corners; with top and bottom main frames factory welded into vertical main frames. Form continuous, integral, full-height door strikes on vertical main frames.
 - 1. Cross Frames for Double-Tier Lockers: Channel formed and fabricated from same material as main frames; welded to vertical main frames.
- E. 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. Knuckle Hinges: Steel, full loop, five or seven knuckles, tight pin; minimum 2 inches high. Provide no fewer than three hinges for each door more than 42 inches high.
- F. Recessed Door Handle and Latch: Stainless-steel cup with integral door pull, recessed so locking device does not protrude beyond door face; pry and vandal resistant.
 - 1. Multipoint Latching: Finger-lift latch control designed for use with built-in combination locks, built-in cylinder locks, 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.
- G. Identification Plates: Manufacturer's standard with numbers and letters at least 3/8 inch high.
- H. Hooks: Manufacturer's standard ball-pointed type, aluminum or steel; zinc plated.

- I. Continuous Sloping Tops: Fabricated from 0.048-inch nominal-thickness steel sheet, with a pitch of approximately 20 degrees.
 - 1. Closures: Vertical-end type.
- J. Recess Trim: Fabricated from 0.048-inch nominal-thickness steel sheet.
- K. Boxed End Panels: Fabricated from 0.060-inch nominal-thickness steel sheet.
- L. Materials:
 - 1. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B, suitable for exposed applications.
 - 2. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with A60 zinc-iron, alloy (galvannealed) coating designation.
 - 3. Expanded Metal: ASTM F 1267, Type II (flattened), Class I, 3/4-inch steel mesh, with at least 70 percent open area.
- M. Finish: Baked enamel.
 - 1. Color: As selected by Architect from manufacturer's full range.

2.4 ACCESSORIES

- A. Provide Anti-graffiti coating.
- B. Fasteners: Zinc- or nickel-plated steel, slotless-type, exposed bolt heads; with self-locking nuts or lock washers for nuts on moving parts.
- C. 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 for corrosion resistance.
 - 2. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

2.5 LOCKER BENCHES

- A. Provide bench units with overall assembly height of 17-1/2 inches. Provide ADA bench units as shown on drawings.
- 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 except provide minimum 20inch- wide tops where accessible benches are indicated.
 - 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- 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.

- D. Materials:
 - 1. Steel Tube: ASTM A 500/A 500 M, cold rolled.

2.6 FABRICATION

- A. Fabricate metal lockers square, rigid, and 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. Knocked-Down Construction: Fabricate metal lockers using nuts, bolts, screws, or rivets for nominal assembly at Project site.
- D. Accessible Lockers: Fabricate as follows:
 - 1. Locate bottom shelf no lower than 15 inches above the floor.
 - 2. Where hooks, coat rods, or additional shelves are provided, locate no higher than 48 inches above the floor.
- E. Hooks: Manufacturer's standard ball-pointed type, aluminum or steel; zinc plated.
- F. Identification Plates: Manufacturer's standard, etched, embossed, or stamped aluminum plates, with numbers and letters at least 3/8 inch high.

2.7 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.

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 o.c. Using concealed fasteners, install anchors through backup reinforcing plates, channels, or blocking as required to prevent metal distortion.
 - 2. Anchor single rows of metal lockers to walls near top and bottom of lockers.
 - 3. Anchor back-to-back metal lockers to floor.
- B. Knocked-Down Lockers: Assemble with standard fasteners, with no exposed fasteners on door faces or 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.
- 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 apart. Securely fasten tops of pedestals to undersides of bench tops, and anchor bases to floor.

3.3 ADJUSTING

A. Clean, lubricate, and adjust hardware. Adjust doors and latches to operate easily without binding.

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 105113

METAL LOCKERS

SECTION 107300 – TRANSLUCENT CANOPY 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. Cellular Polycarbonate Canopy Panel System
 - 2. Monolithic Polycarbonate Low Slope Canopy
- B. Related Requirements:
 - 1. Section 05 1200 Structural Steel Framing
 - 2. Section 07 6200 Sheet Metal Flashing and Trim
 - 3. Section 07 9200 Joint Sealants.

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 canopies.
- 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. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regional materials, certificates indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating distance to Project, cost for each regional material, and fraction by weight that is considered regional.
- C. Shop Drawings:
 - 1. Include plans, elevations, sections, and mounting 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.
- D. Samples for Initial Selection: For each type of exposed finish.
- E. Delegated-Design Submittal: For Panel Systems.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and manufacturer.
- B. Material Test Reports: For each type of panel system, by a qualified testing agency.
 - 1. Self-Ignition Temperature per (ASTM 1929-3)
 - 2. Smoke Density per (ASTM D-2843)
 - 3. Burning Extent per(ASTM D-635)
 - 4. Interior Flame Spread per (ASTM E-84)
 - 5. Color Difference per (ASTM D-2244-85).
 - 6. Weathering (ASTM D-4364)
 - 7. Weathering Evaluation before and after 25 minute exposure to 300°F, for Light Transmission and Color Change, per ASTM E-1175, ASTM D-2244.
 - 8. Large Missile Test Impact Resistance per SFBC PA 201-94.
 - 9. Impact loading per ASTM E 695.
 - 10. Impact level D per ASTM 1886 & ASTM E1996.
 - 11. Uniform load per (ASTM E-330) Cyclic wind load per ASTM 1886 & ASTM E 1996
- C. Sample Warranty: For manufacturer's special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For panels to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Materials and Products manufactured by a company continuously and regularly employed in the manufacture, engineering, and building of Canopies using polycarbonate panel systems for a period of at least ten (10) years.
- B. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1.8 WARRANTY

- A. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace components of Panel System that fail(s) in materials or workmanship within specified warranty period.
 - 1. Glazing Material 10 year from date of substantial completion.

- 2. Aluminum Framing Finish 10 year from date of substantial completion.
- 3. Aluminum Framing Material 3 years from date of substantial completion.
- B. Installer's Special Warranty: Installer agrees to repair or replace components of Panel System that fail(s) in workmanship within five years of date of substantial completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings as manufactured by CPI Daylighting, Inc., www.cpidaylighting.com or comparable product by one of the following:
 - 1. Supersky Inc., www.supersky.com
 - 2. Skylights Over Texas, www.skylightsovertexas.com
 - 3. Mitchell Metals, www.mitchellmetals.net
 - 4. Perfection Architectural Systems, Inc., www.perfectionarch.com
 - 5. Dittmer Architectural Aluminum, www.dittdeck.com.

2.2 CELLULAR POLYCARBONATE CANOPY PANEL SYSTEM DESCRIPTION

- A. Translucent panel shall include an integral extruded structural core. The panel's exterior skins shall be connected with supporting continuous ribs, perpendicular to the skins.
- B. Single Panel assembly thickness: 0.50" nominal with exposed interlocking U battens to the exterior.
- C. Panel width: 2'-0" maximum.
- D. Thermal and Solar Performance:1. Solar Heat Gain Coefficient (SHGC) 0.065.
- E. Color: Selected by Architect from manufacturers complete range.
- F. Translucent Panel Joint System
 - 1. Panel shall be extruded in one single formable length. Transverse connections are not acceptable.
 - 2. The panels should be manufactured with grip-lock flanges or standing seam integral to the unit. The flanges shall be 90 degrees to the panel face. Welding or gluing of flanges or standing seam is not acceptable.
 - 3. The U battens shall have a locking mechanism to ensure maximum uplift capability.
 - 4. Metal retention clip configured with a 0.4" wide top flange that extends continuously across the web from end to end and from side to side. Clip tested to meet wind uplift of 90 psf per ASTM E330.
 - 5. Water Penetration: No water penetration of the panel U joint connection length at test pressure of 6.24 PSF per ASTM E-331.

- 6. Free movement of the panels shall be allowed to occur without damage to the weather tightness of the completed system.
- G. Flammability
 - 1. Exterior and interior faces shall be an approved light transmitting panel with a CC1 fire rating classification per ASTM D-635. Flame spread no greater than 25 per ASTM E-84. Smoke density no greater than 75 per ASTM D2843 and a minimum self-ignition temperature of 1000°F per ASTM 1929. The panel shall be self-extinguishing.
 - 2. Interior flame spread classification of Class A per ASTM E84.
- H. Impact Resistance
 - 1. SFBC–PA 201-94, impact resistance of 350 ft. lbs.
 - 2. Impact loading per ASTM E 695 for 500 ft. lbs.
 - 3. Impact resistance per ASTM 1886 & ASTM E1996 level D.
- I. Weather Resistance:
 - 1. Light transmission as measured by ASTM D1003 shall not decrease more than 6% over 10 years, or after exposure to temperature of 300°F for 25 minutes.
 - 2. Panel tested by recognized laboratory for weathering per ASTM D4364-84 (EMMAQUA, UNBACKED), after exposure to minimum concentrated natural sunlight radiation of 56000 MJ/M (1540 MJ/M of UV, 200 385 N.M). The panel shall not change in color more than 4.0 units Delta E, 4.0 units Delta L and Delta B.
 - 3. Panel shall not change color more than 4.0 units (DELTA-E by ASTM D2244) after 60 months outdoor weathering in Arizona or equivalent climate.
 - 4. Thermal aging the interior and exterior faces shall not change color in excess of 0.75 Delta E by ASTM D2244 and shall not darken more than 0.3 units (Delta L by ASTM D2244) and shall not show cracking or crazing when exposed to 300°F for 25 minutes.
 - 5. Panel faces shall not become readily detached when exposed to temp of 300°F and 0°F for 25 minutes.
 - 6. Panels shall consist of a polycarbonate resin with a permanent, co-extruded, ultra-violet protective layer. Post-applied coating or films of dissimilar materials are unacceptable. Fiberglass skins are unacceptable.
 - 7. UV Maintenance: The system shall require no scheduled re-coating to maintain its performance or for UV protection.
 - 8. Panel shall be factory sealed at the sill to restrict dirt ingress.

2.3 MONOLITHIC POLYCARBONATE SYSTEM DESCRIPTION

- A. Appearance
 - 1. Panel assembly thickness shall be a minimum 0.15" single panel with exposed interlocking aluminum U battens.
 - 2. Panel Width: Shall not exceed 2'-0" to ensure best performance for wind uplift, vibration, oil canning and visual appearance.
 - 3. Glazing Color to be: Selected by Architect from Manufacturer's complete line.
- B. Panel Joint System
 - 1. Panel shall be extruded in one single formable length. Transverse connections are not acceptable.
 - 2. The panels should be manufactured with flanges or up stands that are integral to the unit.

- 3. The flanges shall be 90 degrees to the panel face (standing seam dry glazed concept). Welding or gluing of upstands or standing seam is not acceptable.
- 4. The aluminum U battens shall have a screw down clamping mechanism to ensure the designed uplift capability.
- 5. Free movement of the panels shall be allowed to occur without damage to the weather tightness of the completed system
- C. Flammability
 - 1. The panel shall be an approved light transmitting plastic with a CC1 fire rating classification per ASTM D-635. Smoke density no greater than 75 per ASTM D2843 and a minimum self-ignition temperature of 1000°F per ASTM 1929. The panel shall be self-extinguishing. Flame spread no greater than 25 per ASTM E-84.
- D. Weatherability
 - 1. Panels shall consist of a polycarbonate resin with a permanent, co-extruded, ultra-violet protective layer. Post-applied coating or films of dissimilar materials are unacceptable.

2.4 METAL FRAME STRUCTURE

- A. Loads:
 - 1. Dead Load 3PSF
 - 2. Live Load 28 PSF
 - 3. Wind Load 33 PSF
 - 4. Combined Load 39 PSF
- B. Design framing to be self-supporting between structural supports. Deflection of the structural framing members in a direction normal to the plane of the glazing, when subjected to a uniform load deflection, shall not exceed amounts listed below for the unsupported span. The Canopy will impose reactions to the support construction. All adjacent and support construction must support the transfer of all loads, both horizontal and vertical, exerted by the Canopy.
 - 1. Cellular Polycarbonate Canopy Panel System: L/100
 - 2. Monolithic Polycarbonate Canopy System: L/60

2.5 MATERIALS

- A. Extruded Aluminum: ANSI/ASTM B221; 6063-T6: 6063-T5 or 6005-T5.
- B. Flashing:
 - 1. 5005 H34 aluminum 0.04" minimum thickness.
 - 2. Sheet metal flashings/closures/claddings furnished shop formed to profile when lengths exceed 10 ft. in nominal 10-ft lengths. Field trimming of the flashing and field forming the ends as necessary to suit conditions. Overlap sheet metal ends at least 6-inches, set in a full bed of sealant and riveted if required.
- C. All Fasteners for aluminum framing stainless steel or cadmium plated steel, excluding the final fasteners to the building.

- D. High-Performance Organic Finish: Three-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF or FEVE 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.
 - 1. Color and Gloss: As selected by Architect from manufacturer's full range.

2.6 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design panel systems.
- 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: 75 or less.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, 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. Install components in strict accordance with manufacturer's instructions and approved shop drawings. Use proper fasteners and hardware for material attachments as specified.
- B. Use methods of attachment to structure allowing sufficient adjustment to accommodate tolerances.
- C. Remove all protective coverings on panels immediately after installation.

3.3 CLEANING

- A. Follow manufacturer's instructions when washing down exposed panel surfaces using a solution of mild detergent in warm water that is applied with soft, clean wiping cloths. Always test a small area before applying to the entire area.
- B. Follow strict panel manufacturer guidelines when removing foreign substances from panel surfaces requiring mineral spirits or any solvents that are acceptable for use. Always test a small sample to validate compliance before applying to the Canopy glazing panels.
- C. Installers shall leave panel system clean at completion of installation. Final cleaning is by others upon completion of project, following manufacturer's cleaning instructions

END OF SECTION 107300

TRANSLUCENT CANOPY SYSTEMS

SECTION 107516 - 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 made from aluminum.
- B. Owner-Furnished Material: Flags.

1.3 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.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For flagpoles to include in operation and maintenance manuals.

1.5 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

A. Source Limitations: Obtain flagpoles as complete units, including fittings, accessories, bases, and anchorage devices, 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 flagpole assemblies.
- B. Seismic Performance: Flagpole assemblies shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
- C. Structural Performance: Flagpole assemblies, including anchorages and supports, shall withstand design loads indicated within limits and under conditions indicated.
 - 1. Wind Loads: Determine according to NAAMM FP 1001. Basic wind speed for Project location is120 mph.
 - 2. Base flagpole design on polyester flags of maximum standard size suitable for use with flagpole or flag size indicated, whichever is more stringent.

2.3 ALUMINUM FLAGPOLES

- A. Aluminum Flagpoles: Cone-tapered flagpoles fabricated from seamless extruded tubing complying with ASTM B 241/B 241M, Alloy 6063, with a minimum wall thickness of 3/16 inch.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Acme/Lingo Flagpoles, LLC.
 - b. American Flagpole.
 - c. Baartol Company.
 - d. Concord Industries, Inc.
 - e. Eder Flag Manufacturing Company, Inc.
 - f. Ewing Flagpoles.
 - g. Morgan-Francis Flagpoles and Accessories.
 - h. Pole-Tech Company Inc.
- B. Exposed Height: 30 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 wall thickness with 3/16-inch steel bottom plate and support plate; 3/4-inch- 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.
- E. Sleeve for Aluminum Flagpole: Fiberglass or PVC pipe foundation sleeve, made to fit flagpole, for casting into concrete foundation.
 - 1. Flashing Collar: Same material and finish as flagpole.
- F. Cast-Metal Shoe Base: Made from aluminum with same finish and color as flagpoles for anchor-bolt mounting; furnish with anchor bolts.
 - 1. Furnish ground spike.
- G. Hinged Baseplate: Cast-metal tilting hinged base and anchor plate joined by permanently secured pivot rod. Furnish with stainless-steel screws for securing tilting base to anchor plate when not tilted; furnish with anchor bolts.
 - 1. Finish: Same as flagpole.
 - 2. Furnish aluminum base or aluminum flashing collar finished to match flagpole.
 - 3. Furnish ground spike.

2.4 FITTINGS

- A. Finial Ball: Flush-seam ball, sized as indicated or, if not indicated, to match flagpole-butt diameter.
 - 1. 0.063-inch spun aluminum, finished to match flagpole.
- B. External Halyard: Ball-bearing, nonfouling, revolving truck assembly of cast metal with continuous 5/16-inch- diameter, braided polypropylene halyard and 9-inch cast-metal cleats with fasteners. Finish exposed metal surfaces to match flagpole.
 - 1. Halyards and Cleats: One at each flagpole.
 - 2. Cleat Covers: Cast metal, finished to match flagpole, secured with cylinder locks.
 - 3. Halyard Covers: 2-inch channel, 60 inches long, finished to match flagpole.
 - 4. Halyard Flag Snaps: Stainless-steel swivel snap hooks with neoprene or vinyl covers. Furnish two per halyard.

2.5 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: Single-component 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.

2.6 ALUMINUM FINISHES

- A. Natural Satin Finish: AA-M32, fine, directional, medium satin polish; buff complying with AA-M20; seal aluminum surfaces with clear, hard-coat wax.
- B. Clear Anodic Finish: AAMA 611, AA-M12C22A41.

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 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 107516

SECTION 110000 - MISCELLANEOUS 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. Kiln.

1.3 SUBMITTALS

- A. Product Data: Provide manufacturer's product data for each product specified.
- B. Shop Drawings: Indicate location, dimensions, configuration, details of attachment, mounting methods, and required electrical connections.
- C. Submit manufacturer's installation instructions.
- D. Submit manufacturer's Operation and Repair manuals.

PART 2 - PRODUCTS

2.1 CERAMIC KILN – ELECTRIC

- A. Basis of Design Product: Subject to compliance with requirements, provide the following or approved equal:
 - 1. Skutt Ceramic Products, Inc.; Model KM1027 Electric Kiln.
 - a. 7.0 cu. ft. capacity.
 - b. Temperature: Cone 6, 2250 degrees F.
 - c. Single Phase, 208 Volts, 48 Amps, 9980 Watts.

2.2 CERAMIC KILN – GAS

- A. Basis of Design Product: Subject to compliance with requirements, provide the following or approved equal:
 - 1. Olympic 2327G
 - a. 7.0 cu. ft. capacity
 - b. Temperature: Cone 10, 2350 degrees F.

- c. Fuel type: Natural gas
- 2.3 Accessories: Provide vent kits as required for each kiln. Coordinate duct connections.

PART 3 - EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Verify that surrounding surfaces and areas are ready to receive work of this section. Adjust netting as required.

3.2 INSTALLATION

- A. Install equipment in accordance with manufacturer's written instructions unless otherwise indicated to be installed by a representative of the manufacturer.
- B. Test electrically-operated units to verify controls, switches, and other operating components are in optimum functioning conditions.

3.3 ADJUSTING

A. Adjust installed unit for smooth and balanced operation.

END OF SECTION 110000

SECTION 113100 - RESIDENTIAL APPLIANCES

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. Refrigeration appliances.
 - 2. Cleaning appliances.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include installation details, material descriptions, dimensions of individual components, and finishes for each appliance.
 - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.
- B. Sustainable Design Submittals:
 - 1. Product Data: For indicated products, indicating compliance with requirements for ENERGY STAR product labeling.
 - 2. Product Data: For water-efficient clothes washer, indicating compliance with requirements.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer.
- B. Product Certificates: For each type of appliance.
- C. Field quality-control reports.
- D. Sample Warranties: For manufacturers' special warranties.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each residential appliance to include in operation and maintenance manuals.

1.6 WARRANTY

- A. Special Warranties: Manufacturer agrees to repair or replace residential appliances or components that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain residential appliances from single source.

2.2 PERFORMANCE REQUIREMENTS

- A. Electrical Appliances: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Gas-Fueled Appliances: Certified by a qualified testing agency for each type of gas-fueled appliance according to ANSI Z21 Series standards.
- C. Accessibility: Where residential appliances are indicated to comply with accessibility requirements, comply with applicable provisions in the DOJ's 2010 ADA Standards for Accessible Design and ICC A117.1.

2.3 REFRIGERATOR/FREEZERS

- A. Refrigerator/Freezer: Two-door refrigerator/freezer with freezer on top and complying with AHAM HRF-1.
 - 1. Type: Freestanding and Undercounter.
 - 2. Dimensions:
 - a. Width: As indicated on Drawings.
 - b. Depth: As indicated on Drawings.
 - 3. General Features:
 - a. Door Configuration: Overlay.
 - 4. Refrigerator Features:
 - a. Interior light in refrigeration compartment.
 - b. Door Storage: Modular compartments.
 - 5. Freezer Features: One freezer compartment(s) with door(s).
 - a. Automatic defrost.

- b. Interior light in freezer compartment.
- 6. ENERGY STAR: Provide appliances that qualify for the EPA/DOE ENERGY STAR product-labeling program.
- 7. Front Panel(s): Manufacturer's standard Stainless steel.
- 8. Appliance Color/Finish: Stainless steel.

2.4 DISHWASHERS

- A. Dishwasher: Complying with AHAM DW-1.
 - 1. Type: Built-in undercounter.
 - 2. Dimensions:
 - a. Width: 24 inches.
 - b. Depth: 23 inches.
 - c. Height: 34-1/2 inches.
 - 3. Sound Level: Maximum 42 dB.
 - 4. Tub and Door Liner: Manufacturer's standard with sealed detergent and automatic rinsing-aid dispensers.
 - 5. Rack System: Nylon-coated sliding dish racks, with removable cutlery basket.
 - 6. Controls: Touch-pad controls with four wash cycles and hot-air and heat-off drying cycle options.
 - 7. Features:
 - a. Lock-out feature.
 - b. Half-load option.
 - c. Delay-wash option.
 - d. Digital display panel.
 - 8. ENERGY STAR: Provide appliances that qualify for the EPA/DOE ENERGY STAR product-labeling program.
 - 9. Front Panel: Manufacturer's standard Stainless steel.
 - 10. Appliance Color/Finish: Stainless steel.

2.5 CLOTHES WASHERS AND DRYERS

- A. Clothes Washer: Complying with AHAM HLW-1.
 - 1. Type: Freestanding, front-loading unit.
 - 2. Drum: Manufacturer's standard.
 - a. Capacity: 3.2 cu. ft..
 - 3. Controls: Touch-pad controls for water-fill levels, wash/rinse water temperatures, and variable-speed and fabric selectors.
 - a. Wash Cycles: Four wash cycles, including regular, delicate, and permanent press.
 - b. Wash Temperatures: Three settings.
 - c. Speed Combinations: Two.
 - 4. Electrical Power: 120 V, 60 Hz, 1 phase, 15 A.
 - 5. Motor: Manufacturer's standard with built-in overload protector.
 - 6. Features:
 - a. Self-cleaning lint filter.
 - b. Unbalanced-load compensator.
 - c. Inlet Hoses: Minimum length 60 inches.
 - d. Drain Hoses: Minimum length 48 inches.

- e. Self-leveling legs.
- f. Automatic dispenser for bleach.
- g. Spin-cycle safety switch.
- h. End-of-cycle signal.
- i. Extra-rinse option.
- j. Delay-wash option.
- k. Electronic temperature control.
- l. Water levels automatically set.
- 7. ENERGY STAR: Provide appliances that qualify for the EPA/DOE ENERGY STAR product-labeling program.
- 8. Water-Efficient Clothes Washer: Provide clothes washer with modified energy factor greater than or equal to 2.0 and water factor less than 5.5.
 - Appliance Finish: Enamel.
 - a. Color: White.
- B. Clothes Dryer: Complying with AHAM HLD-1.
 - 1. Type: Freestanding, frontloading, gas unit.
 - 2. Drum: Manufacturer's standard.
 - a. Capacity: 7.0 cu. ft..
 - 3. Controls: Touch-pad controls for drying cycle, temperatures, and fabric selectors.
 - 4. Gas-Dryer Power: 120 V, 60 Hz, 1 phase, 15 A electric; 22,000-Btu/h gas.
 - 5. Features:

9.

- a. Removable lint filter.
- b. Electronic temperature and moisture-level-sensor controls.
- c. End-of-cycle signal.
- d. Interior drum light.
- e. Self-leveling legs.
- f. Antibacterial cycle.
- g. Auxiliary drying rack.
- h. Built-in electrical power fuse.
- 6. Appliance Finish: Enamel.
 - a. Color: White.

2.6 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical 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, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, power connections, and other conditions affecting installation and performance of residential appliances.
- B. Examine roughing-in for piping systems to verify actual locations of piping connections before appliance installation.
- 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 INSTALLATION

- A. Install appliances according to manufacturer's written instructions.
- B. Built-in Equipment: Securely anchor units to supporting cabinets or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and that rough openings are completely concealed.
- C. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.

3.3 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Perform visual, mechanical, and electrical inspection and testing for each appliance according to manufacturers' written recommendations. Certify compliance with each manufacturer's appliance-performance parameters.
 - 2. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.
 - 3. Operational Test: After installation, start units to confirm proper operation.
 - 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and components.
- B. An appliance will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain residential appliances.

END OF SECTION 113100

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SECTION 113113 - COMMERCIAL LAUNDRY EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Washer extractors.
- B. Drying tumblers.

1.2 RELATED SECTIONS

- A. Section 03300 Cast-In-Place Concrete: Foundation bases for equipment.
- B. Division 15 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.
- C. Division 16 Sections for wiring disconnect switches, and other electrical materials required to complete commercial laundry equipment installation.

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 54 National Fuel Gas Code.
- C. NFPA 70 National Electrical Code.

1.4 SUBMITTALS

- A. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
- B. Shop Drawings: Include plans, elevations, sections, roughing-in dimensions, fabrication details, utility service requirements, and attachments to other work.
- C. Coordination Drawings: Indicate locations of laundry equipment and connections to utilities, and clearance requirements for equipment access and maintenance.
- D. 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.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store equipment on site protected from weather, direct sunlight and temperature extremes. Do not remove packaging prior to storage.
- B. Consult manufacturer if machines are to be stored for an extended period of time.

COMMERCIAL LAUNDRY EQUIPMENT

1.6 PROJECT CONDITIONS

A. 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.

1.7 WARRANTY

- A. Washer Extractors: Manufacturer's standard form in which manufacturer agrees to repair or replace any part of the equipment assembly that fails within specified warranty period.
 - 1. Warranty Period: Three years from date of Substantial Completion.
- B. Washer Extractors: Mainframe and Cylinder Shaft Assembly Warranty.: Manufacturer's standard form in which manufacturer agrees to repair or replace main frame, bearing, cylinder or cylinder shaft assembly that fails within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.
- C. Dryer Tumblers: Manufacturer's standard form in which manufacturer agrees to repair or replace any part of the equipment assembly that fails within specified warranty period.
 - 1. Warranty Period: Three years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Washer:
 - 1. Maytag Commercial Neptune
 - 2. Wascomat W-Series
 - 3. Speed Queen
 - 4. Belco
- B. Dryer:
 - 1. Belco Athletic Dryer #50
 - 2. Wascomat TD series.

2.2 WASHER EXTRACTOR MODELS AND COMPONENTS

- A. General Characteristics:
 - 1. Frame: Heavy-duty structural steel.
 - 2. Construction: Cabinet front, top sides, and inner and outer tubs shall be of 304 grade stainless steel.
 - 3. Control System: Multiple cycle programmable microprocessor, with cycle time remaining and cycle counter.
 - 4. Chemical Supply System:
 - a. Three compartment, manually filled dry chemical dispensing system.
 - 5. Automatic Supply Dispenser: Self-cleaning multi-compartment dispenser
 - 6. Drain Valve: Automatic opening in event of power failure. Capacity: 50 lb,

- minimum.
- 8. Extract G Force: 86.
- 9. Cylinder Drive: 2 speed.
- 10. Drive Motor: 2.7 hp.
- 11. Water Inlet Valves and Size: 2 at 1/2 inch (13 mm), with 3/4 inch (19 mm) NH male connectors.
- 12. Drain Valves and Diameter: 1 at 3 inches (76 mm).
- 13. Electrical Requirements: 208v-240v/60Hz/1phase.

2.3 DRYER TUMBLER MODELS

- A. Dryer Tumbler General Characteristics:
 - 1. Construction: Heavy duty embossed steel with electrostatically applied baked enamel finish.
 - 2. Control System: Programmable microprocessor with multiple auto drying cycles, ability to time dry, with variable temperature settings and wrinkle free at cycle end to allow tumble action until door opens or maximum of 60 minutes.
 - 3. Lint Filter: Self-cleaning, depositing lint to large storage area at bottom of tumbler.
 - 4. Capacity: 50 lb (22.7 kg).
 - 5. Lint Filter: 576 sq. in (3716 sq. cm).
 - 6. Door: High grade stainless steel reversible door with rubber gasket and heavy duty hinge.
 - 7. Heat Source: Natural Gas, 120,000 BTU/hr, 1/2 in (13 mm) NPT.
 - 8. Exhaust Size: 8 in (203 mm).
 - 9. Electrical Requirements: 120v/60Hz/1phase. Gas and steam models

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation 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. Touch-up, repair or replace damaged products before Substantial Completion. Β.

END OF SECTION

SECTION 114000 – FOODSERVICE EQUIPMENT

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Scope: Furnish all labor, materials, services, equipment and appliances required to provide and deliver all foodservice equipment hereinafter specified into the building, uncrate, assemble, hang, set-in-place, level, and completely install, exclusive of final utility connections.
- B. Related Work Specified Elsewhere:
 - 1. All plumbing, electrical and ventilating work required in conjunction with commercial foodservice equipment including rough-in to points indicated on mechanical drawings, and final connections from rough-in points, electrical service to points of connection and final connections shall be by Divisions 22, 23 and 26.
 - 2. Refrigeration work will be done by the Kitchen Equipment Contractor except for electrical and plumbing connections to and between compressors, blower coils, controls, etc. These final connections shall be by Divisions 22 and 26.
 - 3. All traps, steam traps, grease traps, line strainers, tail pieces, valves, stops, shut-offs, and fittings necessary for equipment specified will be furnished and installed under mechanical contract by Division 22 unless specifically called for otherwise under each item.
 - 4. All line and disconnect switches, safety cut-offs and fittings, convenience boxes or other electrical controls, fittings and connections will be furnished and installed under electrical contract by Division 26, unless specifically indicated otherwise in the item specifications. Starting switches for certain specified pieces of foodservice equipment are to be provided by Kitchen Equipment Contractor. Those starting switches, if furnished loose as standardized by Foodservice Manufacturers (other than fabricated items), shall be mounted and wired complete under Division 26.
 - 5. Any sleeves or conduit required for refrigeration, syrup tubing, or carbonation tubing will be furnished and installed under Division 22.
 - 6. Unless specifically called for in the Item Specifications, ventilating fans and all duct work between same and ceiling rough-in openings, and from same to discharge opening in building will be furnished and installed by Division 22.

1.2 DEFINITIONS

- A. All references to the terms "Contractor", "Kitchen Equipment Contractor", or "K.E.C." in the specifications and/or on the drawings shall be defined to mean the Kitchen Equipment Contractor.
- B. All references to the term "Owner" in the specifications and/or on the drawings shall be defined to mean the Owner or Owner's designated representative and the Foodservice Equipment Consultant.

- C. All references to the term "Consultant" or "Foodservice Equipment Consultant" in the specifications and/or on the drawings shall be defined to mean **NYIKOS ASSOCIATES, INC.** its employees, and authorized representatives and is referred to throughout the contract documents as if singular in number and masculine in gender.
- D. The phrase "The K.E.C. shall" or "by the K.E.C.", as applicable, is understood to be included as a part of each sentence, paragraph or article of these specifications unless otherwise indicated or specified.

1.3 QUALITY ASSURANCE

- A. Qualification of Suppliers:
 - 1. Commercial foodservice equipment suppliers shall submit satisfactory evidence of compliance with the following qualifications and conditions to be approved.
 - a. Successful completion of jobs of comparable scope.
 - b. Have manufacturer's authorization to distribute and install specified factory items of equipment.
 - c. Maintain a permanent staff experienced in the installation of foodservice equipment and preparation of professional style rough-in drawings and brochures.
 - d. Maintain or have access to fabrication shop meeting N.S.F. requirements. If other than foodservice equipment suppliers own fabrication shop, obtain Consultant approval of fabrication shop desired to be used.
 - e. Maintain or have access to a readily available stock of repair and replacement parts, together with authorized service personnel.
- B. Qualification of Fabricators:
 - 1. Fabricators shall be an N.S.F. approved organization with trained personnel and facilities to properly design, detail and fabricate equipment in accordance with the specifications and standard details contained herein.
 - 2. Custom fabricated equipment shall bear the National Sanitation Foundation seal of approval and listed as such under N.S.F. Standards No. 2 and No. 33.
 - 3. Only one (1) fabricator shall be used for this project, and all equipment will be fabricated at the same shop. When units cannot be fully shop-fabricated, complete fabrication at project site.
 - 4. Acceptable fabricators are:
 - a. Pro Stainless, Inc.; Keyser, WV
 - b. Commercial Stainless, Inc.; Bloomsburg, PA
 - c. Keystone Custom Fabricators, Inc.; Elizabeth, PA
 - d. Southern Equipment Fabricators, Inc.; Columbia, SC
 - e. Custom Metals of Virginia, Inc.; Manassas, VA
 - f. Other fabricators, as approved by Consultant.
- C. Qualification of Manufacturers:

- 1. Manufacturers shall be regularly engaged in the production of items furnished and shall have demonstrated the capability to furnish similar equipment that performs the functions specified or indicated herein.
- D. Standard Products:
 - 1. Materials, products, and equipment furnished under this contract shall be the standard items of manufacturers regularly engaged in the production of such materials, products, and equipment and shall be of the manufacturer's latest design that complies with the specifications which have been produced and used successfully on other projects and in similar applications.
 - 2. Discrepancies within contract documents should immediately be brought to the attention of the Consultant in writing for clarification prior to fabrication or ordering of standard items.

1.4 PLANS & SPECIFICATIONS

A. Specifications and drawings have been prepared to form the basis for procurement, erection, start-up and adjustment of all equipment in this contract. Plans and specifications shall be considered as mutually explanatory and work required by one, but not the other, shall be performed as though required by both. Items required by one, but not by the other shall be provided as though required by both. Work shall be accomplished as called for in specifications and shown on drawings, so that all items of equipment shall be completely functional for purpose for which they were designed. When there is any discrepancy between drawings and specifications, drawings shall govern. Bidders should seek clarification of any discrepancies from the Consultant prior to bidding.

1.5 SUBMITTALS

- A. General Requirements:
 - 1. Within six (6) weeks or earlier, as required, assemble and submit all shop drawings, rough-in drawings, brochures, color samples, etc. as a complete package. There will be no review of partial submittals.
 - 2. Any and all costs, to all trades and parties involved, arising from delay of project due to non-submittal of the complete package by the K.E.C. within a reasonable time period shall be borne solely by the K.E.C.
 - 3. Identify each submittal by project name, date, contractor, submittal name, and any other necessary information to distinguish it from other submittals.
- B. Shop Drawings:
 - 1. Submit shop drawings electronically in PDF format, drawn on sheets equal in size to Contract Documents of equipment specified for custom fabrication including all accessories attached to each item.
 - 2. Drawings shall be detailed and fully dimensioned to a minimum scale of 3/4"=1'-0" for plan and elevation views, and 1-1/2"=1'-0" for sections, based on the floor plan(s) and

following item specifications. Drawings will be checked for thoroughness, accuracy, completeness, neatness, and returned for corrections, if necessary.

- C. Rough-in Drawings:
 - 1. Submit rough-in drawings electronically in PDF format, drawn on sheets equal in size to Contract Documents of detailed arrangement plans professionally prepared from architects dimensioned plans (not traced from Contract Documents) at a minimum scale of 1/4"=1'-0".
 - 2. Equipment Layout Plan showing arrangement of all items specified and identified on schedule of equipment listing item number, description, quantity, manufacturer, model number, and remarks.
 - 3. Ventilation Plan showing dimensioned locations of all duct openings for ventilators and dishmachines identifying size, c.f.m. required (exhaust and supply), static pressures, and connection heights.
 - 4. Plumbing/Electrical Plans showing dimensioned locations, sizes, elevations and capacities of all utility services required for each item of equipment in relation to finished walls, columns, and heights above finished floor.
 - 5. Special Conditions Plan showing exact dimensions and details of all masonry bases, floor depressions, critical partition locations/heights, wall openings, reinforcing for wall and/or ceiling mounted equipment, and conduit locations for soda and compressed gas lines.
- D. Equipment Brochures:
 - 1. Submit electronic files in PDF format of manufacturer's illustrations and technical data for approval prior to procurement. All items of Standard Manufacture shall be submitted, including items purchased to be built into fabricated equipment. Each illustration shall be marked to accurately describe the item to be furnished as specified. Include all deviations from standard information (i.e., voltage, phase, load, etc.).
 - 2. Include a separate information sheet ahead of each illustration sheet showing all service connection sizes, electrical requirements, loads, consumptions, and all accessories specified.
 - 3. Manufacturer's suggested schematic drawings for connection of mechanical and electrical services for such items as booster heaters, disposers, or any other item of equipment that may require the same.
- E. Miscellaneous Shop Drawings:
 - 1. Submit electronic files in PDF format of manufactured equipment specified requiring clarification and approval such as, walk-in cooler/freezer drawings, ventilator drawings, utility raceway drawings, and refrigeration system drawings.
- F. Operation and Maintenance Manuals:
 - 1. Submit electronic files in PDF format for all mechanically operated equipment of standard manufacture. Include operating and cleaning/maintenance instructions, parts listing, recommended parts inventory listing and purchase source, copy of warranties, and similar applicable information.
 - 2. Brochure covers shall bear the job name, date, and name of contractor.

G. Manufacturer's List:

- 1. The K.E.C. shall submit electronic files in PDF format a list of all manufacturer's representatives of the food service equipment such as convection ovens, ranges, etc., and their authorized service agencies' addresses and telephone numbers; to be presented after submission of manufacture data.
- H. Samples:
 - 1. Samples of materials, products, and fabrication methods, shall be submitted for approval upon request at no additional cost, before proceeding with work.
 - 2. Re-submission Requirements:
 - 3. Shop Drawings:
 - a. Revise initial drawings as required and resubmit in accordance with submittal procedures.
 - b. Indicate on drawings all changes which have been made in addition to those requested by Consultant.
 - 4. Product Data and Samples:
 - a. Submit new data and samples as required for initial submittal.
 - b. Make all re-submittals within fourteen (14) working days from date of Consultants previous action.
- I. Approvals:
 - 1. After approval of the submittals listed above, furnish as many prints and copies as are required for the various trades, the Owner, the Architect, and the Consultant.
 - 2. The approval of the shop drawings will be general and shall not relieve the K.E.C. of responsibility for proper fitting, finishing, quantities, and erection of work in strict accordance with the contract requirements, nor does it relieve him of the responsibility of furnishing material and workmanship not indicated on approved shop drawings but required for the completion of his work.
 - 3. Approval by the Consultant and/or Owner of the manufacturer's data submitted by the K.E.C. does not waive the responsibility of K.E.C. to furnish each item of equipment in complete compliance with the specifications and drawings. Discrepancies between Contract Documents and furnished equipment shall be corrected even after approval and installation of this equipment at no additional cost to the Owner.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Delivery:
 - 1. Equipment shall be delivered to the job site only after the building is weather-safe and vandal-safe.
- B. Storage:

- 1. Store equipment in an area convenient to the point of installation in such a way that it is protected from the weather and job hazards.
- C. Protection:
 - 1. Wrapping and protective coatings shall remain on all items until ready for use and in the case of stainless steel items, until installation is complete and the job is ready for cleaning.
- D. Damage:
 - 1. All responsibility shall rest with the K.E.C. for any damage or loss incurred prior to final acceptance. Such items as may be lost or damaged shall immediately be replaced or repaired to a new condition to the complete satisfaction of and at no additional cost to the Owner.

1.7 JURISDICTION TRADE AGREEMENTS AND RESTRICTIONS

A. Include the work specified, shown or reasonably inferable as part of foodservice equipment. Portions of this work may be subcontracted to those qualified to do such work, as may be necessary because of jurisdictional trade agreements and restrictions.

1.8 REGULATIONS AND CODES

- A. Except as otherwise indicated, each item of equipment shall comply with the latest current edition of the following standards as applicable to the manufacture, fabrication, and installation of the work in this section.
 - 1. <u>N.S.F. Standards</u>: Comply with National Sanitation Foundation Standards and criteria, and provide N.S.F. "Seal of Approval" on each manufactured item and major items of custom-fabricated work.
 - 2. <u>U.L. Standards</u>: For electrical components and assemblies, provide either U.L. labeled products or, where no labeling service is available, provide a complete index of the components used as selected from the U.L. "Recognized Component Index".
 - 3. <u>A.N.S.I. Standards</u>: For gas-burning equipment, comply with A.N.S.I. Z21-Series standards. Comply with A.N.S.I. B57.1 for compressed gas cylinder connections and with applicable standards of the Compressed Gas Association for water connection air gaps and vacuum breakers.
 - 4. <u>A.G.A.</u>: All gas-fired equipment shall be A.G.A. Approved, equipped to operate on the type gas available at the job site and shall contain 100% automatic safety shut-off devices.
 - 5. <u>N.F.P.A. Standards:</u> Comply with N.F.P.A. Bulletin 96 for exhaust systems and with N.F.P.A. Bulletins 17 & 96, and U.L. 300 for fire extinguishing systems.
 - 6. <u>A.S.M.E. Code:</u> Comply with A.S.M.E. boiler code requirements for steam generating and steam heated equipment. Provide A.S.M.E. inspection, stamps, and certification of registration with National Board.
 - 7. <u>National Electric Code</u>: Comply with N.E.C. Volume 5 for electrical wiring and devices included with foodservice equipment.

- 8. All authorities having jurisdiction over this type of equipment and/or installation.
- 9. Where specifications and/or drawings require mechanical, electrical or refrigeration work to be performed, such work shall be done in strict conformance to other portions of the Base Building Specification which sets forth standards for this type of work.
- 10. Where there exists two standards or codes for one type of work, the stricter method shall govern.

1.9 WARRANTIES

- A. Warrantee in writing all equipment and fabrication against defects and workmanship for a period of two (2) years from date of acceptance.
 - 1. Each piece of mechanical equipment shall be listed, together with the authorized service and repair agency whom the Owner will call should malfunctions occur within the two-year (2) guarantee period.
- B. Refrigeration system compressors shall be warrantied for five (5) years by the manufacturer. Free refrigeration service, including parts and labor, shall be furnished for two (2) year from date of acceptance, unless otherwise specified.

1.10 JOB CONDITIONS

- A. Visit the job site to field check actual wall dimensions and roughing-in and shall be responsible for fabricating and installing the equipment in accordance with the available space and utility services as they exist on the job site.
- B. Check all door openings, passageways, elevators, etc., to be sure that the equipment can be conveyed to its proper location within the building and if necessary, check the possibility of holding wall erection, placement of doorjambs, windows, etc. for the purpose of moving the equipment to its proper location with the Contractor. Any removal and rebuilding of walls, partitions, doorjambs, etc. necessary to place the equipment, or if caused by incorrect information on the Contractor's drawings, shall be done at the expense of the K.E.C., at no additional cost to the Owner.
- C. Notify the Consultant and Owner before fabrication of equipment of any discrepancies between plans and specifications and actual conditions on the job.
- D. Before finished floors, walls, and/or ceilings are in place, physically check the location of all "rough-ins" at the job site. Report discrepancies in writing.
- E. Any changes required after fabrication has been started to ensure equipment accurately fitting the space as it exists and conforming to actual field dimensions on the job shall be made at no additional cost to the Owner.
- F. If special hoisting equipment and operators are required, include such cost as part of the bid for this work.

1.11 CHANGES IN THE WORK

A. The Owner reserves the right to require reasonable modification to be made in the routing of work and relocation of equipment. This specifically refers to conditions where interference occurs or where more desirable accessibility can be obtained or whose materials cannot be installed because of structural or mechanical conditions encountered. Such changes shall be made at no additional cost to the Owner.

1.12 PATENTS

- A. Hold harmless and save the Owner and its officers, consultants, servants and employees from liability of any nature or kind, including costs and expenses for or on account of any copyrighted, patented, or un-patented invention, process, trademark, design, device, material, article, or appliance manufactured or used in the performance of the contract, including its use by the Owner, unless otherwise specifically stipulated in the Contract Documents.
- B. If the Contractor has information that the process or article specified is an infringement of a patent, he shall be responsible for such loss unless he promptly gives such information to the Owner in writing. The contract price shall include all royalties or costs arising from the use of any or all of the above which are, in any way, involved in the contract.

1.13 CONTRACTOR'S WARRANTY

- A. The Contractor represents and warrants:
 - 1. That he is financially solvent and that he is experienced in and competent to perform the types of work or to furnish the plans, materials, supplies or equipment, to be so performed or furnished by him.
 - 2. That he is familiar with all Federal, State, municipal, and department laws, ordinances, orders, and regulations, which may, in any way, affect the work of those employed therein, including, but not limited to, any special acts relating to the work or to the project of which it is a part.
 - 3. That such temporary and permanent work required by the contract as is to be done by him can be satisfactorily constructed and used for the purpose for which it is intended and that such construction will not injure any person or damage any property.
 - 4. That he has carefully examined the plans, specifications, addenda, if any, and the site of the work and that, from his own investigations, he has satisfied himself as to the nature and location of the work, the character, quality, and quantity of materials likely to be encountered, the character of equipment and other facilities needed for the performance of the work, the general and local conditions, and all other materials which may, in any way, affect the work or its performance.
 - 5. That he has satisfied himself as to the existing openings and accesses to the foodservice area through which his equipment shall be required to pass and that he is responsible for his equipment being delivered in as many sections as necessary to conform to the available space dictated by these existing limitations.
1.14 SUBSTITUTIONS

- A. Bids submitted shall be for the specific manufacturer and model, size, capacity, and accessories, as specified or shown on the drawings.
- B. The K.E.C. may quote upon brands and models of equipment other than those specified as a substitute. In the event that it is desired to request approval of substitute material, product, article, process, or item of equipment in lieu of that which is specified, submit a written request at least (10) working days prior to date of bids, setting forth the proposed substitution in detail, including an itemized analysis of the addition or deduction in the amount of the contract, if any, which will result if the substitution is approved. Each such request shall include a complete description of the proposed substitute, the name of the material or equipment for which it is to be substituted, drawings, cuts, performance and test data and any other data or information necessary for a complete evaluation. If approved, bidders will be notified in the form of addendum.
- C. The Contractor shall be held responsible for additional costs to himself or any other prime contractor for changes required to install materials, devices, equipment, etc., which the Contractor has substituted for that specified.
- D. The Owner reserves the right to award a contract or contracts based upon the inclusion or exclusion of one or more of the alternate estimates. The description of all workmanship and materials under the various headings of the specifications shall have the same meaning and force when applied to similar workmanship and materials in the alternate. If the descriptions are not specific, the workmanship shall be the best quality and the materials the best commercial grade.
- E. Whenever any product is specified in the Contract Documents by reference to the name, trade name, make, or catalog number of any manufacturer or supplier, the intent is not to limit competition but to establish a standard of quality which is necessary for the project. Products of other manufacturers meeting the established criteria will be considered. However, please take note that the plumbing, electrical, steam, heating, ventilating, and air-conditioning drawings prepared by the consulting engineers, have been engineered based on the first product named under each item number designation. Therefore, any other product which is submitted for approval in lieu of the primary item specified, shall conform to the rough-in requirements established for the first product named, as well as physical size and building construction requirements.
- F. Any equipment listed which is not in accordance with the provisions of these specifications will be rejected. If the Contractor fails to submit for approval within the specified time the list of equipment as required herein, the Consultant shall then have the right to make the final equipment selection. The selection made by the Consultant shall strictly conform to these specifications and will be final and binding, and the items shall be furnished and installed by the Contractor without change in the contract price at the time of completion.
- G. It shall be the responsibility of the K.E.C. to prove that substitutions are equal to specified items. **NYIKOS ASSOCIATES, INC.** as the Owner's representative, shall be the determining authority as to the acceptability or equality of the substitutions. <u>No substitutions shall be approved after bids are received</u>.

1.15 DESIGN/MODEL CHANGE, DISCONTINUED ITEMS

- A. All equipment specified shall be of latest design. Any improvements made in design and construction of prefabricated items before equipment is actually delivered to the project site, shall be incorporated in equipment, at no additional cost, provided such incorporation does not delay delivery date of equipment.
- B. In the event of an item being discontinued after specified and prior to delivery to project site, the K.E.C. shall be responsible for notifying the Consultant in writing of the discontinued item and request an alternate of equal performance, including all accessories, at no additional cost to the Owner.

PART 2 - PRODUCTS

2.1 GENERAL

- A. The equipment and its component parts shall be new and unused. All items of standard manufactured equipment shall be current models at the time of delivery. All parts subject to wear, breakage, or distortion shall be accessible for adjustment, replacement, and repair.
- B. Means shall be provided to ensure adequate lubrication for all moving parts. All oil holes, grease fittings, and filler caps shall be accessible without the use of tools.
- C. The design of the equipment shall be such as to provide for safe and convenient operation. Covers or other safety devices shall be provided for all items of equipment presenting safety hazards. Such guards or safety devices shall not present substantial interference to the operation of the equipment. All guards shall provide easy access to the guarded parts.
- D. Trim shall not be an acceptable substitute for accuracy and neatness. When trim is required and accepted by the Consultant and the Owner in lieu of rejection of items of equipment, it shall be the K.E.C.'s responsibility to provide same at no additional cost.
- E. Unless otherwise specified herein, no material lighter than #20 gauge shall be incorporated into the work. All gauges for sheet iron and sheet steel shall be U.S. Standard Gauges, and finished equipment gauge thickness shall not vary more than 5% plus or minus from the thickness indicated below.

GAUGE	THICKNESS	GAUGE	THICKNESS
#10	0.1406	#16	0.0625
#12	0.1094	#18	0.0500
#14	0.0781	#20	0.0375

F. Materials or work described in words which have a well known and acceptable trade meaning shall be held to refer to such accepted meanings.

2.2 MATERIALS

A. Refrigeration Systems:

1. Self-contained:

- a. Whether the units be top-mounted or cabinet-mounted, they shall be started by the K.E.C. and shall be tested for maintenance of temperature.
- b. All units shall be furnished with condensate evaporators.
- 2. Remote: Provide and install complete refrigeration system(s), charged, started, and operating properly, according to the Item Specifications and the following.
 - a. Single stage compressors with air-cooled condensers operating within the recommended range of suction discharge pressure of economical operation and within the required capacity.
 - b. All units shall be new and factory assembled, to operate with the refrigerant specified. Refrigerant R-404 shall be used for all medium and low temperature applications. Due to the unsettled nature of refrigerants, no refrigerant shall be used with a phase-out date of less than ten (10) years from the date of installation.
 - c. Compressors shall be accessible hermetic type, Copeland or approved equal, and shall be equipped with high-low pressure control, liquid line drier, sight glass, suction and discharge vibration eliminator, and head pressure control.
 - d. The system shall have a factory mounted and pre-wired control panel complete with main fused disconnect, compressor circuit breakers, contactors, and time clocks wired for single point power connection.
 - e. The supporting frame shall be constructed of structural steel, fully welded, and protected against rust and corrosion with one (1) coat primer, and two (2) coats paint, unless otherwise specified.
 - f. Systems specified for outdoor installation shall be fully protected in a weatherproofed housing with louvered front panel and hinged top, constructed to resist rust and corrosion, and furnished with low ambient controls. Crankcase heater shall be provided with every compressor.
- 3. Where specifications call for pre-piped lines (i.e., from a fixture to a valve compartment, etc.), provide such work in strict conformance with other sections of the specifications which set forth standards for this type of work or in conformity with the requirements of the Board of Fire Underwriters or ASHRAE Standards, whichever is greater.
- 4. Each refrigeration item specification is written to provide minimum specifications and scope of work. All refrigeration equipment shall be designed and installed to maintain the following general temperatures unless otherwise specified.

<u>TYPE</u>	REFRIGERATORS	FREEZERS
a. Walk-In	+35° F./1.7° C.	-10° F./-23.3° C.
b. Reach-In	+35° F./1.7° C.	-10° F./-23.3° C.
c. Undercounter	+35° F./1.7° C.	-10° F./-23.3° C.
d. Fabricated	+35° F./1.7° C.	-10° F./-23.3° C.
e. Cold Pans	+0° F./-17.8° C.	
f. Work Rooms	+50° F./10° C.	

- 5. Provide (including payment if subcontracted) all electrical and refrigeration components needed by the completed system and complete (or have completed by the respective trades) all connections of and to said components.
- 6. An evaporator coil defrost system shall be provided and installed by the K.E.C. on all refrigeration systems designed to operate at an evaporator coil temperature of less than

 $+35^{\circ}$ F. Evaporator coil units provided without electric defrost feature shall be installed with a solenoid value in the liquid line, controlled by the time clock so as to shut off the flow of refrigerant and allow the compressor to pump down and shut off by activation of the pressure control switch.

- 7. Verify the requirements of and provide any or all additional refrigeration specialty(s) or component(s) required or recommended by the manufacturer for proper operation under the specific operating conditions and location of each system specified.
- 8. Verify and provide manufacturer's certification that the equipment selection hereinafter specified for each refrigeration system is properly sized and shall meet the operating requirements set forth for each system regarding maintaining specified operating temperature, hours of compressor running time, and system pressures and velocities as recommended by the equipment manufacturer(s).
- 9. All refrigeration systems shall be installed and wired in strict conformance with the manufacturer's instructions and recommendations.
- B. Motors and Heating Elements:
 - 1. Motors up to and including 1/2 HP shall be wired for 120 volt, single phase service. Motors larger than 1/2 HP shall be wired for 208 volt, single or three phase service as indicated. 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 sleeve bearings. All motors shall have windings impregnated to resist moisture. Motors located where subject to deposits of dust, lint, or other similar matter shall be of the totally enclosed type. Motors shall have ample power to operate the machines for which designated under full load operating conditions without exceeding their nameplate ratings. Insulation shall be N.E.M.A. Class B or better.
 - 2. Heating elements having a connected load up to and including 1,000 watts shall be wired for 120 or 208 volt, single phase service, or as indicated on the drawings.
 - a. Any heating element larger than 1,000 watts or any combination of elements in one fixture totaling more than 1,000 watts shall be wired for 208 volt single or three phase service, as indicated on the drawings.
 - b. Fixtures having multiple heating elements may be wired for three phase service with the load balanced as equally as possible within the fixture.
- C. Switches and Controls:
 - 1. Provide recognized commercial grade signals, "on-off" pushbuttons or switches, and other speed and temperature controls as required for operation of each item, complete with pilot lights and permanent graphics, conspicuously labeled, to assist the user of each item.
 - 2. Mount switches and controls directly adjacent the piece of equipment for which it involves, on operator's side of counter body apron, out of view to the public.
 - 3. Provide on or for each motor-driven appliance or electrical heating or control unit, a suitable control switch or starter of the proper type and rating and in accordance with Underwriter's Code wherever such equipment is not built in. All other line switches, safety cut-outs, control panels, fuse boxes, other control fittings and connections, when not an integral part of the unit or furnished loose by the manufacturer will be furnished and installed by the Electrical Contractor, unless otherwise specified. All electrical

controls, switches, or devices provided loose for field installation as a part of the item specified shall be installed in the field by the Contractor unless otherwise specified.

- 4. Appliances shall be furnished complete with motors, driving mechanisms, starters, and controllers, including master switches, timers, cut-outs, reversing mechanisms, and other electrical equipment if and as applicable.
- D. Cover Plates:
 - 1. All controls mounted on vertical surfaces of fixtures shall be set into recessed die stamped stainless steel cups, or mounted onto removable cover plates in such a fashion as to not protrude or interfere with the operation of each item.
 - 2. Cover plates shall be furnished and installed for all electrical outlets, receptacles, switches and controls furnished by the K.E.C., and shall match the material and finish of the equipment to which they will be fastened.
- E. Wiring and Conduit:
 - 1. Wiring shall be properly protected in N.E.M.A. and U.L. approved metal enclosures. Only rigid steel conduit shall be used, zinc coated where unexposed and <u>chrome plated</u> where exposed. All wiring shall be run concealed wherever possible.
 - 2. All equipment furnished under this contract shall be so wired, wound, or constructed so as to conform with the electrical characteristics at the job site.
 - 3. Wiring and connection diagrams shall be furnished with electrically operated machines and for all electrically wired fabricated equipment.
 - 4. Furnish all foodservice equipment completely wired internally using wire and conduit suitable for a wet location. Where an Electrician's services are required, the work shall be done in the K.E.C.'s factory or at his expense at the job site at no additional cost to the Owner. Provide all electrical outlets and receptacles required to be mounted on or in fabricated equipment and interconnect to a master circuit breaker panel with all wires neatly tagged showing item number, voltage characteristics, and load information. Final connection shall be made by the Electrical Contractor.
- F. Cords, Plugs, and Receptacles:
 - 1. The Electrical Contractor shall provide three- or four-wire, grounding-type receptacles for all wall and floor mounted outlets to be used for plug-in equipment with characteristics as noted on the drawings. Provide Hubbell three-wire or four-wire grounding-type connectors and neoprene cords installed on each item of plug-in equipment, as indicated on drawings and item specifications.
 - 2. K.E.C. shall coordinate with the Electrical Contractor so that the receptacles provided will match the specific plugs provided as part of the plug-in equipment. Any changes in cords and plugs required in the field due to lack of coordination between the Electrical Contractor and the K.E.C. shall be the latter's responsibility.
 - 3. Reduce the length of all cords furnished with the specified equipment to a suitable or appropriate length so they do not interfere with other equipment or operations.
 - 4. Pedestal receptacles that are part of fabricated equipment exposed to view, shall be similar to T&S Model No. B-1508DD single face, single gang or Model No. B-1528DD single face, double gang.
- G. Water Inlets:

- 1. Water inlets shall be located above the positive water level wherever possible to prevent siphoning of liquids into the water supply system. Wherever conditions shall require a submerged inlet, a suitable type of check valve (except in jurisdictions where check valves are prohibited) and vacuum breaker shall be placed on the fixture to form a part of same to prevent siphoning. Where exposed to view, piping and fittings shall be <u>chromeplated</u>.
- H. Drain Lines:
 - 1. Plumbing Contractor shall provide and install indirect waste lines from equipment which will discharge into floor drains or safe wastes in accordance with Plumbing Rough-In Plans, <u>chrome-plated where exposed</u>. Extend to a point at least 1" (or as required by local codes) above the rim of the floor drain, cut bottom on 45° angle and secure in position.
 - 2. All horizontal piping lines shall be run at the highest possible elevation and not less than 6" above finished floor, through equipment where possible.
 - 3. No exposed piping in or around fixtures or in other conspicuous places shall show tool marks of more than one thread at the fitting.
 - 4. All steam operating valves on or in fabricated and purchased foodservice equipment shall be provided with composition hand wheels, which shall remain reasonably cool in service.
 - 5. Provide suitable pressure regulating valves for all equipment with such components that might reasonably be expected to be affected over a period of time by adverse pressure conditions.
- I. Faucets, Valves and Fittings:
 - 1. All sinks shall be fitted with chromium plated, swing spout faucets of same manufacturer throughout as follows, or otherwise specified in Item Specifications.
 - a. Prep and Utility Sinks:
 - 1.) Splash-Mounted:
 - a.) T&S Brass and Bronze Works, Inc., Model B-231.
 - b.) Fisher Manufacturing Company, Model 3253.
 - 2.) Deck-Mounted:
 - a.) T&S Brass and Bronze Works, Inc., Model B-221.
 - b.) Fisher Manufacturing Company, Model 3313.
 - b. Pot Sinks:
 - 1.) Splash-Mounted:
 - a.) T&S Brass and Bronze Works, Inc., Model B-290.
 - b.) Fisher Manufacturing Company, Model 5214.
 - 2. Pre-Rinse Assemblies:
 - a. Splash-Mounted:
 - 1.) T&S Brass and Bronze Works, Inc., Model B-133 with B-109 wall bracket.
 - 2.) Fisher Manufacturing Company, Model 2210 with 2902-12 wall bracket.
 - b. Deck-Mounted:
 - 1.) T&S Brass and Bronze Works, Inc., Model B-143 with B-510 mixing valve and B-109 wall bracket.
 - 2.) Fisher Manufacturing Company, Model 2810 with 2805-CV mixing valve

and 2902-12 wall bracket.

- 3. Vacuum Breakers:
 - a. General Use:
 - 1.) Fisher Manufacturing Company, Model 3990-8000.
 - b. Disposers:
 - 1.) Splash-Mounted:
 - a.) T&S Brass and Bronze Works, Inc., Model B-455.
 - b.) Fisher Manufacturing Company, Model 3990.
 - 2.) Deck-Mounted:
 - a.) T&S Brass and Bronze Works, Inc., Model B-456.
 - b.) Fisher Manufacturing Company, Model 3991.
- 4. Trough Inlets:
 - a. Fisher Manufacturing Company, Model No. 2905.
- 5. Other specialty faucets, pre-rinse assemblies, vacuum breakers, and trough inlets, as specified under Item Specifications.
- 6. All sink compartments shall be fitted with 2" NPT male, chrome-plated, brass rotary waste valves complete with overflow assemblies and stainless steel strainers.
 - a. Prep and General Utility Sinks:
 - 1.) Fisher Manufacturing Company, Model No. 6100.
 - b. Pot Sinks:
 - 1.) Fisher Manufacturing Company, Model No. 6102.
- 7. Refer to Division 22 for all other fittings.
- J. Metals and Alloys:
 - 1. Stainless steel sheets shall conform to ASTM 240, Type 302, Condition A, 18-8, of U.S. Standard Gauges as previously indicated under paragraph 2.1.E.
 - a. All exposed surfaces shall have a No. 4 finish. A No. 2B finish shall be acceptable on surfaces of equipment not exposed to view.
 - b. All sheets shall be uniform throughout in color, finish, and appearance.
 - c. Rolled shapes shall be of cold rolled type conforming to ASTM A36.
 - 2. Stainless steel tubing and pipe shall be Type 304, 18-8, having a No. 4 finish, and shall conform to either ASTM A213 if seamless or ASTM A249 if welded.
 - 3. Where galvanized metal is specified, it shall be copper-bearing galvanized iron, cold-rolled, stretcher leveled, bonderized, re-rolled to insure a smooth surface, and used in the largest possible sizes with as few joints as necessary.
 - 4. Galvanizing shall be applied to rolled shapes in conformance with ASTM A123, and to sheets in conformance with ASTM A526, coating designation G-90.
- K. Castings:

- 1. Castings shall consist of corrosion resisting metal (white metal) containing not less than 30% nickel. All castings shall be rough ground, polished, and buffed to bright lustre and free from pit marks, runs, checks, burrs, and other imperfections. In lieu of corrosion resisting metal castings, die-stamped or cast 18-8 stainless steel will be acceptable.
- L. Hardware and Casters:
 - 1. All hardware shall be of heavy duty type, satin finished chromium plated brass, cast or forged or highlighted stainless steel of uniform design. All hardware shall be a well known brand, and shall be identified by the manufacturer's name and model number for easy replacement of broken or worn parts.
 - 2. Casters on custom built equipment shall be heavy duty type, ball bearing, solid or disc wheel, with grease-proof rubber, neoprene, or polyurethane tire. Wheel shall be 5" diameter, minimum width of tread 1-3/16", minimum capacity per caster 250 pounds, unless otherwise noted.
 - a. Solid material wheels are to be provided with stainless steel rotating wheel guard.
 - b. All casters shall have sealed wheel and swivel bearings, polished plated finish and be N.S.F. approved.
 - c. All equipment specified with casters shall have a minimum of two (2) with brakes installed on opposite corners, unless otherwise noted.
- M. Locks:
 - 1. When specified, doors and drawers of all custom fabricated or manufactured equipment shall be provided with cylinder locks, disc tumbler type with stainless steel faceplate as manufactured by Standard-Keil Mfg. Co., or approved equal.
 - a. Provide two (2) sets of keys for each lock.
 - b. All locks shall be keyed alike, except at cashiers stations or unless otherwise specified.
- N. Thermometers:
 - 1. All fabricated refrigerated compartments shall be fitted with exterior mounted, adjustable, dial or digital thermometers with flush bezels, and shall be calibrated after installation.
- O. Sealants:
 - 1. Sealant, wherever required, shall conform to ASTM C 920; Type S Grade NS, Class 25, Use Nt, with characteristics that when fully cured and washed meets requirements of Food and Drug Administration Regulation 21 CFR 177.2600 and N.S.F. RTV-732 for use in areas where it comes in contact with food.
 - 2. Dow-Corning #780 or General Electric "Silastic", or approved equal, in either clear or approved color to match surrounding surfaces and applied in accordance with sealant manufacturers recommendations for a smooth, sealed finish.
- P. Millwork:

- 1. All millwork materials shall be free from defects impairing strength, durability, or appearance; straight and free from warpage; and of the best grade for their particular function. All wood shall be well seasoned, kiln dried, and shall have an average moisture content of 8%, a max. of 10% and a min. of 5%.
- 2. Plywood and other woodwork of treatable species, where so required by code, shall be fire-retardant treated to result in a flame spread rating of 25 or less with no evidence of significant progressive combustion when tested for 30 minutes duration under ASTM E84 and shall bear the testing laboratory mark on the surface to be concealed.
- 3. Concealed softwood or hardwood lumber shall be of poplar, douglas fir, basswood, red oak, birch, maple, beech or other stable wood and shall be select or better grade, unselected for color and grain, surfaced four sides, square-edged, and straight. Basswood may be used where fire-retardant materials are required.
- 4. Plywood for transparent finish shall conform to U.S. Product Standard PS-51-71, Type I (fully waterproofed bond), with architectural grade face veneers of species as specified, free of all pin knots, patches, color streaks and spots, sapwood, and other defects. Plywood designated to have plywood cores shall be of either 5 or 7 ply construction. Plywood so designated on the drawings and plywood not otherwise shown shall have a particle board core, cross banding of veneers, and face and back veneers. Particle board cores shall have a 45-pound density, except where the fire retardant treatment requires cores of lesser density.
- 5. Face veneers shall be matched for color and grain to produce balance and continuity of character. Mineral streaks and other discolorations, worm holes, ruptured grain, loose texture, doze, or shake will not be permitted. Face veneer leaves on each surface shall be full-length, book-matched, center-matched, and sequence-matched. Surfaces shall be sequence and blueprint matched. Veneers not otherwise indicated shall be plain sliced. Backing veneers for concealed surfaces shall be of a species and thickness to balance the pull of the face veneers.
- 6. Hardwood plywood for painted surfaces shall conform to U.S. Product Standard PS-51-71, Type I, and shall have sound birch, maple or other approved close grain hardwood faces suitable for a paint finish.
- 7. Perforated hardboard shall be a tempered hardboard, 1/4" thick, conforming to Federal Specification LLL-B-810B, Type I, SIS, Finish B (primed), Design B (perforated), with 1/4" diameter holes spaced on 1" centers both ways.
- 8. Plywood for laminate assemblies shown or specified with plywood core shall be of the 5 or 7 ply construction with sanded close-grain hardwood face and back veneers, laminated with waterproof glue, in thickness shown, conforming to U.S. Product Standard PS-51-71.
- 9. Particle board for plastic laminate assemblies shown or specified with particle board wood core shall conform to U.S. Product Standard CS-236-66, Type 1, or 2, Grade B (45 pound density), class 2: except where fire-retardant treatment is required the density shall conform to the treatment requirements.
- Q. Plastic Laminate:
 - 1. Plastic laminate surfaces shall be laminated with thermosetting decorative sheets of the color, pattern, and style as selected by the Architect.
 - a. Horizontal surfaces shall be laminated with sheets conforming to Federal Specification L-P-508F, Style D, Type I (general purpose), Grade HP, Class 1, 1/16" thick, satin finish, with rough sanded backs.

- b. Vertical surfaces shall be laminated with sheets conforming to Federal Specification L-P-598F, Style D, Type II, (vertical Surface), Grade HP, Class 1, non-forming, satin finish, 1/32" thick or heavier.
- c. Curved surfaces shall be laminated from sheets conforming to Federal Specification L-P-508F, Style D, Type III (post-forming), Grade HP, Class 1, satin finish.
- Balance sheets for backs in concealed locations shall be either reject material of the same type and thickness as the general purpose grade facing or may be .020" thick laminate backing sheets conforming to Federal Specification L-P-00508E, Style ND, Type V (backing sheet), Grade HP.
- 2. Adhesives:
 - a. For application of plastic laminate to wood substrates of horizontal surfaces shall be a phenolic, resorcinol, or melamine adhesive conforming to Federal Specification MMM-A-181C, producing a waterproof bond.
 - b. For applying plastic laminate to vertical surfaces shall be either a waterproof type or a water-resistant type such as a modified urea-formaldehyde resin liquid glue conforming to Federal Specification MMM-A-188C.
 - c. Contact adhesive will not be acceptable.

2.3 FABRICATION AND MANUFACTURE

- A. Materials and Workmanship:
 - 1. Unless otherwise specified or shown on drawings, all materials shall be new, of best quality, perfect, and without flaws. Material shall be delivered and maintained on the job in an undamaged condition.
 - 2. Fabrication shall be equal to the standards of manufacture used by all first class equipment manufacturers, performed by qualified, efficient, and skilled mechanics of the trades involved.
 - 3. All items of standard equipment shall be the latest model at time of delivery.
 - 4. All fabricated work shall be the product of one manufacturer of uniform design and finish.
 - 5. Each fabricated item of equipment shall include all necessary reinforcing, bracing, and welding with the proper number and spacing of uprights and cross members for strength.
 - 6. Wherever standard sheet sizes will permit, the tops of all tables, shelves, exterior panels of cabinet type fixtures, and all doors and drainboards shall be constructed of a single sheet of metal.
 - 7. Except where required to be removable, all flat surfaces shall be secured to vertical and horizontal bracing members by welding or other approved means to eliminate all buckle, warp, rattle, and wobble. All equipment not braced in a rigid manner and which is subject to rattle and wobble shall be unacceptable, and the K.E.C. shall add additional bracing in an approved manner to achieve acceptance.
- B. Sanitary Construction:
 - 1. All fabricated equipment shall be constructed in strict compliance with the standards of the National Sanitation Foundation as outlined in their Bulletin on Food Service

Equipment entitled "Standard No. 2" dated October 1952, and in compliance with the local and State Public Health Regulations in which the installation will occur.

- 2. All fabricated equipment shall bear the N.S.F. "Seal of Approval".
- C. Construction Methods:
 - 1. Welding:
 - a. All welding shall be the heliarc method with welding rod of the same composition as the sheets or parts welded. Welds shall be complete, strong, and ductile with excess metal ground off and joints finished smooth to match adjoining surfaces; free of mechanical imperfections such as gas holes, pits, cracks, etc., and shall be continuously welded so that the fixtures shall appear as one-piece construction. Butt welds made by spot solder and finished by grinding shall not be acceptable.
 - b. Spot welds shall have a maximum spacing of 3". Tack welds shall be of at least 1/4" length, and spaced no greater than 4" from center to center. Weld spacing at the ends of the channel battens shall not exceed 2" centers.
 - c. In no case shall soldering be considered as a replacement for welding, nor shall any soldering operation be done where dependence is placed on stability and strength of the joint.
 - d. Fixtures shall be shop fabricated of one piece and shipped to the job completely assembled wherever possible. Equipment too large to transport or enter the building in one piece shall be constructed so that the field joints can be welded at the job site.
 - e. All exposed joints shall be ground flush with adjoining material and finished to harmonize therewith. Whenever material has been sunk or depressed by welding operation, depression shall be suitably hammered and peened flush with the adjoining surface and ground to eliminate low spots. In all cases the grain of rough grinding shall be removed by successive fine polishing operations.
 - f. All unexposed welded joints on undershelves of tables or counters of stainless steel shall be suitably coated at the factory with an approved metallic-based paint.
 - g. After galvanized steel members have been welded, all welds and areas where galvanizing has been damaged shall have a zinc dust coating applied in conformance with Military Specification Number MIL-P-26915.
 - 2. Joints:
 - a. Butt joints and contact joints, wherever they occur, shall be close fitting and shall not require a filler. Wherever break bends occur, they shall be free of undue extrudence 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, and irregular projections and shall be finished to obviate all danger of laceration when the hand is drawn over them. In no case shall overlapping materials be acceptable where miters or bullnosed edges occur.
 - b. Field welded joints shall be ground smooth without dips and irregularities and finished to match original finish.
 - 3. Bolt, Screw and Rivet Construction:

- a. All exposed surfaces shall be free from bolt and screw heads. When bolts are required, they shall be of the concealed type and be of similar composition as the metal to which they are applied.
- b. Where bolt or screw threads on the interior of fixtures are visible or may come into contact with hands or wiping cloths, they shall be capped with a stainless steel or chrome acorn nut and stainless steel lock washer.
- c. If rivets are used to fasten rear paneling to the body of the fixture, such rivets shall be stainless steel. In no case shall iron rivets be used.
- 4. Sound Deadening:
 - a. Schnee Butyl-Sealant 1/2" wide rope continuously between all frame members and underside of stainless steel table tops, overshelves and undershelves.
 - b. Tighten stud bolts for maximum compression of sealant.
- 5. Hi-Liting:
 - a. All horizontal edges of stainless steel tops, splashes, tops of raised rolled rims, and edges of all exposed doors, handles and shelf edges shall be hi-lited, in uniform design by grinding with abrasive not coarser than #240 grit, then polishing with compound to a uniform mirror finish.
- 6. Polishing:
 - a. The grain of polishing shall run in the same direction on all horizontal and on all vertical surfaces of each item of fabricated equipment except in the case where the finish of the horizontal sections of each shall terminate in a mitered edge.
 - b. Where sinks and adjacent drainboards are equipped with backsplash, the grain of the polishing shall be consistent in direction throughout the length of the backsplash and sink compartment.
- 7. Finishes:
 - a. Paint and coatings shall be of an N.S.F. approved type suitable for use in conjunction with foodservice equipment. Such paint or coating shall be durable, non-toxic, non-dusting, non-flaking and mildew resistant, shall comply with all governing regulations, and shall be applied in accordance with the manufacturers recommendations.
 - b. All exterior, galvanized parts, exposed members of framework, and wrought steel pipe where specified to be painted shall be cleaned, primed with rust inhibiting primer, de-greased, and finished with two (2) coats of glossy enamel grey hammertone paint, unless otherwise noted.
 - c. Where baked enamel finishes are specified, they shall be oven baked on the fixtures for a minimum of 1-1/2 hours at a minimum temperature of 300 Fahrenheit.
 - d. Fabricated equipment shall be spray coated with plastic suitable for protecting the equipment during transport and installation. The coating shall be easily removable after the equipment installation is complete at the job site, and final clean-up has begun.

D. Construction:

- 1. Legs:
 - a. All tubular stands for open base tables, sinks, or dishtables shall have legs constructed of 1-5/8" O.D. stainless steel tubing, with 1-1/4" O.D., #16 gauge stainless steel crossbracing running between legs at a point 10" above finished floor.
 - b. All joints between legs and crossbracing shall be welded and ground smooth, full 360° .
 - c. The top end of legs shall be closely fitted into fully-enclosed stainless steel conical gussets no less than 3" high, similar to Klein #481-58 or #483-58, or approved equal.
 - d. Gussets shall be fully welded to framing reinforcing members, so that, set screw is not visible from front.
 - e. Legs without crossrails will not be accepted.
 - f. Legs shall be spaced at not more than 5'-6" on centers, unless otherwise specified.
- 2. Feet:
 - a. All tubular legs will be swedged for appearance and close fit to United Show Case #BF-158, or approved equal, fully enclosed, stainless steel bullet-shaped foot.
 - 1.) The foot shall be threaded into a collar and completely welded inside the tubular leg to permit a maximum adjustment of 2" without any thread exposure.
 - 2.) Threads shall be National Course Series Class 2 fit or better, machined to prevent end play when foot is at maximum adjustment.
 - 3.) The bullet-shaped foot shall have slightly rounded bottom to protect the floor, and a minimum bearing surface of 3/4" diameter of stainless steel-to-floor contact.
 - 4.) Bottom of tubular leg shall be finished off smoothly to provide a sanitary fitting and prevent the accumulation of grease or other debris.
 - b. Cabinet type fixtures shall be mounted on 8" high die-stamped, sanitary, two-piece stainless steel legs no less than 3" in diameter at the top, United Show Case #CM-68B, or approved equal.
 - 1.) The bottom fully enclosed, stainless steel, bullet-shaped foot threads up into the inside of the upper member, with a male threaded 5/8" bushing to permit maximum adjustment of 2" without thread exposure.
 - 2.) The upper section shall be stamped in a neat design with a flared inverted shoulder and fully welded to a base plate designed for anchoring to the channel underbracing.
- 3. Table Tops:
 - a. Tables shall be constructed of stainless steel, and of a thickness not less than #14 gauge with 1-3/4" by 120° rolled edges, or as otherwise specified and detailed.
 - b. All corners shall be bull-nosed and of the same radius as rolled edges.
 - c. Joints where required shall be butt-welded and ground smooth to present a uniform one-piece appearance.

- d. All tops shall be reinforced on the underside with a fully welded framework of 1-1/2"x1-1/2"x1/8" galvanized steel angles with the framing extending around the top perimeter and crossbraced on 24" maximum centers.
- e. 1"x4"x1" galvanized or stainless steel, fully welded, cross channel, closed end members placed at each pair of legs with one (1) channel running lengthwise will also be acceptable.
- f. All tops shall be reinforced so that there will be no noticeable deflection.
- g. Metal tops where adjacent to walls or other items of equipment, shall be constructed with integral, coved, back and/or endsplashes as required and specified in accordance with the standard details contained herein. Close all ends of splashes.
- 4. Enclosed Bases:
 - a. All enclosed bases or cabinet bodies shall be of seamless #18 gauge stainless steel construction, enclosed on the ends and sides as required and called for under each item.
 - b. Ends of body shall terminate at front or operator's side in a 2" wide mullion, vertical, and completely enclosed. All intermediate mullions shall be completely enclosed.
 - c. The bases shall be reinforced at the top with a framework of 1-1/2"x1-1/2"x1/8" galvanized angles, with all corners mitered and welded solid.
 - d. Underside of top shall be reinforced with channels and gussets where necessary. Additional angles and cross members shall be provided to reinforce shelves and support tops under heavy tabletop equipment.
 - e. Where sinks or other drop-in equipment occur, provide additional reinforcing extending crosswise, both sides of opening.
 - f. In the case of fixtures fitting against or between walls, the bodies shall be set in 1" or 2" from the wall line, with the tops continuing to the wall line with integral, coved splashes as specified. Extend vertical face of body to the wall line only. This will permit adjustment to wall irregularities. Vertical trim strips will not be accepted.
 - g. Bodies shall be fitted with counter style stainless steel legs as hereinbefore specified.
- 5. Drawers:
 - a. Drawers, where specified, shall have removable pan inserts of #18 gauge stainless steel, and shall be approximately 20"x20"x5" deep unless otherwise specified.
 - 1.) Perimeter top edge shall be flanged out 1/2".
 - 2.) All interior horizontal corners shall be rounded on a 1" radius, and all interior vertical corners shall be rounded on a 2" radius.
 - b. Fronts shall be double pan #16 gauge stainless steel construction, 1" thick, insulated with a semi-rigid, fiberglass board, un-faced, having a three-pound density.
 - 1.) The top of the drawer face shall be formed as an integral pull by breaking the front pan back on a 45° angle 1", then straight up 1", back to front 1", and then down at the front 3/4".
 - 2.) Drawer front shall have all edges and corners ground smooth with a radius edge pull.

- 3.) Provide hard rubber button bumpers attached to rear of drawer face at each corner.
- c. The drawer shall have an all welded frame of 1"x1", #16 gauge stainless steel angles sized to fit the removable pan insert.
- d. Drawers shall operate on #14 gauge full-extension slides with stainless steel roller bearings with hardened and ground raceways, Component Hardware, S52 Series, or approved equal. Slides shall be pitched approximately 3/8" per foot to permit self closing action.
- e. Drawers shall be adequately and neatly fitted to the guides to permit easy operation without rattle or binding.
- f. Slides and frame shall be reinforced to support a dead weight of 150 pounds when drawer is fully extended.
- g. Adjustable stops shall be provided for each drawer at the fully-opened position, and be readily liftable by hand for easy removal of drawer.
- h. All drawers not mounted inside a cabinet body shall be completely enclosed in an #18 gauge stainless steel box-type enclosure and suspended from angle framing under the fixture top. The housing bottom shall be flanged and welded to an #18 gauge stainless steel reinforcing channel extending across the open end.
- 6. Sliding Doors:
 - a. Sliding doors shall be of the double pan type, with the exterior pan constructed of #18 gauge stainless steel with all four sides channeled and corners welded. The interior pan shall be similarly constructed of #20 gauge stainless steel, set into the exterior pan, and welded in place.
 - b. All doors shall be insulated with semi-rigid fiberglass board, un-faced, having a three-pound density. Styrofoam shall not be acceptable.
 - c. Doors 18" wide or greater, shall have internally welded 4" wide reinforcing channels to prevent warpage.
 - d. Each door shall be fitted with a positive flush-type stainless steel pull, Standard-Kiel #1262-1014-1283 recessed handle, or approved equal.
 - e. In the back of each door install a 1"x1", #16 gauge stainless steel angle stop welded in a suitable location to prevent the doors from overpassing the flush pulls.
 - f. Doors in the closed position shall overlap each other by no more than 2".
 - g. Each door shall be fitted with two (2), 1-3/8" ball bearing sheaves fastened to 1"x1/8" stainless steel bar stock welded to the top corners of each door for suspending on an overhead #16 gauge stainless steel channel track. The hangers shall be tapped for 1/4"-20 thumb screw vertical locks which prevent the doors from jumping the track in operation while permitting easy removal for cleaning without tools.
 - h. Insure that the bottom of the doors are positively and continuously guided to assure proper alignment and passing regardless of the position of each door.
 - i. Provide hard rubber bumpers for doors to close against to insure quiet operation.
- 7. Hinged Doors:
 - a. Hinged doors shall be of the same materials and construction as sliding doors previously specified.

- b. Hinges shall be heavy duty, stainless steel, removable type, and fastened by tapping into 1/4"x3/4" stainless steel bar stock inside the door pan and behind the door jamb.
- c. The door face shall be flush with the cabinet body when fully closed.
- d. Size widths of doors equally when installed in pairs, or in series with other pairs, with no door being greater than 36" in width.
- e. Doors shall be held closed by permanent magnetic closure devices of an approved type and of sufficient strength to hold the doors shut. Install two (2) per door (minimum), mounted to the door jamb, top and bottom, with opposing chrome-plated steel plates securely fastened to the inner panel of the doors.
- 8. Undershelves:
 - a. All open base tables shall be provided with full-length undershelves of #16 gauge stainless steel fully welded to legs with all joints ground smooth and polished.
 - b. Front edge shall turn down 1-1/2" and under 1/2".
 - c. Turn up rear and ends 2", with integral coved radius, when specified.
 - d. If required by width, provide 1-1/2"x1-1/2"x1/8" galvanized angle bracing mounted to underside, full length.
- 9. Interior Shelves:
 - a. All interior shelves within cabinet bodies, enclosed bases and overhead cabinets, shall be of #16 gauge stainless steel.
 - b. Removable shelves shall be constructed in equal sections, and rest in 1-1/2"x1-1/2"x1/8" stainless steel angle frame. Cove all horizontal corners in accordance with N.S.F. requirements.
 - c. Stationary shelves shall have 2" turn-up on back and ends, and continuously welded to cabinet body, polished and ground smooth to form a one-piece interior free of any crevices.
 - d. Front edge shall turn down 1-1/2" and under 1/2", and finished with "z" bar forming completely enclosed edge for maximum strength and sanitation.
 - e. Provide 1-1/2"x1-1/2"x1/8" angle bracing mounted to underside, full length.
- 10. Elevated Shelves:
 - a. Shelves over equipment not adjacent to a wall shall be mounted on 1" diameter #16 gauge stainless steel tubular standards neatly fitted with stainless steel base flanges, unless otherwise specified.
 - b. The top of the tubular standards shall be completely welded to #14 gauge stainless steel support channels, full width of overshelf.
 - c. Inside the tubular standard, and welded to same, provide 1/2" diameter steel tension rod extended through countertop and securely anchored to lower framework reinforcing with nuts and lock washers in such a manner as to assure a stable, sway-free structure.
 - d. If required by width, provide 1-1/2"x1-1/2"x1/8" stainless steel angle bracing mounted to underside, full length.
 - e. Cantilevered shelves, when called for, shall be #16 gauge stainless steel supported on #14 gauge stainless steel brackets welded to 1-5/8" O.D. stainless steel tubular standards extending through the backsplash, and fully welded to the table

framework. Provide Klein #481-SH welded sleeves where standards penetrate backsplash.

- 11. Wall Shelves:
 - a. Open wall shelves shall be constructed of #16 gauge stainless steel with back and ends turned up 2", positioned 2" out from face of wall, with all corners welded, and supported on #14 gauge stainless steel brackets.
 - b. Brackets shall be flanged inward beneath the shelf and at the wall 1-1/2" with intersecting flanges completely welded, and attached to shelf with studs welded to the underside and bolted with stainless steel lock washers and chrome-plated cap nuts.
 - c. Each bracket shall be fastened to the wall with a minimum of two (2) 1/4"-20 stainless steel bolts anchored securely by means of toggles or expansion shields.
- 12. Sinks:
 - a. All sinks shall be the size and shape as shown on drawings, and constructed of #14 gauge stainless steel with backs, bottoms and fronts formed of one continuous sheet and the ends welded in place.
 - b. Sinks shall have all corners, both vertical and horizontal, coved on a 3/4" radius electrically welded, ground smooth and polished. Solder in filleted corners will not be acceptable.
 - c. Multiple compartment sinks shall be divided with double wall, #14 gauge stainless steel partitions with a 1/2" radius on top and all corners rounded as other corners, continuously welded, ground smooth and polished.
 - d. The bottom of each compartment shall be creased to a die stamped recess, tapered and shaped to receive a lever type waste without the use of solder, rivets, or welding.
 - e. Provide #14 gauge stainless steel waste lever angle bracket mounted to underside of compartment at front.
 - f. The front and exposed ends of sinks shall be fabricated with a 1-1/2", 180° rolled edge. The back and ends adjacent to walls or other fixtures shall be turned up with integral coved edge 12" high and returned 2-1/2" at the top on a 45° angle. Cap ends of all exposed splashes.
 - g. Unless otherwise specified, two (2) faucet holes on 8" centers shall be provided, located over the center line of partitions between compartments, 2-1/2" down from splash break.
 - h. Gussets for legs shall be fully welded all around to #12 gauge stainless steel triangular plates fully welded to underside of sink.
 - i. Sinks fabricated into working surfaces shall be constructed of the same material and in like manner to sinks specified above, except rolled edge and backsplash shall be omitted and the bowl shall be completely welded integral and flush with the working surface. Where basket type wastes are called for, they shall be fitted with removable seats.
 - j. Where sink bowls are exposed, the exterior shall also be polished to a #4 finish.
- 13. Sink Drainboards:

- a. Drainboards shall be constructed of the same material as the sinks and shall be welded integral to same.
- b. The front portion of drainboards shall continue the 1-1/2", 180° rolled edge of sink bowls on a continuous and level horizontal plane.
- c. The surface of the drainboard shall pitch from 2-1/2" at the end furthest from the sink, to 3" at the bowl; or 1/8" per foot. In addition, the bottom surface shall be dished toward the center for complete drainage.
- d. The backsplash of the drainboard shall match the rear of the sink contour and shall be welded integral thereto, running parallel to the floor.
- e. Drainboards shall be reinforced on the underside with a framework of 1"x4"x1" stainless steel channel underbracing placed at each pair of legs, with exposed ends capped, and one (1) channel running lengthwise.
- f. Where disposer cones are fabricated into drainboards, additional 1"x4"x1" stainless steel channels shall be welded into the top framing, spanning the drainboard from front-to-back on both sides of the cone and located not more than 3" to either side.
- g. Disposer control panels or switches shall be supported beneath drainboards, when specified, by means of a #12 gauge stainless steel mounting bracket.
- 14. Dishtable Tops:
 - a. Dishtables shall be constructed of #14 gauge stainless steel with all corners, both vertical and horizontal, coved on a 3/4" radius electrically welded, ground smooth and polished. Solder in filleted corners will not be acceptable.
 - b. Fronts and exposed ends shall be fabricated with a 3" high, 1-1/2", 180° rolled edge with rounded corners. The back and ends adjacent to walls or other fixtures shall be turned up with integral coved edge 12" high and returned 2-1/2" at the top on a 45° angle. Cap ends of all exposed splashes.
 - c. All tops shall slope 1/8" per foot (minimum).
 - d. Dishtables shall be reinforced on the underside with a framework of 1"x4"x1" stainless steel channel underbracing placed at each pair of legs, with exposed ends capped, and one (1) channel running lengthwise fully welded between front-to-back channels.
 - e. Where tops fit into dishmachines, they shall turn down and into, forming a sealed watertight fit, and attached according to dishmachine manufacturers instructions.
 - f. On each side of dishmachine, tables shall be provided with integral splash shields as part of the backsplash.
 - g. Silicon filling of gaps caused by poor fit will not be acceptable.
 - h. On corner-type door machines, provide #14 gauge stainless steel wall-mounted, splash panel to protect adjacent wall, full width of door opening.
- 15. Cafeteria Style Counters:
 - a. All counters shall be constructed as previously specified under Enclosed Bases.
 - b. Provide top and bottom framing for each counter food pan, cold pan, coffee urn, ice cream unit, ice bin, dish dispenser, etc., whether a drop-in unit or a cutout for a portable unit.
 - c. Where plate shelves occur, frame horizontally 8-1/2" back from counter edge or as design dictates, and at bottom of shelf at counteredge.
 - d. The countertop shall be constructed of #14 gauge stainless steel, as previously specified, with all joints welded, ground and polished.

- e. Fronts and exposed ends shall be stainless steel, plastic laminate or other material as noted in the Item Specifications.
- f. All display glass shelving shall be 1/4" polished plate glass and fully trimmed with #18 gauge stainless steel formed channels. Top shelves shall be the same width as the shelf below. Shelves shall be supported on 5/8" square, #16 gauge stainless steel perimeter tubing fully welded to 1-1/4" square, #16 gauge stainless steel tubing uprights.
- g. Provide appropriate adjustable glass sneeze or breath guards trimmed in stainless steel along front, entire length, mounted in Klein 4465-A brackets.
- h. Protector shelf over hot food wells shall be #16 gauge stainless steel supported on 1-1/4" square, #16 gauge stainless steel tubing uprights, with 1/4" polished plate glass front and end panels trimmed in #18 gauge stainless steel channels. When specified for self-service, mount bottom edge of front panel 8" above countertop.
- i. All display and protector shelves shall be furnished with full-length fluorescent lights wired to on/off switch in counter apron, with lamps and protective shields. Conceal all wiring in tubular uprights.
- j. Refer to Item Specification for changes, as required.
- k. Counter shall be internally wired complete by the K.E.C., and in such a way as to meet the requirements of the Electrical Code of the job location.

2.4 EQUIPMENT

- A. All items listed on the Contract Documents under the heading "Equipment Schedule" shall be furnished in strict accordance with the foregoing specifications and with the following detailed Itemized Specifications.
- B. Manufacturer's names and model numbers are shown establishing quality, size, and finish required, representing the Owner's and Consultant's requirements and basis for bid. Equipment is listed hereinafter with same item numbers as shown on Contract Documents.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Before beginning the installation of foodservice equipment, the spaces and existing conditions shall be examined by the K.E.C. and any deficiencies, discrepancies, or unsatisfactory conditions for proper installation of foodservice equipment shall be reported to the Architect in writing.
 - 1. Do not proceed with installation until unsatisfactory conditions have been corrected in a manner satisfactory to the installer.
 - 2. Beginning installation shall constitute acceptance of the area.

3.2 PREPARATION

- A. Foodservice equipment drawings are diagrammatic and intended to show layout, arrangement, mechanical and electrical requirements.
- B. Field verify all measurements at the building prior to fabrication of custom equipment. Coordinate measurements and dimensions with rough-in and space requirements.

3.3 INSTALLATION

- A. The K.E.C. shall coordinate his delivery schedule with the Contractor to ensure adequate openings in the building to receive the equipment.
- B. Equipment shall be uncrated, fully assembled and set level in position for final connections. Parts shipped loose but required for connection shall be properly tagged and shall be accompanied by the necessary installation instructions.
- C. Provide a competent, experienced foreman to supervise installation and final connections with other trades.
- D. Remote Refrigeration Systems:
 - 1. All refrigeration work where applicable to this contract shall be accomplished in an approved manner, using finest quality fittings, controls, valves, etc.
 - 2. Refrigeration items shall be started up, tested, adjusted, and turned over to the Owner in first class condition and left running in accordance with the manufacturer's instructions.
 - 3. Refrigeration lines and hook-ups shall be completed by the K.E.C. with the exception of electric, water, and drain line final connections unless otherwise specified.
 - 4. All copper tubing shall be refrigerant grade A.C.R. or type "L".
 - 5. Silver solder and/or Sole-Phase shall be used for all refrigerant piping. Soft solder is not acceptable.
 - 6. All refrigerant lines in pipe sleeves or conduit shall be effectively caulked at ends to prevent entrance of water or vermin and at penetrations through walls or floors.
 - 7. All tubing shall be securely anchored with clamps, and suspended lines shall be supported with adjustable hangers at 6'-0" o.c. maximum.
 - 8. Wrap drain line in freezer compartment(s) with approved heat-tape for final connection by Electrical Contractor.
- E. Sealing and Caulking:
 - 1. Prior to the application of sealant, all surfaces shall be thoroughly cleaned and degreased.
 - 2. Apply around each unit of permanent installation at all intersections with walls, floors, curbs or other permanent items of equipment.
 - 3. Joints shall be air-tight, water-tight, vermin-proof, and sanitary for cleaning purposes.
 - 4. In general, joints shall be not less than 1/8" wide, with backer rod to shape sealant bead properly at 1/4" depth. Shape exposed surfaces of sealant slightly concave, with edges flush with faces of materials at joint.
 - 5. At internal corner joints, apply sealant or gaskets to form a sanitary cove, of not less than 3/8" radius.

- 6. Provide sealant-filled joints up to 3/4" in joint width. Trim strips for wider joints shall be set in a bed of sealant and attached with stainless steel fasteners, 48" o.c., or less, to insure suitable fastening and prevent buckling of the metals fastened.
- F. Cutting:
 - 1. All cutting, fitting, or patching required during installation shall be accomplished by the K.E.C., at his own expense, so as to make the work conform to the plans and specifications.
 - 2. The K.E.C. shall not cut or otherwise alter, except with the consent of the Owner, the work of any other Contractor.
 - 3. Provide cut-outs in foodservice equipment where required to run plumbing, electric, or steam lines through equipment items for final connections.

3.4 FIELD QUALITY CONTROL

- A. Inspection:
 - 1. Provide access to shop fabrication areas during normal working hours to facilitate inspection of the equipment, during construction, by the Architect or his authorized representative.
 - 2. Errors found during these inspections shall be corrected to the extent required within the scope of the plans, specifications, and approved drawings.
- B. Start-Up and Testing:
 - 1. Delay start-up of foodservice equipment until service lines have been tested, balanced, and adjusted for pressure, voltage, and similar considerations; and until water and steam lines have been cleaned and treated for sanitation.
 - 2. Before testing, lubricate each equipment item in accordance with manufacturer's recommendations.
 - 3. Supply a trained person or persons who shall start up all equipment, test and make adjustments as necessary, resulting in each item of equipment, including controls and safety devices, performing in accordance with the manufacturer's specifications.
 - 4. All gas-fired equipment shall be checked by the local gas company as to calibration, air adjustments, etc., and adjustments made as required.
 - 5. Repair or replace any equipment found to be defective in its operation, including items which are below capacity or operating with excessive noise or vibration.
- C. Demonstration:
 - 1. Provide an operating demonstration of all equipment at a time of Owner's convenience, to be held in the presence of authorized representatives of the Architect and Owner.
 - 2. Demonstration shall be performed by manufacturer's representative knowledgeable in all aspects of his equipment.
 - 3. During the demonstration, instruct the Owner's operating personnel in the proper operation and maintenance of the equipment.

4. Furnish complete, bound, operation/maintenance manuals and certificates of warranty for all items of equipment provided, in accordance with Article 1.5 Submittals, Paragraph F, at this demonstration time.

3.5 ADJUST AND CLEAN

- A. Upon completion of installation and tests, clean and sanitize foodservice equipment, and leave in condition ready for use in food service.
- B. Remove all protective coverings, and thoroughly clean equipment both internally and externally.
- C. Make and check final adjustments required for proper operation of the equipment.
- D. Restore finishes marred during installation to remove abrasions, dents, and other damages. Polish stainless steel surfaces, and touch-up painted surfaces with original paint.
- E. Clean up all refuse, rubbish, scrap materials, and debris caused by the work of this Section, and put the site in a neat, orderly, and broom-clean condition.

3.6 ITEMIZED EQUIPMENT

ITEM #1: MOP SINK & RACK

One (1)
IMC Teddy Foodservice Equipment
FS (N058)
Floor Mounted
1/2" HW, 1/2" CW, 4" W
None

Furnish and set-in-place per Equipment Plan, Sheet K101; Manufacturer's Instructions and the following:

- 1. Accessories:
 - -- One (1) #HA hose assembly, 36" long.
 - -- One (1) #SSF service sink wall faucet.
 - -- One (1) #MH mop holder with four (4) individual rubber holders.
- 2. Furnish 16 gauge stainless steel flashing along two (2) walls adjacent sink, 36" high. Attach to wall with non-exposed fasteners and seal to wall and sink.

ITEM #2: WALK-IN COOLER/FREEZER

QUANTITY:	One (1)
MANUFACTURER:	Master-Bilt
MODEL NO.:	Indoor Installation (N058)
PERTINENT DATA:	4" Foamed-In-Place Urethane Panels - Class I, NSF Construction
UTILITIES REQ'D:	1500W, 120V, 1PH; 3/4" IW
ALTERNATE MFRS.:	Bally; Thermo-Kool

Furnish and install per Equipment Plan, Sheet K101; Building Conditions Plan, Sheet K102; Manufacturer's Shop Drawing and the following:

- 1. Two Section Unit; 18'-11" L x 18'-0" D x 8'-6" H. Interior width: Freezer 8'-3" wide; Cooler 9'-8" wide.
- 2. Exterior Finish:
 - -- 26 GA stucco embossed galvanized where unexposed.
 - -- 22 GA stucco embossed stainless steel where exposed.
- 3. Interior Finish:
 - -- White .040 stucco embossed aluminum walls.
 - -- White acrylic enamel baked-on 26 GA smooth galvanized steel ceiling.
- 4. Interior Floor:
 - -- 4" prefabricated heavy-duty structural floor panels with foamed-in ³/₄" plywood reinforcing installed over hot asphalt paper or 10 MIL polyethylene sheets on building floor slab. Provide interior ramp with matching finish at each entrance door.
 - -- Altro Atlas 30 sheet vinyl flooring applied throughout interior with integral 10" high perimeter coved base and rigid edge top trim. Application performed by factory authorized installer.
- 5. Entrance Door:
 - -- Two (2) flush-mounted, self-closing, right-hand hinged doors with 34"x76" net opening.
 - -- Brushed chrome camlift hinges with lift-off capability. Provide one (1) extra hinge per door, three (3) total.
 - -- Kason #1236 brushed chrome lever-action handle with knob-turn release and cylinder lock, each door.
 - -- Kason #09440004 brushed chrome dead-bolt lock, factory mounted.
 - -- Kason #109400003 hydraulic door closer.
 - -- Standard 2" diameter dial thermometer factory mounted in door frame.
 - -- Pilot light and switch assembly factory mounted in door frame with stainless steel coverplate.
 - -- 36" high aluminum diamond tread kickplates, interior and exterior, of door, frame and jambs.
 - -- 14" x 24" heated observation windows, both doors.
 - -- Kason #907 interior door handle, factory mounted with concealed metal backing plate.
 - -- Round vinyl door bumper mounted to front exterior face to protect handle from puncturing wall when door in full open position.
 - -- Stainless steel heated threshold at each entrance door.
 - -- Cool Curtain Clear-Vu Model #SS3678 vinyl swinging curtains factory installed at each entrance door.

ITEM #2: (Continued)

- -- Kason #1806 LED light fixture with high-impact plastic globe factory mounted centered above door opening. Conceal conduit within header of door frame and extend to junction box mounted on top of door panel.
- -- Engraved phenolic plastic compartment sign 12" long x 2" high; white in color with 1" high blue CAPITAL letters mounted on door above observation window; (1) FREEZER, (1) COOLER.
- 6. Heated pressure relief port in freezer compartment.
- 7. Four (4) Kason #1810L21248LB 48" long twin-tube LED light fixtures with shatter-proof high impact plastic covers centrally-mounted to walk-in ceiling per Detail, Sheet K104; two (2) for the freezer, two (2) for the cooler. Extend conduit connection up thru top. Provide low-temperature ballast (-20° F.) for freezer lights. Fixtures shipped loose and mounted by K.E.C.; final connection by Electrical Contractor.
- 8. #MBWA-1 flush-mount digital thermometer with audio-visual temperature alarm and light management system factory mounted in door frames for both cooler and freezer compartments.
- 9. Provide and install trim strips of matching exterior finish between ends of walk-in panels and building walls from floor to finished ceiling. K.E.C. to verify ceiling height.
- 10. Provide and install closure panels of matching exterior finish between top of walk-in and finished ceiling. K.E.C. to verify ceiling height.
- 11. All electrical conduit shall be run concealed <u>above</u> walk-in ceiling per Detail, Sheet K104.
- 12. Evaporator coil drain lines shall be run to floor drain with P-trap on exterior of box by K.E.C.
- 13. Black flexible "Armaflex" insulation applied to exposed drain lines and fittings within interior of box by K.E.C.
- 14. Spiral heat tape applied to drain line within interior of freezer compartment prior to application of insulation by K.E.C.. Drain line heating cable shall be installed for continuous 24-hour operation.
- 15. Coordinate location of sprinkler head drops and provide penetrations, where necessary.
- 16. Seal and insulate all openings to prevent infiltration of warm air into cooler/freezer compartments.
- 17. Quality Inspection Requirement:
 - -- Walk-In shall be completely erected at the manufacturer's facility prior to shipment and a quality control inspection performed on the assembled structure. A digital photograph of factory assembled walk-in shall be provided for the K.E.C. permanent records and included in the operation and maintenance manuals.

ITEM #3: COOLER REFRIGERATION SYSTEM

QUANTITY:	One (1)
MANUFACTURER:	Master-Bilt
MODEL NO.:	MHHZ0171C (N058)
PERTINENT DATA:	M-Series, Air Cooled, Outdoor Installation, Remote, Master Controller Re-
	verse Cycle Defrost System With Web2 Walk-In Software
UTILITIES REQ'D:	20.0A, 208V, 3PH
ALTERNATE MFR.:	ColdZone; Bally

Furnish and install per Equipment Plan, Sheet K101; Manufacturer's Shop Drawing and the following:

- 1. Condensing Unit: Factory Pre-Assembled, Hermetic, Medium Temperature, R-404A.
- 2. Mounted on building roof above walk-in cooler on roof curb. Curb with pitch-pocket furnished and installed by General Contractor. Refer to mechanical roof plan for exact location.
- 3. Complete winterization package and condensing unit weatherproof cover.
- 4. Overall size: 38" L x 27" W x 18" H.
- 5. Weight: 360 lbs.
- 6. Evaporator Coil with High-Efficiency EC Motors: Low-Profile, End-Mount Type, Model E1HZ0130A; 1.8A, 120V, 1PH
 - -- System to operate at $+35^{\circ}$ F.
 - -- Furnished complete with Master Controller Reverse Cycle Hot Gas Defrost System with Web2Walk-In software including self-diagnostics, smart defrost and floating head pressure.
 - -- Furnish Cat5 cable and interwire to building monitoring system by Electrical Contractor.
- 7. Complete refrigeration system warrantee: five (5) years for the compressor, Two (2) years for the condensing unit, and Two (2) years for all parts of the evaporator coil.
- 8. Factory installed main-fused disconnect switch.

ITEM #4: FREEZER REFRIGERATION SYSTEM

QUANTITY:	One (1)
MANUFACTURER:	Master-Bilt
MODEL NO.:	MHLZ0121C (N058)
PERTINENT DATA:	M-Series, Air Cooled, Outdoor Installation, Remote, Master Controller With
	Reverse Cycle Defrost Option
UTILITIES REQ'D:	21.0A, 208V, 3PH
ALTERNATE MFR.:	ColdZone; Bally

Furnish and install per Equipment Plan, Sheet K101; Manufacturer's Shop Drawing and the following:

1. Condensing Unit: Factory Pre-Assembled, Hermetic, Low Temperature, R-404A.

ITEM #4: (Continued)

- 2. Mounted on building roof above walk-in cooler on roof curb. Curb with pitch-pocket furnished and installed by General Contractor. Refer to mechanical roof plan for exact location.
- 3. Complete winterization package and condensing unit weatherproof cover.
- 4. Overall size: 38" L x 27" W x 18" H.
- 5. Weight: 260 lbs.
- 6. Evaporator Coil with High-Efficiency EC Motors: Low-Profile, End-Mount Type, Model E1LZ0120B, 1.4A, 208V, 1PH (Fan); 13.0A, 208V, 1PH (Defrost Heater)
 - -- System to operate at -10° F.
 - -- Furnished complete with Master Controller Reverse Cycle Hot Gas Defrost System with Web2Walk-In software including self-diagnostics, smart defrost and floating head pressure.
 - -- Furnish Cat5 cable and interwire to building monitoring system by Electrical Contractor, as required.
- 7. Complete refrigeration system warrantee: five (5) years for the compressor, Two (2) years for the condensing unit, and Two (2) years for all parts of the evaporator coil.
- 8. Factory installed main-fused disconnect switch.

ITEM #5: UTILITY CART, MOBILE

QUANTITY:Three (3)MANUFACTURER:Lakeside Manufacturing Company, Inc.MODEL NO.:544 (N058)PERTINENT DATA:700-lb. Capacity, Three-Shelf, NSF ModelUTILITIES REQ'D:----ALTERNATE MFRS.:Eagle Group

Furnish and set-in-place per Equipment Plan, Sheet K101; Manufacturer's Instructions and the following:

1. All four (4) casters swivel-type.

ITEM #6: SHELVING, MOBILE

QUANTITY:	Nineteen (19)
MANUFACTURER:	Eagle Group
MODEL NO.:	QuadPLUS (N058)
PERTINENT DATA:	Four-Tier High, Open-Grid Shelf Mat, Polymer
UTILITIES REQ'D:	
ALTERNATE MFRS.:	InterMetro Industries Corporation

ITEM #6: (Continued)

Furnish and set-in-place per Equipment Plan, Sheet K101, Manufacturer's Instructions and the following:

Cooler:

- 1. Two (2) #QPF-1836E-GS sections; 18" W x 36" L x 4-tier high.
- 2. Six (6) #QPF-1848E-GS sections; 18" W x 48" L x 4-tier high.
- 3. Two (2) #QPF-1854E-GS sections; 18" W x 54" L x 4-tier high.
- 4. Forty (40) #C963-E posts for stem casters, 63" high.
- 5. Twenty (20) #CSS5P-300 polyurethane swivel casters with bumpers.
- 6. Twenty (20) #CSB5P-300 polyurethane swivel casters with brakes and bumpers.
- 7. Plastic wedge lock connectors, quantity as required.
- 8. Locate bottom shelf @ 10" A.F.F., space remaining shelves equally.

Freezer:

- 1. Seven (7) #QPF-1848E-GS sections; 18" W x 48" L x 4-tier high.
- 2. Two (2) #QPF-1854E-GS sections; 18" W x 54" L x 4-tier high.
- 3. Thirty-six (36) #C963-E posts for stem casters, 63" high.
- 4. Eighteen (18) #CSS5P-300 polyurethane swivel casters with bumpers.
- 5. Eighteen (18) #CSB5P-300 polyurethane swivel casters with brakes and bumpers.
- 6. Plastic wedge lock connectors, quantity as required.
- 7. Locate bottom shelf @ 10" A.F.F., space remaining shelves equally.

ITEM #7: HI-DENSITY SHELVING SYSTEM

QUANTITY:	Five (5)
MANUFACTURER:	Eagle Group
MODEL NO.:	Lifestor (N058)
PERTINENT DATA:	Overhead Track, Polymer
UTILITIES REQ'D:	
ALTERNATE MFRS.:	InterMetro Industries Corporation

ITEM #7: (Continued)

Furnish and set-in-place per Equipment Plan, Sheet K101; Manufacturer's Instructions and the following:

Dry Storage:

- 1. One (1) #LOHT-12 12-foot overhead track high-density storage system.
- 2. Five (5) #1848E sections; 18" W x 48" L x 5-tier high.
- 3. Three (3) #MUK18-E mobile unit kits.
- 4. Two (2) #EP74-E stationary end kits.
- 5. Locate bottom shelf @ 12" A.F.F.; space remaining shelves equally.

ITEM #8: CAN RACK

QUANTITY:	One (1)
MANUFACTURER:	New Age Industrial Corp., Inc.
MODEL NO.:	97294 F.I.F.O. (N058)
PERTINENT DATA:	All Welded Aluminum Construction, (156) #10 Can Capacity
UTILITIES REQ'D:	
ALTERNATE MFRS.:	Win-Holt

Furnish and set-in-place per Equipment Plan, Sheet K101 and Manufacturer's Instructions.

ITEM #9: DUNNAGE RACK, MOBILE

One (1)
Eagle Group
Lifestor (N058)
Open-Grid Shelf Mat, Heavy-Duty Assembly, Polymer
InterMetro Industries Corporation

Furnish and set-in-place per Equipment Plan, Sheet K101; Manufacturer's Instructions and the following:

Dry Storage:

1. One (1) #MDR-L1850PSM unit, 18" W x 50" L.

ITEM #10: WORKTABLE

QUANTITY:	One (1)
MANUFACTURER:	Custom Fabricated
MODEL NO .:	#14 GA Stainless Steel
PERTINENT DATA:	5'-0" Long x 2'-6" Wide x 3'-0" High
UTILITIES REQ'D:	
ALTERNATE MFRS.:	None

Fabricate and set-in-place per Equipment Plan, Sheet K101; Fabrication Detail, Sheet K501 and the following:

- 1. Front and end edge roll per Detail 1.02M.
- 2. 6" high backsplash per Detail 1.04A.
- 3. Framework per Detail 1.05.
- 4. Legs per Detail 1.07.
- 5. Stainless steel undershelf per Detail 1.11.
- 6. One (1) stainless steel drawer assembly per Detail 1.14, Type I, with lock.
- 7. Worktable per Detail 2.01.
- 8. Sound-deaden underside of worktable with NSF-approved sound dampening material.
- 9. Accessories:
 - -- One (1) Edlund #S-11C manual can opener.

ITEM #11: HAND SINK

Four (4)
Eagle Foodservice Equipment Company
HSA-10-FAW-LRS (N058)
Wall Mounted Assembly, With Wrist Handles
1/2" HW, 1/2" CW, 1-1/2" W
Select Stainless; Universal

Furnish and set-in-place per Equipment Plan, Sheet K101; Manufacturer's Instructions and the following:

1. Complete sink assembly consisting of gooseneck faucet with wrist handles, p-trap, tailpiece and basket drain.

2. Accessories:

- -- #606215 skirt assemblies.
- -- Left and right end splashes.

ITEM #12: SOAP & TOWEL DISPENSER

QUANTITY:	Four (4)
MANUFACTURER:	Bobrick Washroom Equipment, Inc.
MODEL NO.:	B-5050/B-262 (N058)
PERTINENT DATA:	Surface Wall Mounted, Stainless Steel Finish, (400) C-Fold Towel Capacity
UTILITIES REQ'D:	
ALTERNATE MFRS .:	None

Furnish and set-in-place per Equipment Plan, Sheet K101; Manufacturer's Instructions and the following:

1. Mount units above each hand sink and seal perimeter to wall.

ITEM #13: PREP SINK

QUANTITY:	One (1)
MANUFACTURER:	Custom Fabricated
MODEL NO .:	#14 GA Stainless Steel
PERTINENT DATA:	7'-6" Long x 2'-6" Wide x 2'-10" High
UTILITIES REQ'D:	1/2" HW, 1/2" CW, (2)1-1/2" IW
ALTERNATE MFRS.:	None

Fabricate and set-in-place per Equipment Plan, Sheet K101; Fabrication Detail, Sheet K501; and the following:

- 1. Front and end edge rolls per Detail 1.02B.
- 2. 13" high backsplash per Detail 1.04A.
- 3. Framework per Detail 1.05.
- 4. Legs per Detail 1.07.
- 5. Stainless steel undershelf on both ends per Detail 1.11.
- 6. Sound deaden underside of sinks and drainboards with NSF-approved sound dampening material.
- 7. Accessories:
 - -- One (1) T&S #B-231 backsplash mounted swing spout faucet with 12" nozzle and #B-199-1 non-splash aerator.
 - -- Two (2) T&S #B-3950-01 twist handle drains with rear-connected over-flows, handle bracket and basket strainer.

ITEM #13: (Continued)

8. Item will remain shrink-wrapped until ready for final connection by Plumbing Contractor. Immediately following completion of final connections, K.E.C. shall re-shrink-wrap tubs or provide removable panel to avoid use by construction trades. Post sign on wall above sink tubs in English and Spanish stating: <u>WARNING!</u> NOT TO BE USED BY CONSTRUCTION TRADES. FAILURE TO COMPLY WILL RESULT IN \$500.00 FINE AND ALL COSTS TO REPLACE ITEM WITH NEW.

ITEM #14: PAN RACK CART, MOBILE

QUANTITY:	Two (2)
MANUFACTURER:	CresCor
MODEL NO.:	207-UA-13A (N058)
PERTINENT DATA:	Universal Angles, Channel Posts, (18) 22x20 Pan Capacity
UTILITIES REQ'D:	
ALTERNATE MFRS:	InterMetro; Lakeside

Furnish and set-in-place per Equipment Plan, Sheet K101, Manufacturer's Instructions and the following:

- 1. Accessories:
 - -- Full perimeter non-marking wrap-around vinyl bumper.

ITEM #15: UTILITY RACEWAY

QUANTITY:	One (1)
MANUFACTURER:	Captive-Aire Systems, Inc.
MODEL NO.:	UDS (N058)
PERTINENT DATA:	Wall-Mounted
UTILITIES REQ'D:	50.0A, 120/208V, 3PH; 100.0A, 480V, 3PH 3/4"HW, 3/4"CW; 1-1/2" Natural
	Gas @ 1,360MBH
ALTERNATE MFRS.:	Avtec; Gaylord

Furnish and install per Equipment Plan, Sheet K101; Utility Raceway Details, Sheet K502; Manufacturer's Shop Drawing and the following:

- 1. All components and labor necessary for a complete system manufactured in accordance with NEC latest edition, NEMA, NFPA No. 96 and No. 54, Uniform Plumbing Code, ASME, OSHA using only U.L. Listed certified components.
- 2. 20'-0" long x 10" wide x 6'-8" high with risers, completely pre-wired and pre-plumbed to one final connection point for gas, electric, hot water and cold water. All connections shall face down on horizontal member.
- 3. System shall extend up to bottom edge of Ventilator, Item #16.

ITEM #15: (Continued)

- 4. Entire raceway shall be constructed of #16 gauge Type 304 stainless steel with a #4 mill finish.
- 5. Removable link plates constructed of #16 gauge stainless steel.
- 6. Electrical compartment shall be completely enclosed with stainless steel housing accessible by the removal of link plates. Internal electrical feeder shall be cable busbar having balanced load and phases and with connection lugs for main service. Branch circuit wiring for each electrical connection shall be phase identified and sized in accordance with circuit breaker rated capacity. Raceway shall provide gas, electrical and water service for items #17, #18, #19 and #21.
- 7. Provide 12" long interchangeable 16 gauge stainless steel link connection plate for each electrical connection equipped with individual circuit breaker(s) installed in breaker panel mounted in left-hand riser, and grounding type receptacle with twist-lock feature or pre-wired flexible sealtite conduit.
- 8. On each connection plate provide U.L. listed U.L. Listed GFIC ground fault interrupted circuits and matching power supply cords on each 120-volt single-phase connection.
- 9. Hot water and cold water plumbing compartment shall be isolated from electrical compartment. All piping and disconnects in system shall be color coded.
- 10. All hot and cold water piping, including individual branch pipe connection, shall be hard temper type "L" copper tubing with copper sweat type solder fittings. At each individual connection, provide A.G.A approved flexible hose(s) with two wall brass and stainless steel construction with quick-disconnect fittings.
- 11. At each individual gas branch connection, provide ¹/₄ turn ball valve and 48" long Dormont PVC coated AGA and NSF approved flexible hose with SnapFast quick-disconnect device and double SwivelMAX gas connectors.
- 12. Provide fire/fuel shut-off for electric equipment per NFPA No. 96. System shall require one final connection by Contractor from fire protection system.
- 13. Provide matching cord sets for all electric equipment, five (5) total.
- 14. Neoprene bumper strips, full length.
- 15. U.L. listed, solid-state control panel mounted in left-hand riser end, with the following integral accessories:
 - -- Ventilator start/stop station with adjustable time-delay to exhaust residual heat.
 - -- Ventilator light switch, pre-wired in 10ft. flexible conduit ready for connection to light junction box in ventilator by Electrical Contractor.
- 16. Accessories:
 - -- One (1) Everpure #EV9797-21 KleenSteam water filter system factory-installed and housed within right-hand riser. Provide one (1) independent pre-piped water line to service point for Item #21: Convection Steamer. Provide 18" wide x 18" high Lexan viewport in riser panel to monitor pressure gauge and filter bowl.

ITEM #15: (Continued)

- -- Stainless filler panel between UDS risers.
- 17. Electronic gas solenoid valve factory installed at each in-coming gas service ready for final connection per local codes by Plumbing Contractor; inter-wired by Electrical Contractor.
- 18. Provide each mobile piece of equipment with an A.G.A. recognized restraining device protecting respective gas disconnect assemblies and connector.
- 19. Raceway fabricated in three (3) sections, assembled in field to present integral one-piece appearance.
- 20. Main electrical shunt-type circuit breaker mounted in right-hand riser for 50.0A, 120/208V, 3PH and 100.0A, 480V, 3PH services.
- 21. Factory System Design Verification (SDV) shall be performed after all inspections are complete. SDV report shall be available once completed.
- 22. Raceway shall be of same manufacturer as Ventilator, Item #21.

ITEM #16: VENTILATOR

QUANTITY:	One (1)
MANUFACTURER:	Captive-Aire
MODEL NO .:	6630ND-2-PSP-F (N058)
PERTINENT DATA:	Wall Mounted, Captrate Solo Filter, Ceiling Perforated Make Up Air Plenum,
	With Fire Protection System
UTILITIES REQ'D:	3,783 CFM Exhaust/2,975 CFM Supply (Tempered), 350W, 120V, 1PH
	(Lights
ALTERNATE MFRS.:	Avtec; Gaylord

Furnish and install per Equipment Plan, Sheet K101; Ventilator Detail Drawing, Sheet K503, Manufacturer's Shop Drawing and the following:

- 1. 5'-6" Wide x 18'-11" Long x 2'-6" High, with bottom edge mounted at 6'-8" A.F.F. Length comprised of one (1) 9'-6" long section on left end and one (1) 9'-5" long section on right end. Entire unit constructed of 18 GA 304 stainless steel #4 mill finish with liquid tight all welded external continuous seams and joints per N.F.P.A. 96, U.L. and State of Maryland Codes.
- 2. Four (4) U.L. Listed, NSF-Approved, 48" long twin-tube recessed LED light fixtures; two (2) equally spaced each section. Bulbs furnished and installed by K.E.C.
- 3. Matching stainless steel perimeter closure panels to finished ceiling; K.E.C. to verify ceiling height.
- 4. Surface fire protection system nozzles and piping to be installed at manufacturer's factory at time of fabrication. All exposed pipe and fittings shall be chrome-plate or stainless steel.

ITEM #16: (Continued)

- 5. Hanger rods and support system from structure above by General Contractor. K.E.C. to coordinate method and location with other trades.
- 6. Stainless steel hanger brackets.
- 7. 10" wide stainless steel angle framing and closure panels to accommodate Utility Raceway, Item #15.
- 8. Full-length, front-mounted completely insulated, perforated stainless steel ceiling-mounted makeup air plenum with integral supply air balancing dampers for each hood section.
- 9. Stainless steel U.L. Classified 20" captrate solo grease filters with hook.
- 10. Semi-concealed stainless steel grease trough sloped to removable grease cups.
- 11. Ventilator shall be of same manufacturer as Utility Raceway, Item #15.
- 12. HVAC Contractor to provide tempered supply air during winter months: 60° F 65° F.
- 13. Factory System Design Verification (SDV) shall be performed after all inspections are complete. SDV report shall be available once completed.
- 14. Accessories:
 - -- 12" wide utility cabinet mounted on left end of hood section with factory pre-piped Ansul R-102 fire suppression system and U.L. Listed pre-wired electrical package #DCV-1111 consisting of: light switches, lighted fan control switches, and internal factory wiring and components to reduce field wiring requirements.
 - -- Six-month and twelve-month inspections, servicing, and replacement of components of fire protection system as per NFPA-96 Latest Edition.
 - -- One (1) Ansul Model K01-2 hand-held fire extinguisher, 1.6 gallon, wall-mounted.

ITEM #17: CONVECTION OVEN, MOBILE

QUANTITY:	Two (2)
MANUFACTURER:	Southbend
MODEL NO.:	SLGS/22SC (N058)
PERTINENT DATA:	Double-Deck, Standard Depth
UTILITIES REQ'D:	(2) 1/2HP, 120V, 1PV; 3/4" Natural Gas @ 144 MBH
ALTERNATE MFRS.:	None

Furnish and set-in-place per Equipment Plan, Sheet K101, Manufacturer's Instructions and the following:

- 1. Natural gas fired, pressure regulator as required. Manifold rear gas connection of each oven compartment for single connection point ready for quick disconnect assembly furnished with Item #15.
- 2. Standard compliment of five (5) wire racks, each compartment.

ITEM #17: (Continued)

- 3. Both doors with dual pane thermal windows and internal light package.
- 4. Accessories:
 - -- Stainless steel main back panels.
 - -- 5" diameter heavy-duty polyurethane swivel casters, front two (2) with brakes.
 - -- #NRG fuel saving system.
- 5. Cord and plug sets.
- 6. Electrical and mechanical services supplied through Utility Raceway, Item #15.

ITEM #18: RANGE/OVEN, MOBILE

QUANTITY:	One (1)
MANUFACTURER:	South Bend
MODEL NO .:	4361A (N058)
PERTINENT DATA:	Heavy-Duty, Convection Oven Base, (6) Open Burners, Ultimate Series, Elec-
	tronic Ignition, Flame Failure Protection
UTILITIES REQ'D:	6.2A, 120V, 1PH; 3/4" Natural Gas @ 230MBH
ALTERNATE MFRS.:	None

Furnish and set-in-place per Equipment Plan, Sheet K101; Manufacturer's Instructions and the following:

- 1. Accessories:
 - -- Four (4) heavy-duty 5" diameter polyurethane swivel casters, front two (2) with brakes.
 - -- Stainless steel front, rear and both sides.
 - -- ³/₄" rear gas connection. Cap and cover manifold ends.
 - -- 10" low-profile backguard.
 - -- Pressure regulator.
 - -- Flame failure protection.
 - -- Electronic spark ignition.
- 2. Mechanical and electrical services provided thru Utility Raceway, Item #15.

ITEM #19: TILTING SKILLET, 40-GALLON

QUANTITY:	One (1)
MANUFACTURER:	Southbend
MODEL NO .:	BECT-40 (N058)
PERTINENT DATA	Open Leg Frame Base, With Manual Tilt Mechanism
UTILITIES REQ'D:	27.0KW, 480V, 3PH; 1/2" HW, 1/2" CW, 2" IW
ALTERNATE MFRS .:	None

Furnish and set-in-place per Equipment Plan, Sheet K101; Manufacturer's Instructions and the following:

ITEM #19: (Continued)

- 1. Accessories:
 - -- One (1) #DF-12 double pantry faucet.
 - -- One (1) #PC-1 pan carrier.
 - -- One (1) #TVT-2 2" tangent draw-off valve with strainer.
 - -- One (1) #GMS-40 permanent etched interior markings.
- 2. Cord and plug set.
- 3. Mechanical and electrical services provided thru Utility Raceway, Item #15.

ITEM #20: FLOOR TROUGH

QUANTITY:	One (1)
MANUFACTURER:	IMC Teddy Foodservice Corporation
MODEL NO.:	ASFT2430-SGAS (N058)
PERTINENT DATA:	Anti-Spill, 14 GA S/S
UTILITIES REQ'D:	4" W
ALTERNATE MFRS.:	Eagle Group

Furnish and install per Equipment Plan, Sheet K101; Manufacturer's Instructions and the following:

- 1. 2'-6" long x 2'-0" wide, constructed and installed per Detail, Sheet K102.
- 2. SGAS-24 anti-slip stainless steel subway style removable floor grate in equal sections, the lessor of 30 lbs. and/or 20" long.
- 3. Bottom of trough pitched to integral stainless steel waste cup with removable perforated stainless steel basket.
- 4. Top of trough installed flush with top of kitchen finished floor.
- 5. Unit furnished by K.E.C.; installed by Plumbing Contractor.

ITEM #21: CONVECTION STEAMER

QUANTITY:	One (1)
MANUFACTURER:	South Bend
MODEL NO.:	EZ18-5/EZ18-5 (N058)
PERTINENT DATA:	(2) Double Stacked, Stand-Mounted 5-Pan, Boilerless, Manual Fill, Manual
	Drain
UTILITIES REQ'D:	15.0KW, 480V, 3PH; 1/2" IW
ALTERNATE MFRS:	None

Furnish and set-in-place per Equipment Plan, Sheet K101; Manufacturer's Instructions and the following:
ITEM #21: (Continued)

- 1. Accessories:
 - -- 480-volt operation, 3-phase.
 - -- #DHK drain hose kit.
 - -- #TS-120-1 120 minute timer.
 - -- #R18SS-5 double unit stacking stand.
 - -- One (1) Everpure #EV9797-21 KleenSteam II Water Filter. Ship to Utility Raceway manufacturer for factory installation.
- 2. Extended warranty protection covered through KleenSteam Filtration System.
- 3. Backflow preventor furnished and installed by Plumbing Contractor.
- 4. Mechanical and electrical services provided thru Utility Raceway, Item #15.

ITEM #22: WORKTABLE

QUANTITY:	One (1)
MANUFACTURER:	Custom Fabricated
MODEL NO .:	#14 GA Stainless Steel
PERTINENT DATA:	8'-0" Long x 2'-6" Wide x 3'-0" High
UTILITIES REQ'D:	
ALTERNATE MFRS.:	None

Fabricate and set-in-place per Equipment Plan, Sheet K101; Fabrication Detail, Sheet K501 and the following:

- 1. Perimeter edge roll per Detail 1.02M.
- 2. Framework per Detail 1.05.
- 3. Legs per Detail 1.07.
- 4. Full-length stainless steel undershelf per Detail 1.11.
- 5. Two (2) stainless steel drawer assemblies per Detail 1.14, Type I, with locks.
- 6. Worktable per Detail 2.01.
- 7. Sound-deaden underside of worktable with NSF-approved sound dampening material.

ITEM #23: REACH-IN HEATED CABINET, MOBILE

QUANTITY:	One (1)
MANUFACTURER:	Continental Refrigerator
MODEL NO.:	DL1W-SS-HD (N058)
PERTINENT DATA:	One-Section, Self-Contained, Stainless Steel Interior/Exterior
UTILITIES REQ'D:	7.8A, 120/208V, 1PH
ALTERNATE MFRS.:	None

Furnish and set-in-place per Equipment Plan, Sheet K101; Manufacturer's Instructions and the following:

- 1. Half-height doors hinged per Equipment Plan.
- 2. Cylinder locks, keyed-alike.
- 3. Universal tray slide assembly installed on 5" centers in lieu of wire shelves, five (5) pair per compartment.
- 4. Exterior mounted digital thermometer, installed on kitchen side.
- 5. 5" diameter heavy-duty swivel casters, two (2) with brakes.
- 6. Plastic laminate finish factory applied to exterior door fronts on serving side only; color as selected by Architect; K.E.C. to verify.
- 7. Stainless steel case back.

ITEM #24: PASS-THRU HEATED CABINET, MOBILE

QUANTITY:	Two (2)
MANUFACTURER:	Continental Refrigerator
MODEL NO.:	DL1W-SS-PT-HD (N058)
PERTINENT DATA:	One-Section, Self-Contained, Stainless Steel Interior/Exterior
UTILITIES REQ'D:	7.8A, 120/208V, 1PH
ALTERNATE MFRS.:	None

- 1. Half-height doors hinged per Equipment Plan. Glass doors on kitchen side, solid doors on serving side.
- 2. Cylinder locks, keyed-alike.
- 3. Universal tray slide assembly installed on 5" centers in lieu of wire shelves, five (5) pair per compartment, ten (10) pair total, each unit.
- 4. Exterior mounted digital thermometer, installed on kitchen side.

ITEM #24: (Continued)

- 5. 5" diameter heavy-duty swivel casters, two (2) with brakes.
- 6. Plastic laminate finish factory applied to exterior door fronts on serving side only; color as selected by Architect; K.E.C. to verify.

ITEM #25: REFRIGERATED WORKTOP, MOBILE

QUANTITY: Three (3)	
MANUFACTURER: Continental Refrigerator	
MODEL NO.: DLRA60-SS (N058)	
PERTINENT DATA: Two-Section, Self-Contained, Stainless Steel	Front, Sides & Interior
UTILITIES REQ'D: 12.3A, 120V, 1PH	
ALTERNATE MFRS: None	

Furnish and set-in-place per Equipment Plan, Sheet K101, Manufacturer's Instructions and the following:

- 1. Accessories:
 - -- Stainless steel finished back and end panels.
 - -- Cylinder door lock.
 - -- 5" diameter heavy-duty polyurethane swivel casters, front two (2) with brakes.
- 2. Cord and plug set.

ITEM #26: TRAY/FLATWARE DISPENSER, MOBILE

QUANTITY:	Two (2)
MANUFACTURER:	Steril-Sil
MODEL NO .:	CRT36-18-RP (N058)
PERTINENT DATA:	150-Tray Capacity, Stainless Steel Finish
UTILITIES REQ'D:	
ALTERNATE MFRS.:	None

Furnish and set-in-place per Equipment Plan, Sheet K101; Manufacturer's Instructions and the following:

1. Accessories:

- -- Round corner bumpers.
- -- 5" diameter polyurethane swivel casters, two (2) with brakes.
- -- Steril-Sil #RP-25 white plastic flatware cylinders, (18) total, each unit.

ITEM #27: MILK COOLER, MOBILE

QUANTITY:	Two (2)
MANUFACTURER:	Continental Refrigerator
MODEL NO.:	MC4-SS-S (N058)
PERTINENT DATA:	49" Wide, Single-Access, 12-Case Capacity, Forced Air
UTILITIES REQ'D:	6.7A, 120V, 1PH
ALTERNATE MFRS.:	None

Furnish and set-in-place per Equipment Plan, Sheet K101; Manufacturer's Instructions and the following:

- 1. Stainless steel exterior and interior.
- 2. Cord and plug set.
- 3. Cylinder lid lock.
- 4. Heavy-duty swivel casters with brakes.
- 5. Accessories:
 - -- #5-223 corner bumpers.
 - -- #50182 foot pedal floor lock.
 - -- Custom laminate finish to match the serving counter.

ITEM #28: SERVING COUNTER, MOBILE

QUANTITY:	One (1)
MANUFACTURER:	Eagle Group
MODEL NO.:	Director's Choice (N058)
PERTINENT DATA:	Straight Line Configuration, #14 Gauge S/S Tops, Modular Interlocking Sec-
	tions
UTILITIES REQ'D:	
ALTERNATE MFRS.:	None

Refer to individual counter components listed under alpha headings for specification.

ITEM #28A: COMBINATION HOT/COLD FOOD COUNTER, MOBILE

QUANTITY:One (1)MANUFACTURER:Director's Choice by Eagle GroupMODEL NO.:DCS4-STU-MOD (N058)PERTINENT DATA:Open Base, With Four (4) WellsUTILITIES REQ'D:30.0A, 120/208V, 1PH; 1/2" IWALTERNATE MFRS.:None

ITEM #28A: (Continued)

- 1. 10" wide full-length solid ribbed stainless steel tray slide mounted @ 34" A.F.F.
- 2. 6" wide full-length fold-down stainless steel work shelf on server's side.
- 3. Sloped front food protector with tempered glass front panel adjustable for serve and self-serve application and end panels.
- 4. Radiant heat lamp with incandescent lights and on/off switch.
- 5. Line-up interlocks for counter body and tray slide.
- 6. Provide cut-out in top for drop-in self-contained 4-pan hot/cold unit. Locate compressor assembly to end and conceal within isolated compartment with lift-off louvered access panel, server's side. Remainder of base counter shall have open understorage with bottom stainless steel shelves.
- 7. 5" diameter heavy-duty swivel casters, all (4) with brakes.
- 8. Open understorage with bottom stainless steel shelf.
- 9. Cord and plug set.
- 10. Modified counter height of 36" A.F.F.
- 11. Removable vinyl panel inserts capable of being laser engrave and color coordinated with school logo. Architect to coordinate counter finish, graphics and color selection with Owner.
- 12. Accessories:
 - -- One (1) Wells #HRCP-7400 drop-in hot & cold combination pan, 30.0A, 120/208V, 1PH with adapter bar for 1/6 size pan and automatic water fill.

ITEM #28B: COLD FOOD COUNTER, MOBILE

QUANTITY:	One (1)
MANUFACTURER:	Director's Choice by Eagle Group
MODEL NO.:	DCS4-CFURN-MOD (N058)
PERTINENT DATA:	Mechanically-Refrigerated, Open Base, NSF 7
UTILITIES REQ'D:	7.8A, 120V, 1PH; 3/4" IW
ALTERNATE MFRS.:	None

- 1. 10" wide full-length solid stainless steel tray slide mounted @ 34" A.F.F.
- 2. Single-tier display case with adjustable glass sneezeguards and end panels.

ITEM #28B: (Continued)

- 3. Fluorescent light fixture with shatterproof shield.
- 4. Line-up interlocks for counter body and tray slide.
- 5. Cord and plug set.
- 6. 5" diameter heavy-duty swivel casters, all (4) with brakes.
- 7. Open understorage with bottom stainless steel shelf.
- 8. Modified counter height of 36" A.F.F.
- 9. Modify length of cold pan and food protector to provide an opening adjacent to Item #28A: Combination Hot/Cold Food Counter for clear passage of 12"x20" tray.
- 10. Removable vinyl panel inserts capable of being laser engrave and color coordinated with school logo. Architect to coordinate counter finish, graphics and color selection with Owner.

ITEM #28C: CASHIER STAND, MOBILE

QUANTITY:	One (1)
MANUFACTURER:	Director's Choice by Eagle Group
MODEL NO.:	DCS-CUEL-24-MOD (N058)
PERTINENT DATA:	24" Long x 30" Wide
UTILITIES REQ'D:	1.0KW, 120V, 1PH (Convenience Receptacle)
ALTERNATE MFRS.:	None

- 1. 10" wide full-length solid stainless steel tray slide with @ 34" A.F.F.
- 2. Line-up interlocks for counter body and tray slide.
- 3. One (1) 15-amp 120-volt convenience outlet mounted on counter apron, operator's side.
- 4. Cashier's utility drawer with locking provision mounted on end.
- 5. One (1) cord and plug set.
- 6. 5" diameter heavy-duty swivel casters, all (4) with brakes.
- 7. Modified counter height set @ 36" A.F.F.
- 8. Removable vinyl panel inserts capable of being laser engrave and color coordinated with school logo. Architect to coordinate counter finish, graphics and color selection with Owner.

ITEM #29: SERVING COUNTER, MOBILE

QUANTITY:	One (1)
MANUFACTURER:	Eagle Group
MODEL NO .:	Director's Choice (N058)
PERTINENT DATA:	T-Shaped Configuration, #14 Gauge S/S Tops, Modular Interlocking Sections
UTILITIES REQ'D:	
ALTERNATE MFRS.:	None

Refer to individual counter components listed under alpha headings for specification.

ITEM #29A: COMBINATION HOT/COLD FOOD COUNTER, MOBILE

QUANTITY:	Two (2)
MANUFACTURER:	Director's Choice by Eagle Group
MODEL NO .:	DCS4-STU-MOD (N058)
PERTINENT DATA:	Open Base, With Four (4) Wells
UTILITIES REQ'D:	30.0A, 120/208V, 1PH; 1/2" IW
ALTERNATE MFRS.:	None

- 1. 10" wide full-length solid ribbed stainless steel tray slide mounted @ 34" A.F.F.
- 2. 6" wide full-length fold-down stainless steel work shelf on server's side.
- 3. Sloped front food protector with tempered glass front panel adjustable for serve and self-serve application and end panels.
- 4. Radiant heat lamp with incandescent lights and on/off switch.
- 5. Line-up interlocks for counter body and tray slide.
- 6. Provide cut-out in top for drop-in self-contained 4-pan hot/cold unit. Locate compressor assembly to end and conceal within isolated compartment with lift-off louvered access panel, server's side. Remainder of base counter shall have open understorage with bottom stainless steel shelves.
- 7. 5" diameter heavy-duty swivel casters, all (4) with brakes.
- 8. Open understorage with bottom stainless steel shelf.
- 9. Cord and plug set.
- 10. Modified counter height of 36" A.F.F.
- 11. Removable vinyl panel inserts capable of being laser engrave and color coordinated with school logo. Architect to coordinate counter finish, graphics and color selection with Owner.

ITEM #29A: (Continued)

- 12. Accessories:
 - -- One (1) Wells #HRCP-7400 drop-in hot & cold combination pan, 30.0A, 120/208V, 1PH with adapter bar for 1/6 size pan and automatic water fill.

ITEM #29B: COLD FOOD COUNTER, MOBILE

QUANTITY:	Two (2)
MANUFACTURER:	Director's Choice by Eagle Group
MODEL NO .:	DCS3-CFURN-MOD (N058)
PERTINENT DATA:	Mechanically-Refrigerated, Open Base, NSF 7
UTILITIES REQ'D:	6.0A, 120V, 1PH; 3/4" IW
ALTERNATE MFRS.:	None

- 1. 10" wide full-length solid stainless steel tray slide with mitered end mounted @ 34" A.F.F.
- 2. Single-tier display case with adjustable glass sneezeguards and end panels.
- 3. Fluorescent light fixture with shatterproof shield.
- 4. Line-up interlocks for counter body and tray slide.
- 5. Cord and plug set.
- 6. 5" diameter heavy-duty swivel casters, all (4) with brakes.
- 7. Open understorage with bottom stainless steel shelf.
- 8. Modified counter height of 36" A.F.F.
- 9. Modify length of cold pan and food protector to provide an opening adjacent to Item #29A: Combination Hot/Cold Food Counter for clear passage of 12"x20" tray.
- 10. Removable vinyl panel inserts capable of being laser engrave and color coordinated with school logo. Architect to coordinate counter finish, graphics and color selection with Owner.

ITEM #29C: SOLID TOP COUNTER, MOBILE

QUANTITY:	One (1)
MANUFACTURER:	Director's Choice by Eagle Group
MODEL NO.:	DCS2-STU (N058)
PERTINENT DATA:	3'-0" Long, Open Base
UTILITIES REQ'D:	15.0, 120V, 1PH (Convenience Receptacle)
ALTERNATE MFRS.:	None

Furnish and set-in-place per Equipment Plan, Sheet K101; Manufacturer's Shop Drawing and the following:

- 1. Line-up interlocks for counter body.
- 2. 5" diameter heavy-duty swivel casters, all (4) with brakes.
- 3. Open understorage with bottom stainless steel shelf.
- 4. Modified counter height of 36" A.F.F.
- 5. One (1) 120-volt duplex convenience outlet mounted in counter apron, operator's side.
- 6. Open understorage with bottom stainless steel shelf.

ITEM #29D: COLD FOOD COUNTER, MOBILE

QUANTITY:One (1)MANUFACTURER:Director's Choice by Eagle GroupMODEL NO.:DCS4-CFURN-MOD (N058)PERTINENT DATA:Mechanically-Refrigerated, Enclosed Base, NSF 7UTILITIES REQ'D:7.8A, 120V, 1PH; 3/4" IWALTERNATE MFRS.:None

- 1. 10" wide full-length solid stainless steel tray slide with mitered end mounted @ 34" A.F.F., both sides.
- 2. Double service, fully adjustable, tempered glass top shelf, sneeze guards and end panels.
- 3. Full-length fluorescent light fixtures.
- 4. Line-up interlocks for counter body and tray slide.
- 5. Cord and plug set.
- 6. 5" diameter heavy-duty swivel casters, all (4) with brakes.

ITEM #29D: (Continued)

- 7. Modified counter height of 36" A.F.F.
- 8. Removable vinyl panel inserts capable of being laser engrave and color coordinated with school logo. Architect to coordinate counter finish, graphics and color selection with Owner.

ITEM #29E: CASHIER STAND, MOBILE

QUANTITY:	One (1)
MANUFACTURER:	Director's Choice by Eagle Group
MODEL NO.:	DCS-CUI-36-MOD (N058)
PERTINENT DATA:	36" Long x 24" Wide
UTILITIES REQ'D:	1.0KW, 120V, 1PH (Convenience Receptacle)
ALTERNATE MFRS.:	None

Furnish and set-in-place per Equipment Plan, Sheet K101; Manufacturer's Shop Drawing and the following:

- 1. 10" wide full-length solid stainless steel tray slide mounted @ 34" A.F.F., both sides.
- 2. Line-up interlocks for counter body and tray slide.
- 3. One (1) 15-amp 120-volt convenience outlet mounted on counter apron, operator's side.
- 4. Cashier's utility drawer with locking provision mounted on end.
- 5. One (1) cord and plug set.
- 6. 5" diameter heavy-duty swivel casters, all (4) with brakes.
- 7. Modified counter height set @ 36" A.F.F.
- 8. Removable vinyl panel inserts capable of being laser engrave and color coordinated with school logo. Architect to coordinate counter finish, graphics and color selection with Owner.

ITEM #30: CASH REGISTER -- (N.I.C. - FURNISHED BY OWNER)

QUANTITY: Three (3)

ITEM #31: POT WASHING SINK

QUANTITY:	One (1)
MANUFACTURER:	Custom Fabricated
MODEL NO .:	#14 GA Stainless Steel
PERTINENT DATA:	11'-3" Long x 2'-6" Wide x 2'-10" High
UTILITIES REQ'D:	6.0A, 120V, 1PH; (2) 3/4" HW, (2) 3/4" CW, (3) 2" IW
ALTERNATE MFRS.:	None

Fabricate and set-in-place per Equipment Plan, Sheet K101; Fabrication Detail, Sheet K501 and the following:

- 1. Front and end edge rolls per Detail 1.02B.
- 2. 13" high backsplash per Detail 1.04A.
- 3. Framework per Detail 1.05
- 4. Legs per Detail 1.07
- 5. Stainless steel undershelf on both ends per Detail 1.11.
- 6. 7'-0" long table-mounted stainless steel overshelf per Detail 1.12A.
- 7. Sinks and drainboards per Detail 3.01.
- 8. Sound deaden underside of sinks and drainboards with NSF-approved sound dampening material.
- 9. Accessories:
 - -- Two (2) T&S #B-290 swing-spout backsplash mounted faucets.
 - -- Three (3) T&S #B-3950-01 twist handle drains with rear-connected over-flows, handle bracket and basket strainer.
 - -- One (1) Wells #PW-106 hydro-surge washing unit, 1/3HP, 120V, 1PH.
- 10. Item will remain shrink-wrapped until ready for final connection by Plumbing Contractor. Immediately following completion of final connections, K.E.C. shall re-shrink-wrap tubs or provide removable panel to avoid use by construction trades. Post sign on wall above sink tubs in English and Spanish stating: <u>WARNING!</u> NOT TO BE USED BY CONSTRUCTION TRADES. FAILURE TO COMPLY WILL RESULT IN \$500.00 FINE AND ALL COSTS TO REPLACE ITEM WITH NEW.

ITEM #32: TRASH CONTAINER, MOBILE

QUANTITY:	Two (2)
MANUFACTURER:	Rubbermaid Commercial Products, Inc.
MODEL NO.:	2632 (N058)
PERTINENT DATA:	32-Gallon Capacity
UTILITIES REQ'D:	
ALTERNATE MFRS.:	Continental Plastics

Furnish and set-in-place per Equipment Plan, Sheet K101; Manufacturer's Instructions and the following:

- 1. Grey in color.
- 2. Accessories:
 - -- Two (2) #2645 matching flat lids.
 - -- Two (2) #2640 conversion dollies.

ITEM #33: POT & PAN SHELVING, MOBILE

One (1)
Eagle Foodservice Equipment Co. Inc.
Quik-Set (N058)
Four-Tier High, 24" Wide, Embossed Shelf
InterMetro Industries Corporation

Furnish and set-in-place per Equipment Plan, Sheet K101, Manufacturer's Instructions and the following:

- 1. One (1) #PR2448VE14 unit; 24" W x 48" L x 4-tier high.
- 2. Locate bottom shelf @ 18" A.F.F., space remaining shelves equally.

ITEM #34: SHELVING

One (1)
Eagle Group
Chrome-Plated, Wire (N058)
Four-Tier High, 14" Wide, Free-Standing
InterMetro Industries Corporation

Furnish and set-in-place per Equipment Plan, Sheet K101; Manufacturer's Instructions and the following:

Soap Storage:

1. One (1) #1430C section; 14" W x 30" L x 4-tier high.

ITEM #34: (Continued)

- 2. Four (4) #P63-C chrome-plated posts, 63" high.
- 3. Plastic split sleeves, quantity as required.
- 4. Locate bottom shelf @ 12" A.F.F.; space remaining shelves equally.

ITEM #35: MILK COOLER, MOBILE

QUANTITY:	One (1)
MANUFACTURER:	Continental Refrigerator
MODEL NO.:	MC3-SS-S (N058)
PERTINENT DATA:	34" Wide, Single-Access, 8-Case Capacity, Forced Air
UTILITIES REQ'D:	5.3A, 120V, 1PH
ALTERNATE MFRS.:	None

Furnish and set-in-place per Equipment Plan, Sheet K101; Manufacturer's Instructions and the following:

- 1. Stainless steel exterior and interior.
- 2. Cord and plug set.
- 3. Cylinder lid lock.
- 4. Heavy-duty swivel casters with brakes.
- 5. Accessories:
 - -- #5-223 corner bumpers.
 - -- #50182 foot pedal floor lock.
 - -- Custom laminate finish to match the serving counter.

(END OF FOODSERVICE ITEMIZED SPECIFICATIONS)

JRS Architects March 31, 2016 Bid Issue

STANDARD DETAILS



NOTE! JOINED SECTIONS SHALL BE DRAWN TOGETHER LEAVING ONLY A HAIRLINE SEAM.

A. BOLT DRAWN JOINT



NOTE! ON FIXTURES SPECIFIED WITH WELDED FIELD JOINTS, WELDS SHALL BE CONTINUOUS, GROUND & POLISHED LEAVING NO VISIBLE EVIDENCE OF WELD.

B. WELDED BUTT JOINT



NOTE! JOINED SECTIONS SHALL BE DRAWN TOGETHER LEAVING ONLY A HAIRLINE SEAM.

C. RAISED CAP SEAM - KNUCKLE JOINT









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- a. FULLY WELDED CONSTRUCTION.
- b. ANGLE LOCATION ENDS; SIDES OF TOP INSETS; INTERMEDIATES 24" ON CENTER.
- c. CHANNEL LOCATION ENDS AND INTERMEDIATE MAXIMUM 6'-6" O.C.
- d. ADD CENTER CHANNEL WHEN DRAINBOARD LENGHT EXCEEDS 5'-6".
- e. SECURE TOP TO FRAMEWORK WITH WELDED STUDS, S/S LOCKWASHERS AND CAP NUTS.
- f. CLOSE CHANNEL AT FRONT ONLY.



TABLE & DRAINBOARD FRAMEWORK





	NYIKOS
<i>i</i> ¥ 7	ASSOCIATES, INC.
Food Facilities Design/Consulting	

TABLE & SINK LEGS

DESCRIPTION:



a. FULLY WELD, GRIND SMOOTH AND POLISH.





- a. FULLY WELD, GRIND SMOOTH AND POLISH.
- b. WHEN SPECIFIED, TURN REAR AND ENDS UP 2".





- a. 16 GA S/S SHELF
- b. STD.- 1.02 EDGE
- c. I"x 3"x I" I4 GA. S/S CROSS CHANEL
- d. I'x 3"x I" 14 GA. S/S LENGTHWISE CHANNEL WHEN LENGTH BETWEEN SUPPORTS EXCEEDS 42"
- e. 14 GA. S/S BRACKETS FULLY WELDED TO SUPPORT AND CHANNEL ..
- f. I-1/4" O.D. 16 GA. S/S UPRIGHT. MAXIMUM 5'-0" ON CENTER.
- g. TIGHT FIT. SEAL WITH SILICONE SEALANT.
- h. I-1/2"x 1-1/2" 12 GA. S/S CLIPS WELDED TO REAR OF SPLASH AT DRAINBOARD HEIGHT.
- i. 3/8"x 16 S.S. HEX HEAD BOLT, S/S NUT & S/S LOCKWASHER. NUT WELDED IN TUBE.
- w. WIDTH AS SPECIFIED.











- e. DRAINBOARDS UP TO 24" IN LENGTH REQUIRE NO LEGS OR BRACES. DRAINBOARDS 25" TO 30" REQUIRE I" O.D. 16 GA. S/S BRACE. DRAINBOARDS OVER 30" REQUIRE LEGS AND CHANNEL FRAMEWORK.
- f. DRAINBOARDS SHALL PITCH TO SINK 1/8" PER FOOT OF LENGTH TO PROVIDE COMPLETE DRAINING WITHOUT POOLING. THE 3" HIGH RAISED ROLLED RIM AT THE SINK SHALL DECREASE IN HEIGHT TOWARD THE OUTER ENDS OF THE DRAINBOARD.
- g. PARTITIONS BETWEEN COMPARTMENTS TO BE DOUBLE WALLED CONSTRUCTION WITH ROUNDED TOP, ALL WELDED INTEGRAL WITH SINK BODY.
- h. BACK, BOTTOM, AND FRONT SHALL BE ONE CONTINUOUS PIECE WITH ENDS WELDED INTEGRAL, WITHOUT OVERLAPPING JOINTS OR OPEN SPACES, BETWEEN COMPARTMENTS.
- i. WASTES SHALL BE SEATED IN DIE STAMPED DEPRESSIONS WITHOUT USE OF SOLDER, RIVETS OR WELDING. INSTALLED COMPONENTS SHALL BE FLUSH WITH SURROUNDING SURFACE.
- j. EACH SINK COMPARTMENT TO BE PITCHED AND CREASED TO WASTE TO ASSURE COMPLETE DRAINING WITHOUT POOLING.
- k. ENTIRE UNIT SHALL BE ALL WELDED COVE CORNERED CONSTRUCTION WITH VERTICAL AND HORIZONTAL AND INTERIOR CORNERS HAVING A 3/4" RADIUS.
- 1. STD.- 1.02 b EDGE.
- m. STD. 1.04a. BACKSPLASH.
- n. UNDERSIDE OF DRAINBOARDS AND SINKS TO BE SPRAYED WITH SOUND DAMPENING IN COMPLIANCE WITH N.S.F. STD. 2 PARA 4.441 WHEN SPECIFIED.
- 0. FAUCETS T&S MODEL B-232 WITH AERATOR B-199, REMOVABLE MONEL SEATS AND 1/2" I.P.S. MALE INLETS.
- P. WASTES 2" NICKEL PLATED BRONZE ROTARY HANDLE WASTE S/S STRAINER PLATE WITH CHROME WITH CHROME PLATED BRASS CONNECTED OVERFLOW, STAN-DARD- KIEL HARDWARE MFG. CO. #1770-1015-1000.
- q. REAR CROSS BRACING ONLY.
- r. OMIT FRONT AND REAR LENGTHWISE CROSSBRACIG UNDER SINKS.
- 5. 12 GAUGE STAINLESS STEEL 6"x 6" TRIANGULAR SUPPORT PLATE WELDED TO UNDERSIDE OF SINKS.
- t. WIDTH AS SPECIFIED.

(END OF SECTION 114000)



DESCRIPTION:

SINK AND DRAINBOARDS



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SECTION 115123 - LIBRARY STACK 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. Wood-case shelving.
- B. Related Requirements:
 - 1. Section 064113 "Wood-Veneer-Faced Architectural Cabinets" for custom-fabricated library shelving, end panels, and canopy tops.
 - 2. Section 105613 "Metal Storage Shelving" for metal storage shelving for retail, commercial, and industrial uses.
 - 3. Section 105626 "Mobile Storage Shelving" for shelving units mounted on wheeled carriages that roll back and forth on a track system.

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 library stack systems and accessories.
- B. Sustainable Design Submittals:
 - 1. Chain-of-Custody Certificates: For certified wood products. Include statement of costs.
 - 2. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.
 - 3. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.
 - 4. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
- C. Shop Drawings:
 - 1. Include plans, elevations, sections, and details.
 - 2. Show clear-aisle widths from face of units.
 - 3. Detail fabrication and installation of library stack systems, including methods of anchoring them to building structures at locations recommended by manufacturer.
- D. Samples for Initial Selection: For units with factory-applied finishes, 6 inches in size.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Sample Warranty: For manufacturer's special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For library stack systems to include in maintenance manuals.

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.
- C. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install wood shelving 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.

1.8 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of library stack systems 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 and other materials beyond normal wear.
 - 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 WOOD-CASE SHELVING

- A. Wood-Case Library Shelving: Shelving designed for library use, consisting of base frame and full end, top, and back panels, with end panels made to receive pins to support adjustable shelves.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Blanton and Moore

- b. Brodart Co.
- c. Library Bureau; a ModuForm Company.
- d. Tesco.
- e. Worden Company.
- B. Bookstack Units: As shown on Drawings
- C. Base Frames: Solid hardwood toe kick, back rail, and two end cleats, 3 to 4 inches high, designed to support bottom shelf and fabricated to attach and tie together vertical panels.
- D. Bottom Shelf: Solid hardwood boards glued together, 3/4 inch thick, or veneer panels, 1 inch thick, with 1/4-inch solid-wood banding.
- E. Adjustable Shelves:
 - 1. Adjustable Wood Shelves: Panels consisting of solid hardwood boards glued together, 3/4 inch thick, or veneer panels, 1 inch thick, with 1/4-inch solid-wood banding, and grooved on underside to rest securely on supporting pins.
- F. End Panels: Panels consisting of solid hardwood boards glued together, 3/4 inch thick,. Provide two rows of holes at 1-1/4-inch intervals for 5/16-inch shelf-support pins on one side of end panels and both sides of intermediate panels.
- G. Tops: 3/4- to 1-inch- thick veneer-faced panels banded with 2- to 3-inch solid hardwood fasciae on one side for single-faced units and on two sides for double-faced units, fabricated to attach and tie together vertical panels.
- H. Back Panels: Veneer-faced panels, 1/4 inch thick, at each single-faced unit.
- I. Divider Panels: Veneer-faced panels, 1/4 inch thick, at each double-faced unit.

2.2 WOOD 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."
- D. Solid Wood: Clear hardwood lumber, selected for compatible grain and color.
 - 1. Wood Species and Cut: Northern grown hard maple.
 - 2. Staining and Finish: As selected by Architect from manufacturer's full range.
- E. Veneer-Faced Panels: HPVA HP-1, with face veneer of species indicated, with Grade A faces.
 - 1. Face Veneer Species and Cut: Northern grown hard maple.
 - 2. Staining and Finish: As selected by Architect from manufacturer's full range.

F. Edgebanding: Minimum 1/8-inch- thick solid wood of same species as face veneer.

2.3 GENERAL FINISH REQUIREMENTS

A. 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.

2.4 WOOD FINISHES

A. Finishing: Apply manufacturer's standard, baked, clear finish, consisting of a sealer and a conversion varnish or nitrocellulose lacquer topcoat. Sand and wipe clean between applications of sealer and topcoat.

2.5 ACCESSORIES

- A. Floor Anchors: Galvanized steel, post-installed expansion anchors power-actuated fasteners or threaded concrete screws.
- B. Wall Anchors: Manufacturer's standard galvanized-steel anchors.
- C. Filler Panels: Provide corner and intermediate wall filler panels; wood, in color and finish to match shelving. Locate where indicated to fill gaps at abutting shelving units.
- D. Sliding Book Supports: Movable, 3/16-inch- diameter wire supports, designed for insertion into track on shelf.
 - 1. Provide two per shelf.
- E. Shelf Label Holders: Clear plastic, 5 inches long, designed to snap over adjustable shelves.1. Provide one per shelf.
- F. Cardholders: Sized to hold 3-by-5-inch cards.
 - 1. Provide one for single-faced units and two for double-faced units at each end of each range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances, location of framing and reinforcements, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Vacuum finished floor and wet mop resilient flooring over which shelving is to be installed.
- B. Before installing wood-case shelving, condition materials to average prevailing humidity in installation areas for a minimum of 48 hours unless longer conditioning is recommended by manufacturer.

3.3 INSTALLATION

- A. Install library stack systems at locations indicated on Drawings and according to manufacturer's written instructions.
- B. Starter/Adder Units: Connect groups together with standard fasteners according to manufacturer's written instructions, using concealed fasteners where possible.
- C. Enclosure Panels: Install end panels and canopy tops with concealed fasteners.
- D. Level and plumb bookstack units to a tolerance of 1/8 inch in 96 inches.
- E. Filler Panels: Install corner and intermediate wall filler panels where indicated to fill gaps at abutting shelving units.
- F. Install type of shelves at locations indicated and at spacing indicated or, if not indicated, at equal spacing in each unit.

3.4 ANCHORAGE

A. Bookstack Anchorage: Install bookstacks using floor anchors, wall anchors, or top bracing in locations recommended by manufacturer and as indicated on Shop Drawings.

3.5 CLEANING AND PROTECTING

- 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. Protect installed products from damage during remainder of the construction period.

END OF SECTION 115123

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SECTION 115213 - PROJECTION SCREENS

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. Electrically operated, front-projection screens and controls.
- B. Related Requirements:
 - 1. Section 055000 "Metal Fabrications" for metal support framing for front-projection screens.

1.3 DEFINITIONS

- A. Gain: Ratio of light reflected from screen material to that reflected perpendicularly from a magnesium carbonate surface as determined per SMPTE RP 94.
- B. Half-Gain Angle: The angle, measured from the axis of the screen surface to the most central position on a perpendicular plane through the horizontal centerline of the screen where the gain is half of the peak gain.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show layouts and types of front-projection screens. Include the following:
 - 1. Drop lengths.
 - 2. Location of seams in viewing surfaces.
 - 3. Location of screen centerline relative to ends of screen case.
 - 4. Anchorage details, including connection to supporting structure for suspended units.
 - 5. Details of juncture of exposed surfaces with adjacent finishes.
 - 6. Location of wiring connections for electrically operated units.
 - 7. Wiring diagrams for electrically operated units.
 - 8. Accessories.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For front-projection screens to include in maintenance manuals.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Environmental Limitations: Do not deliver or install front-projection screens until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.7 COORDINATION

A. Coordinate layout and installation of front-projection screens with adjacent construction, including ceiling suspension systems, light fixtures, HVAC equipment, fire-suppression system, and partitions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Projection Screens: Obtain front-projection screens from single manufacturer. Obtain accessories, including necessary mounting hardware, from screen manufacturer.

2.2 ELECTRICALLY OPERATED, FRONT-PROJECTION SCREENS

- A. General: Manufacturer's standard units consisting of case, screen, motor, controls, mounting accessories, and other components necessary for a complete installation. Provide units that are listed and labeled as an assembly by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. 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. Controls: Remote, key-operated, three-position control switch installed in recessed device box with flush cover plate matching other electrical device cover plates in room where switch is installed.
 - 3. Motor in Roller: Instant-reversing motor of size and capacity recommended by screen manufacturer; with permanently lubricated ball bearings, automatic thermal-overload protection, preset limit switches to automatically stop screen in up and down positions, and positive-stop action to prevent coasting. Mount motor inside roller with vibration isolators to reduce noise transmission.
- 4. Screen Mounting: Top edge securely anchored to rigid metal roller and bottom edge formed into a pocket holding a 3/8-inch- diameter metal rod with ends of rod protected by plastic caps.
 - a. Roller for motor in roller is supported by vibration- and noise-absorbing supports.
- 5. Tab Tensioning: Provide units that have a durable low-stretch cord, such as braided polyester, on each side of screen that is connected to edge of screen by tabs to pull screen flat horizontally.
- B. Suspended, Electrically Operated Screens without Ceiling Closure, with Motor-in-Roller, and with Tab Tensioning: Units designed and fabricated for suspended mounting, with bottom of case entirely or partially open under screen compartment.
 - 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. Da-Lite Screen Company.
 - b. Draper Inc.
 - c. Stewart Filmscreen Corporation.
 - 2. Provide metal or metal-lined wiring compartment.
 - 3. Screen Case: Made from metal.
 - 4. Provide screen case with trim flange to receive ceiling finish as shown on drawings.
 - 5. Finish on Exposed Surfaces: Vinyl covering or baked enamel.

2.3 FRONT-PROJECTION SCREEN MATERIAL

- A. Matte Reflective Viewing Surface: Peak gain of not less than 1.3, and half-gain angle of at least 40 degrees from the axis of the screen surface.
- B. Material: Vinyl-coated, glass-fiber fabric.
- C. Mildew-Resistance Rating: Zero or 1 when tested according to ASTM G 21.
- D. Flame Resistance: Passes NFPA 701.
- E. Flame-Spread Index: Not greater than 75 when tested according to ASTM E 84.
- F. Seamless Construction: Provide screens, in sizes indicated, without seams.
- G. Edge Treatment: Black masking borders.
- H. Size of Viewing Surface: 72 by 96 inches.
- I. Provide extra drop length to compensate for ceiling slope and as needed for the bottom edge to be 36 inches above the floor.
 - 1. Color: Black.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install front-projection screens at locations indicated to comply with screen manufacturer's written instructions.
- B. Install front-projection screens with screen cases in position and in relation to adjoining construction indicated. Securely anchor to supporting substrate in a manner that produces a smoothly operating screen with vertical edges plumb and viewing surface flat when screen is lowered.
 - 1. Install low-voltage controls according to NFPA 70 and complying with manufacturer's written instructions.
 - a. Wiring Method: Install wiring in raceway except in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Use UL-listed plenum cable in environmental air spaces, including plenum ceilings. Conceal raceway and cables except in unfinished spaces.
 - 2. Test electrically operated units to verify that screen controls, limit switches, closures, and other operating components are in optimum functioning condition.
 - 3. Test manually operated units to verify that screen-operating components are in optimum functioning condition.

END OF SECTION 115213

SECTION 115313 - LABORATORY FUME HOODS

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. Bench-top laboratory fume hoods.
 - 2. Piping and wiring within fume hoods for service fittings, light fixtures, fan switches, and other electrical devices included with fume hoods.
 - 3. Fume hood base cabinets.
 - 4. Work tops within fume hoods.
 - 5. Laboratory sinks and cup sinks in fume hoods.
 - 6. Water, laboratory gas, and electrical service fittings in fume hoods.
- B. Related Requirements:
 - 1. Section 061053 "Miscellaneous Rough Carpentry" for wood blocking for anchoring fume hoods.
 - 2. Section 092216 "Non-Structural Metal Framing" for reinforcements in metal-framed partitions for anchoring fume hoods.
 - 3. Section 096513 "Resilient Base and Accessories" for resilient base applied to fume hood base cabinets.
 - 4. Section 230593 "Testing, Adjusting, and Balancing for HVAC" for field quality-control testing of fume hoods.

1.3 COORDINATION

- A. Coordinate layout and installation of framing and reinforcements for lateral support of fume hoods.
- B. Coordinate installation of fume hoods with laboratory casework and other laboratory equipment.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For laboratory fume hoods.
 - 1. Include plans, elevations, sections, and attachment details.

- 2. Indicate details for anchoring fume hoods to permanent building construction including locations of blocking and other supports.
- 3. Indicate locations and types of service fittings together with associated service supply connection required.
- 4. Indicate duct connections, electrical connections, and locations of access panels.
- 5. Include roughing-in information for mechanical, plumbing, and electrical connections.
- 6. Show adjacent walls, doors, windows, other building components, laboratory casework, and other laboratory equipment. Indicate clearances from the above items.
- 7. Include layout of fume hoods in relation to lighting fixtures and air-conditioning registers and grilles.
- 8. Include coordinated dimensions for laboratory equipment specified in other Sections.
- C. Samples: For fume hood exterior finishes interior lining and epoxy work tops.
- D. Delegated-Design Submittal: For fume hoods indicated to comply with seismic performance requirements and design criteria.

1.5 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: Showing compliance with specified performance requirements for asmanufactured containment and static pressure loss, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency.
- B. Source quality-control reports.
- C. Field quality-control reports.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish complete touchup kit for each type and color of fume hood finish provided. Include fillers, primers, paints, and other materials necessary to perform permanent repairs to damaged fume hood finish.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect finished surfaces during handling and installation with protective covering of polyethylene film or another suitable material.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install fume hoods until building is enclosed, wet work and utility roughing-in are complete, and 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 fume hoods by field measurements before being enclosed, and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Bypass Fume Hoods with Stainless Steel or Fiberglass Exterior:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Campbell Rhea.
 - b. Fisher Hamilton.
 - c. Kewaunee Scientific Corporation.
 - d. Labconco Corporation.
- B. Source Limitations: Obtain laboratory fume hoods from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Containment: Provide fume hoods that comply with the following when tested according to ASHRAE 110:
- B. Static-Pressure Loss: Not more than 1/2-inch wg at 100-fpm face velocity with sash fully open when measured at four locations 90 degrees apart around the exhaust duct and at least three duct diameters downstream from duct collar.

2.3 FUME HOODS

- A. Product Standards: Comply with SEFA 1, "Laboratory Fume Hoods Recommended Practices."
- B. Bypass Fume Hoods: Provide bypass fume hoods. Compensating bypass above the sash opens as sash is closed. Provide sufficient bypass capacity so that face velocity with sash opening of 6 inches does not exceed 3 times the face velocity with sash fully open.

2.4 MATERIALS

- A. Steel Sheet: Cold-rolled, commercial steel (CS) sheet, complying with ASTM A 1008/ A 1008M; matte finish; suitable for exposed applications.
- B. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304, stretcher-leveled standard of flatness.
- C. Glass-Fiber-Reinforced Polyester: Polyester laminate with a chemical-resistant gel coat on exposed faces, and having a flame-spread index of 25 or less according to ASTM E 84.
- D. Epoxy: Factory molded, modified epoxy-resin formulation with smooth, nonspecular finish.

- 1. 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.
 - f. Flame-Spread Index: 25 or less according to ASTM E 84.
- 2. Chemical Resistance: As follows 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).
- 3. Color: As selected by Architect from manufacturer's full range.
- E. Polypropylene: Unreinforced polypropylene complying with ASTM D 4101, Group 01, Class 1, Grade 2.
- F. Glass: Clear, laminated tempered glass complying with ASTM C 1172, Kind LT, Condition A, Type I, Class I, Quality-Q3; with clear, polyvinyl butyral interlayer.
 - 1. Safety Glass: Provide products complying with testing requirements in 16 CFR 1201 for Category II materials.
 - 2. Permanently mark safety glass with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction or the manufacturer. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- 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. Fasteners: Provide stainless-steel fasteners where exposed to fumes.

2.5 FABRICATION

- A. General: Assemble fume hoods in factory to greatest extent possible. Disassemble fume hoods only as necessary for shipping and handling limitations. Fume hoods shall be capable of being partly disassembled as necessary to permit movement through a 35-by-79-inch door opening.
- B. Stainless-Steel Exterior: Fabricate from stainless-steel sheet, 0.050 inch thick, with component parts screwed together to allow removal of end panels, front fascia, and airfoil and to allow access to plumbing lines and service fittings.
- C. Fiberglass Exterior: Fabricate from glass-fiber-reinforced polyester components not less than 1/4 inch thick, bonded together to maximum extent practical. Trim edges of panels with PVC extrusion. Limit removable parts to access panels, front fascia, and airfoil.
- D. Product Option: Provide either steel or fiberglass exterior as specified above.

- E. Ends: Fabricate with double-wall end panels without projecting corner posts or other obstructions to interfere with smooth, even airflow. Close area between double walls at front of fume hood and as needed to house sash counterbalance weights, utility lines, and remote-control valves.
- F. Splay top and sides of face opening to provide an aerodynamic shape to ensure smooth, even flow of air into fume hood.
- G. Interior Lining: Provide one of the following unless otherwise indicated:
 - 1. Glass-fiber-reinforced polyester, not less than 3/16 inch thick.
 - 2. Epoxy, not less than 1/4 inch thick.
 - 3. Glass-fiber-reinforced epoxy, not less than 3/16 inch thick.
- H. Lining Assembly: Unless otherwise indicated, assemble with stainless-steel fasteners or epoxy adhesive, concealed where possible. Seal joints by filling with chemical-resistant sealant during assembly.
 - 1. Fasten lining components together with steel cleats or angles to form a rigid assembly to which exterior panels are attached.
 - 2. Punch fume hood lining side panels to receive service fittings and remote controls. Provide removable plug buttons for holes not used for indicated fittings.
- I. Molded Glass-Fiber-Reinforced Polyester Lining: Molded unit consisting of end panels, back panel, preset rear baffle, and top bonded together into a single piece; reinforced to form a rigid assembly to which exterior is attached.
 - 1. Punch fume hood lining side panels to receive service fittings and remote controls. Provide removable plug buttons for holes not used for indicated fittings.
- J. Rear Baffle: Unless otherwise indicated, provide baffle, of same material as fume hood lining, at rear of hood with openings at top and bottom. Secure baffle to cleats at rear of hood with stainless-steel screws. Fabricate baffle for easy removal for cleaning behind baffle.
 - 1. Provide preset baffles.
 - 2. Provide epoxy-coated, stainless-steel screen at bottom baffle opening to prevent paper from being drawn into the exhaust plenum behind baffles.
- K. Exhaust Plenum: Full width of fume hood and with adequate volume to provide uniform airflow from hood, of same material as hood lining, and with duct stub for exhaust connection.
 - 1. Duct-Stub Material: Epoxy-coated steel stainless steel or glass-fiber-reinforced polyester.
- L. Bypass Grilles: Provide grilles at bypass openings of fume hoods.
- M. Sashes: Provide operable sashes of type indicated.
 - 1. Fabricate from 0.050-inch- thick stainless steel 0.048-inch- thick steel sheet, with chemical-resistant finish or PVC extrusions. Form into four-sided frame with bottom corners welded and finished smooth. Make top member removable for glazing replacement. Set glazing in chemical-resistant, U-shaped gaskets.
 - 2. Glaze with laminated safety glass.
 - 3. Counterbalance vertical-sliding sash with sash weight and stainless-steel cable system to hold sash in place regardless of position. Provide ball-bearing sheaves, plastic glides in stainless-steel guides, and stainless-steel lift handles. Provide rubber bumpers at top and bottom of each sash unit.

- N. Airfoil: Unless otherwise indicated, provide airfoil at bottom of fume hood face opening with 1inch space between airfoil and work top. Sash closes on top of airfoil, leaving 1-inch opening for air intake. Airfoil directs airflow across work top to remove heavier-than-air gases and to prevent reverse airflow.
 - 1. Fabricate airfoil from stainless steel.
- O. Light Fixtures: Provide vaporproof, two-tube, rapid-start, fluorescent light fixtures, of longest practicable length; complete with tubes at each fume hood. Shield tubes from hood interior with 1/4-inch- thick laminated glass or 3-mm-thick tempered glass, sealed into hood with chemical-resistant rubber gaskets. Provide units with fluorescent tubes easily replaceable from outside of fume hood.
 - 1. Provide LED light source with color temperature of 4000 K and minimum color-rendering index of 85.
- P. Filler Strips: Provide as needed to close spaces between fume hoods or fume hood base cabinets and adjacent building construction. Fabricate from same material and with same finish as fume hoods or fume hood base cabinets, as applicable.
- Q. Ceiling Extensions: Provide filler panels matching fume hood exterior to enclose space above fume hoods at front and sides of fume hoods and extending from tops of fume hoods to ceiling.
- R. Finished Back Panels: Where rear surfaces of fume hoods are exposed to view, provide finished back panels matching rest of fume hood enclosure.
- S. Comply with requirements in other Sections for installing water and laboratory gas service fittings, piping, electrical devices, and wiring. Install according to Shop Drawings. Securely anchor fittings, piping, and conduit to fume hoods unless otherwise indicated.

2.6 FUME HOOD BASE CABINETS WORK TOPS SINKS AND SERVICE FITTINGS

- A. Comply with Section 123553.19 "Wood Laboratory Casework."
- B. Work Tops: Epoxy.
 - 1. Work-Top Configuration: Raised (marine) edge with beveled or rounded edge and corners.
 - 2. Where acid storage cabinets are indicated beneath fume hoods, provide holes in work tops as need to accommodate cabinet vents.
 - 3. Where epoxy sinks occur in epoxy work tops, provide integral sinks bonded to tops with invisible joint line.
 - 4. Where epoxy sinks occur in phenolic-composite work tops, provide drop-in sinks with 1/4-inch thick lip around perimeter of sink.
- C. Cup Sinks: Epoxy, 3-by-6-inch oval.
 - 1. Provide with polypropylene strainers and integral tailpieces.

2.7 CHEMICAL-RESISTANT FINISH

- A. General: Prepare, treat, and finish welded assemblies after welding. Prepare, treat, and finish components that are to be assembled with mechanical fasteners before assembling. Prepare, treat, and finish concealed surfaces same as exposed surfaces.
- B. Preparation: Clean steel surfaces, other than stainless steel, of mill scale, rust, oil, and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it.
- C. Chemical-Resistant Finish: Immediately after cleaning and pretreating, apply fume hood manufacturer's standard two-coat, chemical-resistant, 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.
 - 1. Chemical and Physical Resistance of Finish System: Finish complies with acceptance levels of cabinet surface finish tests in SEFA 8M. Acceptance level for chemical spot test shall be no more than four Level 3 conditions.
 - 2. Colors for Fume Hood Finish: As selected by Architect from manufacturer's full range.

2.8 ACCESSORIES

- A. Airflow Indicator and Alarm: Provide each fume hood with manufacturer's standard airflow indicator with audible and visual alarm that activates when airflow sensor reading is outside of preset range.
- B. Airflow Indicator: Provide each fume hood with airflow indicator of one of the following type(s):
 - 1. Indicator Type: Direct-reading aneroid (Magnehelic-type) gage that measures exhaust duct static pressure of fume hood as an indication of airflow.
 - 2. Indicator Type: Thermal anemometer that measures fume hood face velocity and indicates whether it is below normal, normal, or above normal.
 - 3. Indicator Type: Thermal anemometer that measures fume hood face velocity and displays data as digital readout.
- C. Airflow Alarm: Provide fume hoods with audible and visual alarm that activates when airflow sensor reading is outside of preset range.
 - 1. Provide with thermal-anemometer or aneroid (Magnehelic-type) gage airflow sensor.
 - 2. Provide with reset and test switches.
 - 3. Provide with switch that silences audible alarm and automatically resets when airflow returns to within preset range.
- D. Sash Stops: Provide fume hoods with sash stops to limit hood opening to 50 percent of sash height. Sash stops can be manually released to open sash fully for cleaning fume hood and for placing large apparatus within fume hood.
- E. Bypass Grille Blank-off Panel: Provide fume hoods with blank-off panel on bypass grille designed for use with sash stops to reduce exhaust air volume and provide design face velocity with sash at 50 percent open position.
- F. Service Fittings:
 - 1. Water: One remote-control, rigid, gooseneck, single-service faucet(s) with vacuum breaker and removable serrated outlet.
 - 2. Laboratory Gas for Gas (Fuel Gas): One flange-type fitting(s) with outlet and remotecontrol valve.

- 3. Electrical: One duplex receptacle, switch, and pilot light at both end(s) of hood, mounted on exterior front face of end pilaster.
 - a. Provide GFCI receptacles.

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 fume hoods.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install fume hoods according to manufacturer's written instructions. Install level, plumb, and true; shim as required, using concealed shims, and securely anchor to building and adjacent laboratory casework. Securely attach access panels but provide for easy removal and secure reattachment. Where fume hoods abut other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical.
- B. Comply with requirements for installing water and laboratory gas service fittings and electrical devices.
 - 1. Install fittings according to Shop Drawings, installation requirements in SEFA 2.3, and manufacturer's written instructions. Set bases and flanges of sink and work top-mounted fittings in sealant recommended by manufacturer of sink or work-top material. Securely anchor fittings to fume hoods unless otherwise indicated.

3.3 FIELD QUALITY CONTROL

- A. Field test installed fume hoods according to ASHRAE 110 to verify compliance with performance requirements.
 - 1. Adjust fume hoods, hood exhaust fans, and building's HVAC system, or replace hoods and make other corrections until tested hoods perform as specified.
 - 2. After making corrections, retest fume hoods that failed to perform as specified.

3.4 ADJUSTING AND CLEANING

- A. Adjust moving parts for smooth, near silent, accurate sash operation with one hand. Adjust sashes for uniform contact of rubber bumpers. Verify that counterbalances operate without interference.
- B. Clean finished surfaces, including both sides of glass; touch up as required; and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.

END OF SECTION 115313

SECTION 116143 - STAGE CURTAINS

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. Stage curtains, scrims, and drops.
 - 2. Draw-curtain tracks.
- B. Related Requirements:
 - 1. Section 055000 "Metal Fabrications" for steel framing and supports for stage-curtain systems.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product and the following:
 - 1. Tracks: Capability of each track to support the weight and operation of curtains that it supports.
- 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 attachment details of curtains.
 - 2. Include fabric assembly and hanging details.
 - 3. Dimension operating clearances.
 - 4. Include documentation of capacity of each batten, track, attachment, and rigging component to support loads.
- C. Samples for Initial Selection: For each type of stage curtain indicated. Include color charts showing full range of colors, textures, and patterns available, together with 12-inch- square Sample (any color) of each fabric type and seam.

1.4 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. Structural members to which tracks, battens, and other stage-curtain equipment will be attached.
- 2. Locations of lighting fixtures and cabling, ductwork, piping, and sprinklers.
- 3. Rigging equipment for stage equipment.
- 4. Access panels.
- B. Qualification Data: For Installer.
- C. Product Certificates: For the following, from manufacturer:
 - 1. Fabric: Provide name of flame-retardant chemical used, identification of applicator, treatment method, application date, allowable life span for treatment, and details of any restrictions and limitations.
 - 2. Rigging: Compliance of suspended battens and tracks with requirements.
- D. Sample Warranty: For manufacturer's special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For stage curtains and rigging to include in operation and maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer of stage curtains.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not install stage curtains 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. Field Measurements: Verify locations of supporting structural elements and construction contiguous with stage curtains and rigging by field measurements before fabrication.

1.8 WARRANTY

- A. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace components of stage-curtain systems that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, faulty operation of rigging.
 - 2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: Provide stage curtains meeting the following requirements as determined by testing identical products by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Flame-Propagation Resistance: Passes NFPA 701.
 - a. Permanently attach label to each fabric of curtain assembly indicating whether fabric is inherently and permanently flame resistant or is treated with flame-retardant chemicals and whether it requires retreatment after cleaning or after a designated time period of use.
 - b. Permanently attach 12-inch- square swatch of same fabric and dye lot for each fabric of a curtain assembly to the back of assembly for use as fire-resistance test strip.

2.2 CURTAIN FABRICS

- A. General: Provide fabrics inherently and permanently flame resistant or chemically flame resistant by immersion treatment according to performance requirements indicated. Provide fabrics of each type and color from same dye lot.
- B. Muslin: Sheer, plain-woven fabric.
 - 1. Fabric: 100 percent Trevira weighing not less than 11.75 oz./linear yd.; inherently and permanently flame resistant; 106-inch minimum width.
 - 2. Color: Black.

2.3 CURTAIN-BOTTOM WEIGHTS

A. Individual Weights: Curtain manufacturer's standard segmented weights to suit each curtain type and location.

2.4 CURTAIN FABRICATION

- A. General: Affix permanent label, stating compliance with requirements of authorities having jurisdiction, in accessible location on fabric not visible to audience. Provide vertical seams unless otherwise indicated. Arrange vertical seams so they do not fall on faces of pleats. Do not use fabric cuts less than one-half width.
- B. Vertical and Top Hems: Machine sew hems as follows unless otherwise indicated:
 - 1. Vertical Hems: Minimum 2 inches wide, with not less than a 1-inch tuck and with no selvage material visible from front of curtain. Sew open ends of hems closed.

- 2. Turnbacks: Provide leading- and trailing-edge turnbacks for traveler curtains, formed by folding back not less than 12 inches of face fabric, with not less than a 1-inch tuck, and vertically secured by sewing.
- 3. Top Hems: Reinforced by double-stitching 3-1/2-inch- wide, heavy, jute or laminated synthetic webbing to top edge on back side of curtain with not less than 2 inches of face fabric turned under.
- C. Fullness:
 - 1. 50 Percent Fullness: Provide fullness, exclusive of turnbacks and hems, by tying or hooking together adjacent grommets into round pleats spaced at 12 inches o.c. along top hem reinforcement.
- D. Grommets: Brass, No. 3, or No. 4.
 - 1. Black Curtains: Provide brass or aluminum grommets with black finish.
 - 2. Pleated Curtains: Double grommets for each round pleat and place 1 inch from corner of curtain; for snap hooks or S-hooks.
- E. Bottom Hems: Machine sew hems as follows unless otherwise indicated:
 - 1. For Curtains With Fullness:
 - a. Floor-Length Curtains: Hems not less than 6 inches deep, with 1-inch weight tape sewn to top seam of the bottom hem, clear of the finished bottom edge, and with open ends of hems sewn closed.

2.5 CURTAIN ACCESSORIES

A. S-Hooks: Manufacturer's standard heavy-duty plated-wire hooks, not less than 2 inches long.

2.6 ALUMINUM CURTAIN TRACK

- A. Aluminum Track: Extruded aluminum, ASTM B 221; alloy and temper as recommended by manufacturer for strength and corrosion resistance; black paint finish; complete with necessary accessories for support and operation.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Automatic Devices Company.
 - b. JR Clancy, Inc.
 - c. The Janson Industries.
 - 2. Curved Track: Fabricate curved portions of track in shop or on-site.
 - 3. Aluminum Thickness: As recommended by manufacturer for loads and operation.
- B. Curtain Rails: Single or double curtain capacity as indicated. Provide end stops for track rails.
- C. Curtain Carriers: Standard carriers with a pair of nylon-tired ball-bearing wheels riveted parallel to plated-steel body. Equip carriers with rubber or neoprene bumpers and nylon glide strips to

reduce noise, and heavy-duty, plated-steel swivel eye for attaching curtain snap or S-hook. Provide quantity of curtain carriers sufficient for track length, to suit curtain fabrication.

- 1. Master Curtain Carriers: One master carrier, for each leading curtain edge, with two pairs of nylon-tired ball-bearing wheels riveted parallel to plated-steel body.
- D. Curved-Suspended-Track Stiffener: NPS 1-1/2 steel pipe for supporting both sections of suspended curved tracks; curved to match track.
- E. Clamp and Bracket Hangers: Steel clamps and brackets of sufficient strength required to support loads for attaching track to overhead support.
- F. Track-Lap Clamp: Metal to match track channel for attaching two tracks at center overlap.
- G. Manual Walk-Along Operation: Fabricate curtain track without cord, cable, pulleys, or floor pulley.

2.7 CURTAIN RIGGING

- A. Battens: Fabricated from steel pipe with a minimum number of joints. Connect pipe at joints with a drive-fit pipe sleeve not less than 18 inches long, and secure with four flush rivets, plug welds, threaded couplings, or another equally strong method.
 - 1. Steel Pipe: ASTM A 53/A 53M, Grade A, standard weight (Schedule 40), black, NPS 1-1/2 nominal diameter unless otherwise indicated.
 - 2. Finish: Shop painted black, with a 1-inch- wide yellow stripe at center of each batten.
- B. Supports, Clamps, and Anchors: ASTM A 153/A 153M, Class B, galvanized sheet steel in manufacturer's standard thicknesses, galvanized after fabrication.
- C. Trim and Support Cable: 1/4-inch- diameter, 7x19 galvanized-steel cable with a breaking strength of 7000 lb. Provide fittings according to cable manufacturer's written instructions for size, number, and method of installation, including a drop-forged galvanized turnbuckle to allow for leveling.
- D. Trim and Support Chain: ASTM A 391/A 391M, Grade 80, hardened alloy steel chain rated for overhead lifting.
- E. Inserts, Bolts, Rivets, and Fasteners: Manufacturer's standard corrosion-resistant units.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for supporting members, blocking, installation tolerances, clearances, and other conditions affecting performance of stage-curtain work.

- B. Examine inserts, clips, blocking, or other supports required to be installed by others to support tracks and battens.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.
- 3.2 INSTALLATION, GENERAL
 - A. Install stage-curtain system according to curtain and track manufacturer's written instructions.

3.3 BATTEN INSTALLATION

- A. Install battens by suspending at heights indicated with trim and supports spaced to support load, except do not exceed 10 feet between supports.
 - 1. Chain Trim and Support: Secure chain with load-rated terminations.

3.4 TRACK INSTALLATION

- A. Ceiling-Mounted Track: Drill track at intervals not greater than manufacturer's written instructions for spacing, and fasten directly to structure.
- B. Batten-Hung Track: Install track by suspending from pipe batten with manufacturer's track clamp hangers attached to batten pipe clamps at track-support spacing, according to manufacturer's written instructions.
- C. Track-Support Spacing: According to manufacturer's recommendations for applied loads, but not exceeding the following dimensions between supports:
 - 1. Curved Walk-Along Track: 48 inches, with additional supports at curves and splices.

3.5 CURTAIN INSTALLATION

A. Track Hung: Secure curtains to track carriers with S-hooks.

3.6 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain stage curtains and tracks.

END OF SECTION 116143

SECTION 116623 - 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. Indoor basketball backstops complete with backboard, goal, net, and anchorages.
 - 2. Scoreboard.
 - 3. Safety wall padding.
 - 4. Volleyball equipment.

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 096466 "Wood Athletic Flooring" for game lines and markers.
- 3. Section 116653 "Gymnasium Dividers."

1.3 DEFINITIONS

- A. FIBA: Federation Internationale de Basketball Amateur (The International Basketball Federation).
- B. FIVB: Federation Internationale de Volleyball (The International Volleyball Federation).
- C. NCAA: The National Collegiate Athletic Association.
- D. NFHS: National Federation of State High School Associations.
- E. USAV: USA Volleyball.

1.4 ACTION SUBMITTALS

- A. Product Data: Submit manufacturer's descriptive literature and installation instructions, and recommended procedures.
- B. Sustainable Design Submittals:
 - 1. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.
 - 2. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.
- C. Shop Drawings: Prior to fabrication and delivery of materials, submit shop drawings clearly indicating:

GYMNASIUM EQUIPMENT

- 1. Construction details, details of anchorage and mounting devices, size and arrangement of equipment, layout and dimensions.
- D. Samples for Verification: For the following products:
 - 1. Pad Fabric: Wall padding not less than 3 inches 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, or an entity that employs installers and supervisors who are trained and approved by manufacturer.

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

- A. Basis-of-Design Product: Subject to compliance with requirements, provide g ymnasium basketball backstops and safety wall padding products as manufactured by Porter Athletic Equipment Company, or comparable products by one of the following:
 - 1. AALCO Manufacturing.
 - 2. Draper Inc.
 - 3. Jaypro Sports, LLC.
 - 4. Performance Sports Systems.
 - 5. Porter Athletic Equipment Company..

2.2 BASKETBALL BACKSTOPS

- A. Type and Manufacturer: Ceiling supported, forward fold, single-mast drop frame and rear braced backstop assembly shall be Porter Model No. 917 Center-Strut.
- B. Vertical Front Drop Frame Assembly: One-piece, all welded construction, consisting of a main, center mast of 6-5/8 inch O.D. heavy wall structural steel support tube with 2-1/2 inches x 1-1/2 inches rectangular steel tubing diagonal sway-braces. The main frame shall be supported to the rear by an inclined folding brace incorporating a dual, formed steel hinge with an integral torsion spring for maximum stability.
- C. Finish: All backstop pipe parts, etc., shall receive a factory applied enamel paint finish, in color as later selected by A/E.
- D. Overhead Support Assembly: Suspension of ceiling-supported backstops shall be from spans of 3 inch SCH 40 (3-1/2 inches O.D.) structural steel pipe, fastened to the roof framing system with formed and welded steel beam clamps and when appropriate, to masonry walls with steel fittings onto anchored wood pads of 2 x 8, #1 dense yellow pine. Spans exceeding 16 feet shall be of 6-5/8 inches O.D. x 0.188 inch thick wall steel tubing.
- E. Electric Cable Hoist: Each folding backstop shall be operated by a ceiling mounted, remote control, Porter Model No. 707 electric winch. Hoist motor shall be a capacitor- start type, 60 cycle, 120 volt, single phase, 3/4 HP to provide 15 FPM cable speed, with thermal overload protection manufactured to NEMA specifications, designed to hold backstop at any position when raising and lowering. The motor shall be controlled by a special flush, wall mounted key

switch that can be instantly reversed, providing a safety provision so as not to damage motor or hoist. Hoist shall be mechanically connected to a special rotary travel controller.

- F. Hoisting Cable: 1/4 inch 7 x 19 galvanized aircraft cable shall operate through steel pulleys. Pulleys shall have 3-1/2 inch O.D. deep grooved, solid steel sheaves turning on and oil-impregnated bronze bushing and hanging from a 360 degree swiveling clevis hanger.
- G. Backboards Main Court: Porter Model No. 209, rectangular glass backboard, meeting the National Basketball Committee specifications.
 - 1. Backboard: 72 inches x 42 inches x 1/2 inch thick fully tempered (heat treated) glass section with uniform load and impact strength, and cushioned in frame with continuous vinyl- rubber channel.
 - 2. Backboard Frame: Welded, unitized construction fabricated from heavy wall rectangular steel tubing, aluminum-faced for professional appearance. Unitized frame shall be designed for use only on direct goal mounting (Center-Strut) type support structures.
 - 3. Unitized Frame: Shall be designed to allow the bottom two goal mount holes to pass beneath the glass section to further alleviate stress on the glass. Backside of goal mount structure shall be provide with two mounting holes and hardware to independently secure to a direct mount goal feature which relieves all stress and shock on the backboard frame conforming to latest NCAA Rules. Backboard frame shall be furnished with heavy steel gusset plates in the top two corners incorporating key slots for mounting the backboard to direct-mount type support structures. Rear backboard frame shall be finished in a durable neutral "Gray" powder coated finish.
 - 4. Glass board shall have an official "White" border and target area, "fired-in" permanently on front side of glass section so that it cannot wear away. Glass section shall be secured to unitized rear frame by means of an attractive, L- shaped brushed aluminum extrusion for optimum durability. Front perimeter frame shall be secured to unitized rear frame with structural truss head rivets. Glass section shall be fitted with shock absorbing neoprene material to cushion and protect the glass section. Goal mounting holes (4) to be on standard 5 inch (horizontal) x 4-1/2 inch (vertical) mounting centers for mounting goals.
 - 5. Backboard Padding: Porter Model No. 00326-000 PRO PAD. Pad shall fit any official size (72 inches wide) glass backboard, consisting of two pieces with molded type square corners for maximum safety, appearance and durability pads shall be molded from Polyurethane Foam (9 lb. Density) with extremely durable integral skin (self-skinning) minimizing the possibility of cracks and tears, NBA, NCAA, NFSHSA approved. A positive bolt-on type attachment shall be provided to eliminate glue or peel and stick tape type attachment methods. Pad sections shall be provided with integral, molded in steel attachment channel sections which are secured to the backboard with special self-drilling, self-tapping attachment hardware provided in kit.
 - 6. Height Adjustment: Porter Model No. 00901-506, to adjust goal height from 8 ft. to 10 ft., with clearly marked height settings.
- H. Backboards –Side Courts: Porter Model No. 267, fan shaped, molded fiberglass backboard, meeting the National Basketball Committee specifications.
 - 1. Backboard: 54 inches x 39 inches x 1/2 inch thick molded from fiberglass.
 - 2. Backboard Frame: Welded, unitized construction fabricated from heavy wall rectangular steel tubing, aluminum-faced for professional appearance. Unitized frame

shall be designed for use only on direct goal mounting (Center-Strut) type support structures.

- 3. Unitized Frame: Shall be designed to allow the bottom two goal mount holes to pass beneath the glass section to further alleviate stress on the glass. Backside of goal mount structure shall be provide with two mounting holes and hardware to independently secure to a direct mount goal feature which relieves all stress and shock on the backboard frame conforming to latest NCAA Rules. Backboard frame shall be furnished with heavy steel gusset plates in the top two corners incorporating key slots for mounting the backboard to direct-mount type support structures. Rear backboard frame shall be finished in a durable neutral "Gray" powder coated finish.
- 4. Backboard Padding: Porter Model No. 00326-000 PRO PAD. Pad shall fit any official size (72 inches wide) glass backboard, consisting of two pieces with molded type square corners for maximum safety, appearance and durability pads shall be molded from Polyurethane Foam (9 lb. Density) with extremely durable integral skin (self-skinning) minimizing the possibility of cracks and tears, NBA, NCAA, NFSHSA approved. A positive bolt-on type attachment shall be provided to eliminate glue or peel and stick tape type attachment methods. Pad sections shall be provided with integral, molded in steel attachment channel sections which are secured to the backboard with special self-drilling, self-tapping attachment hardware provided in kit.
- 5. Height Adjustment: Porter Model No. 00901-506, to adjust goal height from 8 ft. to 10 ft., with clearly marked height settings.
- I. Goal: Porter Model No. 00225-000 high strength Super Goal, face mounted to backboard, with inside ring positioned 6" from face of backboard by heavy, L-shaped, formed steel mounting plated with 5 inch x 4 inch and 5 inch x 4-1/2 inch mounting hole centers for front mounting on glass backboard, meeting the National Basketball Committee specifications.
 - 1. 5/8 inch diameter cold drawn alloy steel rod rim with 18 inches inside diameter formed ring.
 - 2. Provide "no-tie" welded clips, and complete with a high quality "White" nylon net.
 - 3. Goal shall be finished with an electrostatic powder coating of official "Orange".
- J. Basketball Backstop Safety Lock: Porter #10797-100 "SAF-STRAP", inertia sensitive to automatically lock a basketball backstop in position at any time in storage or during the raising or lowering due to a sudden surge of speed created by a possible malfunction of the hoisting apparatus, such as the winch, cable, pulleys, support fittings, etc.
 - 1. "Saf-strap" shall incorporate a 2-inch wide nylon belt rated at 6,000 pound breaking strength and entire unit shall be tested to withstand a 1,500 pound free fall load. Strap shall extend a maximum of 35 ft. and shall be automatically retracted and stored on a reel equipped with a special negator type constant force spring. Operation and locking action of strap shall be by means of integral cast components which are activated by centrifugal force to lock a backstop before unit travels 12-inch of free fall. Unit shall incorporate a fully automatic reset requiring no poles, ropes, levers or buttons.
 - 2. Unit shall be furnished with a universal mounting bracket to fit on any size pipe mounted either parallel or at right angles to unit. Belt shall be supplied with a special belt connection bracket for ease of securing directly to the basketball backstop.

2.3 SCOREBOARD

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Model 2780 manufactured by Nevco, Inc. or comparable product by one of the following:
 - 1. All American Scoreboards.
 - 2. Fair-Play Scoreboards.
 - 3. Sportable Scoreboards.
- B. Scoreboard Type: Interior, electronic basketball/volleyball multisport scoreboard with two integral horns and LED displays for time, scores, period, number for player fouling with personal fouls, team fouls, bonus and double bonus indicators and next possession arrows; 100% electronic.
 - 1. Size: 10 feet long x 5 feet high x 8 inches deep.
 - 2. Approximate hanging weight: 135 pounds.
 - 3. LED displays:
 - a. Timing: Super Bright Red 13 inches high digits with lit colon.
 - b. Team Scores: Super Bright Amber 13 inches high digits.
 - c. Period: Super Bright Amber 9 inches high digits.
 - d. Player Number and Fouls: Super Bright Red 9 inches high digits.
 - e. Team Fouls: Super Bright Amber 9 inches high digits.
 - f. Next Possession: Super Bright Amber arrow for each team.
 - g. Bonus and double bonus in the form of a 4 inch Super Bright Red LED "B".
 - 4. Suspension mounting attachments will be included.
 - 5. Power requirement: 168 Watts, MAX, 100-240 Volts AC w/Power Factor Correction.
 - 6. Provide each scoreboard or accessory with control cable of length required. Electrical junction boxes, conduits, mounting hardware, and other accessories as required for installation are to be provided by others.

2.4 VOLLEYBALL EQUIPMENT

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Porter Model No. 00870-100, 3-1/2 inch diameter floor sleeve (chrome), with cover plate or comparable product by one of the following:
 - 1. Dunsen.
 - 2. Senoh.

1.

- 3. Sports Imports.
- B. Net: 32 feet long; one per pair of paired post standards; and as follows:
 - Width and Mesh: 36 inches with 4-1/2-inch-square mesh made of black polyester string.
 - a. Hem Band Edges: White, 2-inch- wide top binding; black, 1-inch-wide bottom and side bindings; tie offs at top and bottom of each side end of net; and 1/4-inch-diameter rope, at least 42 feet long, threaded through top hem of binding.
 - 2. Dowels: Not less than 1/2-inch- diameter fiberglass or 1-inch- diameter wood. Provide two dowels per net threaded through each side hem sleeve for straightening net side edges.
 - 3. Net Antennas: 3/8-inch- diameter, high-tensile-strength, extruded-fiberglass or plastic rods, 72 inches long, extending above top hem band of net, with alternating white and red bands according to competition rules. Provide two antennas per net.
 - 4. Boundary Tape Markers: 2-inch- wide white strip with sleeve for securing net antenna, secured to net top and bottom with hook-and-loop attachment. Provide two tape markers per net for marking court boundaries.

C. Net-Tensioning System: Designed to adjust and hold tension of net. Fully enclosed, nonslip manufacturer's standard-type winch with cable length and fittings for connecting to net lines, positive-release mechanism, and manufacturer's standard handle. Mount net tensioner on post standard at side away from court. Provide end post with post top pulley. Provide opposing post with welded-steel loops, hooks, pins, or other devices for net attachment and post top grooved line guide.

2.5 SAFETY WALL PADDING

- A. Type and Manufacturer: Safety wall padding basis of design is Porter 90350-326, foam filled vinyl protection panels, in colors as later selected by Architect.
- B. Panels: Padding panels shall be 24 by 70 inches, constructed of 2 inch thick polyurethane foam, cemented to 3/8 inch thick plywood backing board and covered with flame retardant, tough 18 ounce reinforced polyester vinyl covering, folded and stapled securely to back of plywood.
 - 1. A 1 inch attaching margin shall be provided at top and bottom for securing panels to wall.
 - 2. Attach to wall using chrome finishing washers, No. 8 chrome screws and drop in masonry anchors. Provide 6 fasteners per 2-ft. wide panel minimum.
- C. All cutouts in panels, for such items as electrical outlets, switches, water fountains, etc., shall be made in field to fit job conditions, with extra vinyl provided.

2.6 GYMNASIUM CONTROL SYSTEMS

- A. Key Switches:
 - 1. Wall-Mounted Dual-Key Switch: Switch with separate "up" and "down" keys to prevent improper operation of system. Single key systems or "toggle" type switches are not approved.
 - 2. Momentary Switch: Switch automatically returns to "off" position if released.
 - 3. Cover Plate: Flush-mounted stainless steel cover plate with manufacturer's label including operating instructions.
 - 4. Key Switches: Provide for all electrically operated equipment. Key switches for all gymnasium equipment to be furnished identical.

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, accurate locations of connections to building electrical system, 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, and core drill floor for inserts after game lines are applied.
 - 2. Floor Insert Elevation: Coordinate installed heights of floor insert with installation and field finishing 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. Wall Safety Pads: Mount with bottom edge at 4 inches above finished floor.
- F. 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.
- G. Anchoring to In-Place Construction: Use anchors and fasteners where necessary to secure builtin and permanently placed gymnasium equipment to structural support and to properly transfer load to in-place construction.
- H. Connections: Connect electric operators to building electrical system.
- I. Removable Gymnasium Equipment and Components: Assemble in place to verify that equipment and components are complete and in proper working order. Instruct Owner's designated personnel in properly handling, assembling, adjusting, disassembling, transporting, storing, and maintaining units. Disassemble removable gymnasium equipment after assembled configuration is approved by Owner, and store units in location indicated on Drawings.

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.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain gymnasium equipment.

END OF SECTION 116623

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SECTION 116653 - 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. Samples for Initial Selection: For each type of gymnasium divider curtain fabric.
- D. Samples for Verification: For divider curtain fabric, not less than 12 inches square of mesh and of solid fabric.

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.

GYMNASIUM DIVIDERS

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

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 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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Draper Inc.
 - 2. Jaypro Sports, LLC.
 - 3. Performance Sports Systems.

GYMNASIUM DIVIDERS

- 4. 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 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- diameter galvanized-stranded-steel wire rope with a breaking strength of 2000 lb. 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- nominal diameter steel pipe.
 - b. Top and Bottom Battens: 1-1/2-inch- nominal diameter steel pipe.

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, 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.

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: 115 V.
 - 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. Wireless control system.

2.5 DIVIDER CURTAINS

- A. Upper Curtain, Mesh: Woven mesh of polyester yarn coated with vinyl, weighing not less than 7 oz./sq. yd..
 - 1. Mesh Color: As selected by Architect from full range of industry colors and color densities.
- B. Lower Curtain, Solid: Woven polyester fabric coated with vinyl, 18 oz./sq. yd., 8-foot height above floor.
 - 1. Fabric Color(s): One color(s), as selected by Architect from full range of industry colors and color densities.
- C. Hems: Folded and electronically welded.
- D. Seams: Electronically welded.
- E. Overall Curtain Height: Floor to ceiling, within installation clearances required.
- F. Bottom of Curtain: Approximately 2 inches above finished floor.
- G. 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.
- 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. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain gymnasium dividers.

END OF SECTION 116653

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SECTION 122413 - ROLLER WINDOW SHADES

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. Manually operated roller shades with single rollers.
 - 2. Motor-operated roller shades with single rollers.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions for roller shades.
- B. Shop Drawings: Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations.
- C. Samples: For each type of roller shade.
 - 1. Shadeband Material: Not less than 10 inches square. Mark inside face of material if applicable.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: For each type of shadeband material, signed by product manufacturer.
- C. Product Test Reports: For each type of shadeband material, for tests performed by manufacturer and witnessed by a qualified testing agency.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roller shades 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.
 - 1. Roller Shades: Shadeband material equal to 5 percent of quantity installed for each size, color, and shadeband material indicated, but enough for no fewer than two units.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver roller shades in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not install roller shades until construction and finish work in spaces, including painting, 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: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 MANUALLY OPERATED - MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide products manufactured by MechoShade Systems, Inc. or comparable product by one of the following:
 - 1. Solarfective/Accent Architectural
 - 2. Lutron Electronics Co., Inc.
 - 3. Crown Shade Co.
- B. Source Limitations: Obtain roller shades from single source from single manufacturer.

2.2 MANUALLY OPERATED SHADES WITH SINGLE ROLLERS

- A. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.
 - 1. Bead Chains: Manufacturer's standard.
 - a. Loop Length: As indicated on Drawings.
 - b. Limit Stops: Provide upper and lower ball stops.
- B. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.
 - 1. Roller Drive-End Location: Right side of interior face of shade unless there is an obstruction.
 - 2. Direction of Shadeband Roll: Regular, from back (exterior face) of roller..
 - 3. Shadeband-to-Roller Attachment: Manufacturer's standard method.
- C. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.
- D. Shadebands:
 - 1. Shadeband Material: Translucent single-fabric shadecloth: Mechoshade Systems Inc., Thermoveil.
 - a. Source: Shade manufacturer.
 - b. Woven PVC coated fiberglass and PVC coated polyester.
 - c. Weave: Mesh
 - d. Thickness: 0.030 inches.
 - e. Roll Width: As needed for width of shades.
 - f. Openness Factor: 1 percent.
 - g. Color: As selected by Architect from manufacturer's entire range
 - 2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
 - a. Type: Enclosed in sealed pocket of shadeband material.
 - b. Color and Finish: As selected by Architect from manufacturer's full range.
- E. Installation Accessories:
 - 1. Exposed Headbox: Rectangular, extruded-aluminum enclosure including front fascia, top and back covers, endcaps, and removable bottom closure.
 - 2. Endcap Covers: To cover exposed endcaps.

2.3 MOTOR-OPERATED (Collaboration Stair 224)

- A. Basis-of-Design Product: Subject to compliance with requirements, provide MechoShade Systems, Inc.; ElectroShade Systems for motorized shades, or comparable product by one of the following:
 - 1. Solarfective/Accent Architectural
 - 2. Lutron Electronics Co., Inc.
 - 3. Crown Shade Co.

B. Source Limitations: Obtain roller shades from single source from single manufacturer.

2.4 MOTOR-OPERATED, SINGLE-ROLLER SHADES

- A. Motorized Operating System: Provide factory-assembled, shade-operator system of size and capacity and with features, characteristics, and accessories suitable for conditions indicated, complete with electric motor and factory-prewired motor controls, power disconnect switch, enclosures protecting controls and operating parts, and accessories required for reliable operation without malfunction. Include wiring from motor controls to motors. Coordinate operator wiring requirements and electrical characteristics with building electrical system.
 - 1. Electrical Components: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 - 2. Electric Motor: Manufacturer's standard tubular, enclosed in roller.
 - a. Electrical Characteristics: Single phase, 110 V, 60 Hz.
 - 3. Remote Control: Electric controls with NEMA ICS 6, Type 1 enclosure for flush mounting. Provide the following for remote-control activation of shades:
 - a. Control Station: Momentary-contact, three-position, switch-operated control station with open, close, and off functions.
 - 4. Limit Switches: Provide programming of upper and lower stopping points (operating limits) of shadebands into motors via a hand held removable program module/configurator.
 - 5. Operating Features:
 - a. Capable of interface with audiovisual control system.
- B. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required for accommodating operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.
 - 1. Roller Drive-End Location: As indicated on Drawings.
 - 2. Direction of Shadeband Roll: Regular, from back of roller.
 - 3. Shadeband-to-Roller Attachment: Removable spline fitting integral channel in tube.
- C. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.
- D. Shadebands:
 - 1. Shadeband Material: Translucent single-fabric shadecloth: Mechoshade Systems Inc., Thermoveil.
 - a. Source: Shade manufacturer.
 - b. Woven PVC coated fiberglass and PVC coated polyester.
 - c. Weave: Mesh
 - d. Thickness: 0.030 inches.
 - e. Roll Width: As needed for width of shades.
 - f. Openness Factor: 1 percent.
 - g. Color: As selected by Architect from manufacturer's entire range
 - 2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
 - a. Type: Enclosed in sealed pocket of shadeband material.
 - b. Color and Finish: As selected by Architect from manufacturer's full range.
E. Installation Accessories:

- 1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.
 - a. Shape: L-shaped.
 - b. Height: Manufacturer's standard height required to conceal roller and shadeband when shade is fully open.
 - c. Endcap Covers: To cover exposed endcaps.
 - d. Installation Accessories Color and Finish: As selected from manufacturers' full range.
- 2. Side Channels: With light seals and designed to eliminate light gaps at sides of shades as shades are drawn down. Provide side channels with shadeband guides or other means of aligning shadebands with channels at tops.
- 3. Bottom (Sill) Channel or Angle: With light seals and designed to eliminate light gaps at bottoms of shades when shades are closed.
- 4. Installation Accessories Color and Finish: As selected from manufacturer's full range.

2.5 SHADEBAND MATERIALS

- A. Shadeband Material Flame-Resistance Rating: Comply with NFPA 701. Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- B. Light-Filtering Fabric: Woven fabric, stain and fade resistant, type selected by Architect.
- C. Light-Blocking Fabric: Opaque fabric, stain and fade resistant, type selected by Architect.

2.6 ROLLER-SHADE FABRICATION

- A. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.
- B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F:
 - 1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which shade is installed less 1/4 inch per side or 1/2-inch total, plus or minus 1/8 inch. Length equal to head-to-sill or -floor dimension of opening in which shade is installed less 1/4 inch, plus or minus 1/8 inch.
 - 2. Installation Locations: As indicated on Drawings.
- C. Shadeband Fabrication: Fabricate shadebands without battens or seams to extent possible except as follows:
 - 1. Vertical Shades: Where width-to-length ratio of shadeband is equal to or greater than 1:4, provide battens and seams at uniform spacings along shadeband length to ensure shadeband tracking and alignment through its full range of movement without distortion of the material.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, locations of connections to building electrical system, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ROLLER SHADE INSTALLATION

- A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions.
 - 1. Opaque Shadebands: Located so shadeband is not closer than 2 inches to interior face of glass. Allow clearances for window operation hardware.
- B. Electrical Connections: Connect motor-operated roller shades to building electrical system.
- C. Roller Shade Locations: At exterior windows.

3.3 ADJUSTING

A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

- A. Clean roller shade surfaces, after installation, according to manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure that roller shades are without damage or deterioration at time of Substantial Completion.
- C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain motor-operated roller shades.

END OF SECTION 122413

ROLLER WINDOW SHADES

SECTION 123216 - MANUFACTURED PLASTIC-LAMINATE-FACED 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 plastic-laminate-faced cabinets and countertops.

1.3 DEFINITIONS

- A. Definitions in the AWI's, AWMAC's, and WI's "Architectural Woodwork Standards" apply to the work of this Section.
- B. Hardwood Plywood: A panel product composed of layers or plies of veneer, or of veneers in combination with lumber core, joined with adhesive and faced both front and back with hardwood veneers.

1.4 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that casework can be supported and installed as indicated.

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.
 - 2. 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.
 - 3. Chain-of-Custody Certificates: For certified wood products. Include statement of costs.
 - 4. Chain-of-Custody Qualification Data: For manufacturer and vendor.
 - 5. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.
 - 6. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.

- C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work. Show fabrication details, including types and locations of hardware. Show installation details, including field joints and filler panels. Indicate manufacturer's catalog numbers for casework.
- D. Samples: For cabinet finishes.
- E. Samples for Initial Selection: For cabinet finishes.
 1. Samples for Verification: 8-by-10-inch Samples for each type of finish.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.
- C. Sample Warranty: For special warranty.

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.
- C. Installer Qualifications: An authorized representative who is trained and approved by manufacturer for installation of units required for this Project and who is a certified participant in AWI's Quality Certification Program.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver casework only after painting, utility roughing-in, and similar operations that could damage, soil, or deteriorate casework have been completed in installation areas. If casework must be stored in other than installation areas, store only in areas where environmental conditions meet requirements specified in "Project Conditions" Article.
- B. Keep finished surfaces covered with polyethylene film or other protective covering during handling and installation.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install casework 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. Maintain temperature and relative humidity during the remainder of the construction period in range

recommended for Project location by the AWI's, AWMAC's, and WI's "Architectural Woodwork Standards."

- B. Established Dimensions: Where casework is indicated to fit to other construction, establish dimensions for areas where woodwork is to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.
- C. Locate concealed framing, blocking, and reinforcements that support casework by field measurements before being enclosed, and indicate measurements on Shop Drawings.

1.10 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of casework that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Delamination of components or other failures of glue bond.
 - b. Warping of components.
 - c. Failure of operating hardware.
 - 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide products manufactured by one of the following:
 - 1. Case Systems Inc.
 - 2. Stevens Cabinet Co., Inc.
 - 3. TMI Systems Design Corporation.
- B. Source Limitations: Obtain plastic-laminate-faced cabinets from single manufacturer.

2.2 CASEWORK, GENERAL

- A. Quality Standard: Unless otherwise indicated, comply with the AWI's, AWMAC's, and WI's "Architectural Woodwork Standards" for grades of casework indicated for construction, finishes, installation, and other requirements.
 - 1. Grade: Custom.
 - 2. Provide labels and certificates from AWI certification program indicating that casework, including installation, complies with requirements of grades specified.
- B. Product Designations: Drawings indicate configurations of manufactured plastic-laminate-faced cabinets by referencing designations of Casework Design Series numbering system in Appendix A of the AWI's, AWMAC's, and WI's "Architectural Woodwork Standards."

2.3 EDUCATIONAL CASEWORK

A. Design:

1. Flush overlay.

- B. Grain Direction for Wood Grain Plastic Laminate:
 - 1. Vertical on both doors and drawer fronts.
 - 2. Lengthwise on face frame members.
 - 3. Vertical on end panels.
 - 4. Side to side on bottoms and tops of units.
 - 5. Vertical on knee-space panels.
 - 6. Horizontal on aprons.
- C. Exposed Materials:
 - 1. Plastic Laminate: Grade HGS.
 - a. Colors and Patterns: As selected by Architect from manufacturer's full range.
 - 2. Unless otherwise indicated, provide specified edge banding on all exposed edges.
 - 3. Solid Wood: Clear hardwood lumber of species indicated, selected for compatible grain and color.
 - 4. Wood Species: As selected by Architect.
- D. Semi-exposed Materials:
 - 1. Plastic Laminate: Grade VGS unless otherwise indicated. Provide plastic laminate for semi-exposed surfaces unless otherwise indicated.
 - a. Provide plastic laminate of same grade as exposed surfaces for interior faces of doors and drawer fronts and other locations where opposite side of component is exposed.
 - 2. Unless otherwise indicated, provide specified edgebanding on all semi-exposed edges.
- E. Concealed Materials:
 - 1. Solid Wood: Any hardwood or softwood species, with no defects affecting strength or utility.
 - 2. Plywood: Hardwood plywood.
 - 3. Plastic Laminate: Grade BKL.

2.4 MUSICAL INSTRUMENT STORAGE CASEWORK

- A. Manufacturers:
 - 1. Case Systems, Inc.
 - 2. Wenger Corporation.
- B. Design:
 - 1. Flush overlay.
- C. Exposed and Semi-exposed Materials:
 - 1. Thermoset Polyester Laminate.
 - a. Colors and Patterns: As selected by Architect from manufacturer's full range.
 - 2. Unless otherwise indicated, provide specified edge banding on all exposed edges.
 - 3. Solid Wood: Clear hardwood lumber of species indicated, selected for compatible grain and color.
 - 4. Wood Species: Maple.

- D. Concealed Materials:
 - 1. Solid Wood: Any hardwood or softwood species, with no defects affecting strength or utility.
 - 2. Plywood: Hardwood plywood.
- E. Shelving: One piece high molecular-formed polyethylene 3/16 inch wall thickness, ribbed for structural integrity, supported by 0.060 wall steel tubes.
- F. Doors: Welded steel grille construction with powder coat finish.
- G. Edging: Heat bonded 3 mm beveled PVC edge band.

2.5 MATERIALS

- A. Maximum Moisture Content for Lumber: 7 percent for hardwood and 12 percent for softwood.
- B. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1, made with adhesive containing no urea formaldehyde.
 - 1. Core: Hardwood or softwood veneers. Particleboard, medium-density fiberboard, medium density overlay, or hardboard not permitted unless specifically noted otherwise.
 - 2. Face Veneers: Grade A select hardwood both sides.
 - 3. Plywood 1" thick is solid core 11 ply.
- C. Softwood Plywood: DOC PS 1.
- D. MDF: ANSI A208.2, Grade 130.
- E. Plastic Laminate: High-pressure decorative laminate complying with NEMA LD 3.
 - 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. Formica Corporation.
 - b. Nevamar; International Paper.
 - c. Wilsonart International.
- F. Edgebanding for Plastic Laminate: Rigid PVC extrusions, through color with satin finish, 3 mm thick at doors and drawer fronts, 1 mm thick elsewhere.

2.6 COLORS AND FINISHES

- A. Wood Colors and Finishes: As selected by Architect from casework manufacturer's full range.
- B. Plastic-Laminate Colors, Patterns, and Finishes: As selected by Architect from casework manufacturer's full range.
- C. PVC Edgebanding Color: As selected from casework manufacturer's full range.

2.7 CASEWORK HARDWARE AND ACCESSORIES

- A. Hardware, General: Unless otherwise indicated, provide manufacturer's standard satin-finish, commercial-quality, heavy-duty hardware.
 - 1. Use threaded metal or plastic inserts with machine screws for fastening to particleboard except where hardware is through-bolted from back side.
- B. Butt Hinges: Stainless-steel, semiconcealed, five-knuckle hinges complying with BHMA A156.9, Grade 1, with antifriction bearings and rounded tips. Provide two hinges for doors less than 48 inches high, and provide three hinges for doors more than 48 inches high. 270 degree door swing.
- C. Pulls: Solid stainless-steel wire pulls, fastened from back with two screws. For sliding doors, provide recessed stainless-steel flush pulls. Provide two pulls for drawers more than 24 inches wide.
- D. Door Catches: Dual, self-aligning, permanent magnet catch. Provide two catches on doors more than 48 inches high.
- E. Drawer Slides: BHMA A156.9, Type B05091.
 - 1. Grade 1 and Grade 2: Side mounted; full-extension type; zinc-plated steel with polymer rollers.
 - 2. Grade 1HD-100 and Grade 1HD-200: Side mounted; full-extension type; zinc-plated-steel ball-bearing slides.
 - 3. For drawers not more than 3 inches high and not more than 24 inches wide, provide Grade 1.
 - 4. For drawers more than 3 inches high but not more than 6 inches high and not more than 24 inches wide, provide Grade 1HD-100.
 - 5. For drawers more than 6 inches high or more than 24 inches wide, provide Grade 1HD-200.
 - 6. For computer keyboard shelves, provide Grade 1HD-100.
- F. Drawer and Hinged Door Locks: Type as selected, five-pin tumbler, brass with chrome-plated finish, and complying with BHMA A156.11, Grade 1.
 - 1. Provide a minimum of two keys per lock and six master keys.
 - 2. Provide door locks for all educational casework.
- G. Music Instrument Storage Cabinet Door Locks: Locking slide bolt designed for padlocks.
- H. Adjustable Shelf Supports: Polycarbonate shelf support: The Bainbridge shelf clip (Model 3220CL) or equal, rated at 300 lbs/clip.
 - 1. Shelves less than 36 inches shall be $\frac{3}{4}$ inch thick.
 - 2. Shelves 36 inches long and over and all adjustable shelves in wall cabinets and bookcases shall be 1 inch thick.
- I. Adhesives: Do not use adhesives that contain urea formaldehyde.
- J. Adhesives: Use adhesives that meet 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."

2.8 FABRICATION

- A. Laminate-Faced Cabinet Construction: As required by referenced quality standard, but not less than the following:
 - 1. Bottoms and Ends of Cabinets, and Tops of Wall Cabinets and Tall Cabinets: 3/4-inch plywood.
 - 2. Shelves: 3/4-inch- thick plywood.
 - 3. Backs of Cabinets: 1/2-inch- thick plywood where exposed, 1/4-inch hardboard or 1/4-inch veneer-core hardwood plywood dadoed into sides, bottoms, and tops where not exposed.
 - 4. Drawer Fronts: 3/4-inch plywood.
 - 5. Drawer Sides and Backs: 1/2-inch solid-wood or veneer-core hardwood plywood, with glued dovetail or multiple-dowel joints.
 - 6. Drawer Bottoms: 1/4-inch hardwood plywood glued and dadoed into front, back, and sides of drawers. Use 1/2-inch material for drawers more than 24 inches wide.
 - 7. Doors 48 Inches High or Less: 3/4 inch thick, with MDF cores and solid-wood stiles and rails.
 - 8. Doors More Than 48 Inches High: 1-1/16 inches thick, with honeycomb cores and solid hardwood stiles and rails.
- B. Filler Strips: Provide as needed to close spaces between cabinets and walls, ceilings, and indicated equipment. Fabricate from same material and with same finish as cabinets.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances, location of framing and reinforcements, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 CASEWORK INSTALLATION

- A. Grade: Install cabinets to comply with same grade as item to be installed.
- B. Install casework level, plumb, and true; shim as required, using concealed shims. Where casework abuts other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical.
- C. Base Cabinets: Set cabinets straight, level, and plumb. Adjust subtops within 1/16 inch of a single plane. Align similar adjoining doors and drawers to a tolerance of 1/16 inch. Bolt adjacent cabinets together with joints flush, tight, and uniform.
- D. Wall Cabinets: Hang cabinets straight, level, and plumb. Adjust fronts and bottoms within 1/16 inch of a single plane. Fasten to hanging strips, masonry, framing, wood blocking, or reinforcements in walls and partitions. Align similar adjoining doors to a tolerance of 1/16 inch.

- E. Fasten cabinets to adjacent cabinets and to masonry, framing, wood blocking, or reinforcements in walls and partitions to comply with the AWI's, AWMAC's, and WI's "Architectural Woodwork Standards."
- F. Install hardware uniformly and precisely. Set hinges snug and flat in mortises unless otherwise indicated. Adjust and align hardware so moving parts operate freely and contact points meet accurately. Allow for final adjustment after installation.
- G. Adjust casework and hardware so doors and drawers operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.

3.3 CLEANING

- 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.

END OF SECTION 123216

SECTION 123553.13 - METAL 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. Acid Storage Cabinets.
 - 2. Flammable Liquids Storage Cabinets.
- B. Related Requirements:
 - 1. Section 061000 "Rough Carpentry" for wood blocking for anchoring laboratory casework.
 - 2. Section 092216 "Non-Structural Metal Framing" for reinforcements in metal-framed partitions for anchoring laboratory casework.
 - 3. Section 096513 "Resilient Base and Accessories" for resilient base applied to metal laboratory casework.
 - 4. Section 115313 "Laboratory Fume Hoods" for fume hoods.

1.3 DEFINITIONS

- A. MDF: Medium-density fiberboard.
- B. 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 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.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Sustainable Design Submittals:
 - 1. Chain-of-Custody Certificates: For certified wood products. Include statement of costs.
 - 2. Chain-of-Custody Qualification Data: For manufacturer and vendor.
 - 3. Product Data: For adhesives, indicating that product contains no urea formaldehyde.
 - 4. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
 - 5. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.
 - 6. 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 of blocking and reinforcements required for installing laboratory casework.
 - 4. Indicate locations of and clearances from adjacent walls, doors, windows, other building components, and other laboratory equipment.
- D. Keying Schedule: Include schematic keying diagram and index each key set to unique designations that are coordinated with the Contract Documents.

1.6 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 M.
- B. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect finished surfaces during handling and installation with protective covering of polyethylene film or other suitable material.

1.8 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 CASEWORK, GENERAL

- A. Casework Product Standard: Comply with SEFA 8 M, "Laboratory Grade Metal Casework."
- B. Flammable Liquid Storage: Where cabinets are indicated for solvent or flammable liquid storage, provide units that are listed and labeled as complying with requirements in NFPA 30 by FM Approvals.
- 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.

2.2 METAL CABINET MATERIALS

- A. Metal: Cold-rolled, commercial steel (CS) sheet, complying with ASTM A 1008/A 1008M; matte finish; suitable for exposed applications.
- B. Nominal Metal Thickness:
 - 1. Sides, Ends, Fixed Backs, Bottoms, Tops, Soffits, and Items Not Otherwise Indicated: 0.048 inch. Except for flammable liquid storage cabinets, bottoms may be 0.036 inch if reinforced.
 - 2. Back Panels, Doors, Drawer Fronts and Bodies, and Shelves: 0.036 inch except 0.048 inch for back panels and doors of flammable liquid storage cabinets and for unreinforced shelves more than 36 inches long.
 - 3. Intermediate Horizontal Rails, Table Aprons and Cross Rails, Center Posts, and Top Gussets: 0.060 inch.
 - 4. Drawer Runners, Sink Supports, and Hinge Reinforcements: 0.075 inch.
 - 5. Leveling and Corner Gussets: 0.105 inch.

2.3 AUXILIARY CABINET MATERIALS

A. Acid Storage-Cabinet Lining: 1/4-inch- thick, polyethylene or polypropylene.

2.4 METAL CABINETS

A. Fabrication: Assemble and finish units at point of manufacture. Use precision dies for interchangeability of like-size drawers, doors, and similar parts. Perform assembly on precision jigs to provide units that are square. Reinforce units with angles, gussets, and channels. Except

METAL LABORATORY CASEWORK

where otherwise specified, integrally frame and weld cabinet bodies to form dirt- and verminresistant enclosures. Where applicable, reinforce base cabinets for sink support. Maintain uniform clearance around door and drawer fronts of 1/16 to 3/32 inch.

- B. Flush Doors: Outer and inner pans that nest into box formation, with full-height channel reinforcements at center of door. Fill doors with noncombustible, sound-deadening material.
- C. Hinged Doors: Mortise for hinges and reinforce with angles welded inside inner pans at hinge edge.
- D. Adjustable Shelves: Front, back, and ends formed down, with edges returned horizontally at front and back to form reinforcing channels.
- E. Toe Space: Fully enclosed, 4 inches high by 3 inches deep, with no open gaps or pockets.
- F. Utilities: Provide space, cutouts, and holes for pipes, conduits, and fittings in cabinet bodies to accommodate utility services and their support-strut assemblies.

2.5 METAL CABINET FINISH

- A. General: Prepare, treat, and finish welded assemblies after assembling. Prepare, treat, and finish components that are to be assembled with mechanical fasteners before assembling. Prepare, treat, and finish concealed surfaces same as exposed surfaces.
- B. Preparation: After assembly, clean surfaces of mill scale, rust, oil, and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it.
- C. Chemical-Resistant Finish: Immediately after cleaning and pretreating, apply laboratory casework manufacturer's standard two-coat, chemical-resistant, 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.
 - 1. Chemical and Physical Resistance of Finish System: Finish complies with acceptance levels of cabinet surface finish tests in SEFA 8 M. Acceptance level for chemical spot test shall be no more than four Level 3 conditions.
 - 2. Colors for Metal Laboratory Casework Finish: As selected by Architect from manufacturer's full range.

2.6 HARDWARE

- A. General: Provide laboratory casework manufacturer's standard, commercial-quality, heavy-duty hardware complying with requirements indicated for each type.
- B. Hinges: Epoxy-coated-steel, 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. Hinged Door and Drawer Pulls: Solid-aluminum, stainless-steel, or chrome-plated-brass, backmounted pulls. Provide two pulls for drawers more than 24 inches wide.
 - 1. Design: As selected from manufacturer's full range.
- D. Locks: Cam or half-mortise type with five-pin tumbler, brass with chrome-plated finish; complying with BHMA A156.11, Type E07281, Type E07111, or Type E07021.
 - 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.
 - 4. Master Key System: Key all locks to be operable by master key.

2.7 ACID CABINETS

- A. Manufactured cabinet with molded interior of polyethylene or other material impervious to acids. Shelves and shelf supports of the same material.
- B. Provide cabinet bottom with raised lip to contain spills.
- C. Capacity: maximum 8 gallon capacity.
- D. Doors: non-self closing doors.
- E. Labeling: "ACID".

2.8 FLAMMABLE LIQUIDS STORAGE CABINET

- A. Flammable liquids storage cabinets that meet the construction requirements of NFPA 30-4.3.3, or are custom built and tested in accordance with section NFPA 30-4.3.3(a) or meet the requirements of UL 1275 are acceptable.
- B. Capacity: 8 gallons, maximum.
- C. Doors: Swing open, self-closing.
- D. Labeling: "FLAMMABLE KEEP FIRE AWAY".
- E. Venting:

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. 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 Bottoms of Upper Cabinets from Level: 1/8 inch in 10 feet.
 - 3. Variation of Faces of Cabinets from a True Plane: 1/8 inch in 10 feet.
 - 4. Variation of Adjacent Surfaces from a True Plane (Lippage): 1/32 inch.
 - 5. Variation in Alignment of Adjacent Door and Drawer Edges: 1/16 inch.
- B. Install hardware uniformly and precisely. Set hinges snug and flat in mortises.
- C. 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 LABORATORY ACCESSORIES

A. Install accessories according to Shop Drawings, installation requirements in SEFA 2.3, and manufacturer's written instructions.

3.4 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 waterresistant covering. Tape to underside of countertop at a minimum of 48 inches o.c.

END OF SECTION 123553.13

SECTION 123553.19 - 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 base cabinets.
 - 3. Filler and closure panels.
 - 4. Laboratory casework system that includes support and utility-space framing, filler and closure panels, wall panels and modular countertops.
 - 5. Laboratory countertops.
 - 6. Laboratory sinks.
 - 7. Laboratory accessories.
- B. Related Requirements:
 - 1. Section 061053 "Miscellaneous Rough Carpentry" for wood blocking for anchoring laboratory casework.
 - 2. Section 092216 "Non-Structural Metal Framing" for reinforcements in metal-framed partitions for anchoring laboratory casework.
 - 3. Section 096513 "Resilient Base and Accessories" for resilient base applied to wood laboratory casework.
 - 4. Section 115313 "Laboratory Fume Hoods" for fume hoods.

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 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, or MDF core, joined with adhesive and faced both front and back with hardwood veneers.

1.4 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.

1.5 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 details of exposed conduits, if required, for service fittings.
 - 8. Indicate locations of and clearances from adjacent walls, doors, windows, other building components, and other laboratory equipment.
 - 9. Include coordinated dimensions for laboratory equipment specified in other Sections.
- D. Samples for Selection: For cabinet finishes and other materials requiring color selection.

1.6 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.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish complete touchup kit for each type and color of wood laboratory casework provided. Include scratch fillers, stains, finishes, and other materials necessary to perform permanent repairs to damaged laboratory casework finish.
- B. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Cabinet Mounting Clips and Related Hardware: Quantity equal to 5 percent of amount installed, but no fewer than 20 of each type.
 - 2. Modular Countertop Units: Two extra units of each length and material installed.

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. Subject to compliance with requirements, provide products manufactured by one of the following:
 - 1. Campbell-Rhea
 - 2. Kewaunee
 - 3. Sheldon/Div. General Equipment Manufacturers
 - Leonard Peterson 4.
- Source Limitations: Obtain laboratory casework from single source from single manufacturer B. unless otherwise indicated.
 - Obtain countertops, sinks, accessories and service fittings from casework manufacturer. 1.

2.2 CASEWORK, GENERAL

- A. Casework Product Standard: Comply with SEFA 8 W, "Laboratory Grade Wood Casework."
- B. Flammable Liquid Storage: Where cabinets are indicated for solvent or flammable liquid storage, provide units that are listed and labeled as complying with requirements in NFPA 30 by a testing and inspecting agency acceptable to authorities having jurisdiction.
- Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by C. a qualified testing agency, and marked for intended location and application.

2.3 WOOD CASEWORK

- A. Design: Reveal overlay with radiused edges. Provide 1/8-inch reveals between doors and drawers that are adjacent. 1.
- B. Wood Species: White birch or White maple.
- C. Cut: Rift cut/sawn.
- D. Matching:
 - 1. None required; select and arrange components for compatible grain and color. 2.
 - Provide veneers for each elevation from a single flitch, book and running matched.
 - Provide continuous matching of adjacent drawer fronts within each cabinet and a. end matching between drawer fronts of adjacent cabinets.
- E. Grain Direction:
 - 1. Vertical on both doors and drawer fronts, with continuous vertical matching.

- 2. Vertical on doors, horizontal on drawer fronts.
- 3. Lengthwise on face frame members.
- 4. Vertical on end panels.
- 5. Side to side on bottoms and tops of units.
- 6. Vertical on knee-space panels.
- 7. Horizontal on aprons and table frames.
- 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, veneer 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.
 - 3. Solid Wood: Clear hardwood lumber of species indicated.
- G. Semiexposed Materials:
 - 1. Solid Wood: Sound hardwood lumber, selected to eliminate appearance defects, of any species similar in color and grain to exposed solid wood.
 - 2. Plywood: Hardwood plywood of any species similar in color and grain to exposed plywood. Grade B faces and Grade J crossbands. Provide backs of same species as faces.
 - 3. Provide solid wood or hardwood plywood for semiexposed surfaces unless otherwise indicated.
- H. Concealed Materials:
 - 1. Solid Wood: Any species, with no defects affecting strength or utility.
 - 2. Plywood: Hardwood plywood. Provide backs of same species as faces.
 - 3. Hardboard.
- I. 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.

2.4 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, veneer core.
- E. MDF: ANSI A208.2, Grade 130.Hardboard: ANSI A135.4, Class 1 Tempered.
- F. Adhesives: Do not use adhesives that contain urea formaldehyde.

- G. Adhesives: Use adhesives that meet 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."
- H. Edgebanding for Wood-Veneered Construction: Wood veneer of same species as face veneer.
 - 1. Select wood edgebanding for grain and color compatible with face veneers.
 - 2. Colors: As selected by Architect from manufacturer's full range.

2.5 AUXILIARY CABINET MATERIALS

A. Acid Storage-Cabinet Lining: 1/4-inch- thick, polyethylene, polypropylene, epoxy, or phenolic-composite lining material.

2.6 COUNTERTOP TABLETOP AND SINK MATERIALS

- A. Epoxy: Factory-molded, modified epoxy-resin formulation with smooth, nonspecular finish.
 - 1. 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.
 - 2. 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).
 - 3. Color: As selected by Architect from epoxy manufacturer's full range.

2.7 FABRICATION

- A. Construction: Provide wood-faced laboratory casework complying with SEFA 8 W and of the following minimum construction:
 - 1. Bottoms of Base Cabinets and Tall Cabinets: 3/4-inch- thick, veneer-core hardwood plywood.
 - 2. Tops and Bottoms of Wall Cabinets and Tops of Tall Cabinets: 1-inch- thick, veneer-core hardwood plywood.
 - 3. Ends of Cabinets: 3/4-inch- thick, hardwood plywood.
 - 4. Shelves: 1-inch- thick, veneer-core hardwood plywood.
 - 5. Base Cabinet Top Frames: 3/4-by-2-inch solid wood with mortise and tenon or doweled connections, glued and pinned or screwed.
 - 6. Exposed Backs of Cabinets: 3/4-inch- thick, MDF-core hardwood plywood.
 - 7. Unexposed Backs of Cabinets: 1/2-inch- thick, hardwood plywood dadoed into sides, bottoms, and tops, unless otherwise indicated.
 - 8. Drawer Fronts: 3/4-inch- thick, MDF-core hardwood plywood or solid hardwood.

- 9. Drawer Sides and Backs: 1/2-inch- thick, solid hardwood or hardwood plywood, with glued dovetail or multiple-dowel joints.
- 10. Drawer Bottoms: 1/4-inch- thick, veneer-core hardwood plywood glued and dadoed into front, back, and sides of drawers.Use 1/2-inch- thick material for drawers more than 24 inches wide.
- 11. Doors : 3/4 inch thick, with MDF cores, solid-hardwood stiles and rails, and hardwood face veneers and crossbands.
- B. 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.
- C. Removable Backs: Provide backs that can be removed from within cabinets at utility spaces.
- D. 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.
 - 1. Provide knee-space panels (modesty panels) at spaces between base cabinets, where cabinets are not installed against a wall or where space is not otherwise closed.
 - 2. Provide utility-space closure panels at spaces between base cabinets where utility space would otherwise be exposed, including spaces below countertops.
 - 3. Provide closure panels at ends of utility spaces where utility space would otherwise be exposed.

2.8 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 manufacturar's full range.
 - 1. Stain Color: As selected by Architect from manufacturer's full range.
- C. Chemical-Resistant Finish: Apply laboratory casework manufacturer's standard three-coat, chemical-resistant, transparent finish. Sand and wipe clean between coats. Topcoat(s) may be omitted on concealed surfaces.
 - 1. Chemical and Physical Resistance of Finish System: Finish complies with acceptance levels of cabinet surface finish tests in SEFA 8 W. Acceptance level for chemical spot test shall be no more than four Level 3 conditions.

2.9 HARDWARE

- A. General: Provide laboratory casework manufacturer's standard, commercial-quality, heavy-duty hardware complying with requirements indicated for each type.
- B. Butt Hinges: Stainless-steel, 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. Hinged Door and Drawer Pulls: Solid-aluminum back-mounted pulls. Provide two pulls for drawers more than 24 inches wide.
 - 1. Design: As selected from manufacturer's full range.
 - 2. Overall Size: As selected from manufacturer's full range.
- 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. Provide Grade 1HD-100; for drawers not more than 6 inches high and 24 inches wide.
 - 2. Provide Grade 1HD-200; for drawers more than 6 inches high or 24 inches wide.
 - 3. Standard Duty (Grade 1): Full-extension type, with polymer rollers.
 - 4. 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 alike within each room, key each room separately.
 - 4. Master Key System: Key all locks to be operable by master key.
- G. Adjustable Shelf Supports: Mortise-type, powder-coated steel standards and shelf rests complying with BHMA A156.9, Type B04071 and Type B04091.
- H. 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.

2.10 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: Where indicated, provide overflow of standard behive 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, 3/4 inch thick, with rounded edge and corners, and with drip groove and applied backsplash.
 - b. 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.
- D. Cup Sinks: Epoxy, 3-by-6-inch oval.
 - 1. Provide with polypropylene strainers and integral tailpieces.

2.11 LABORATORY ACCESSORIES

- A. Reagent Shelves: Provide as indicated, fabricated from same material as adjacent countertop unless otherwise indicated.
- B. Burette Rods: Aluminum or stainless-steel rods, 1/2 inch in diameter and 18 inches long, threaded on one end to fit tapered plug adapter for flush socket receptacle. Provide with tapered plug adapter and receptacle.
- C. Greenlaw Arm Assembly: Aluminum or stainless-steel vertical rod, tapered on one end to fit flush socket receptacle. Adjustable crossbar of hardwood with black, acid-resistant finish, secured to upright with adjustable clamp. Provide with receptacle.
- D. Pegboards: Polypropylene, epoxy, or phenolic-composite pegboards with removable polypropylene pegs and stainless-steel drip troughs with drain outlet.

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 Bottoms of Upper Cabinets from Level: 1/8 inch in 10 feet.
 - 3. Variation of Faces of Cabinets from a True Plane: 1/8 inch in 10 feet.
 - 4. Variation of Adjacent Surfaces from a True Plane (Lippage): 1/32 inch.
 - 5. 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. Wall Cabinets: Fasten to hanging strips, masonry, partition framing, blocking, or reinforcements in partitions. Fasten each cabinet through back, near top, at not less than 16 inches o.c.
- E. Install hardware uniformly and precisely. Set hinges snug and flat in mortises.
- F. 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 countertops, except for epoxy countertops, to cabinets with Z-type fasteners or equivalent, using two or more fasteners at each cabinet front, end, and back.
 - 2. Secure epoxy countertops to cabinets with epoxy cement, applied at each corner and along perimeter edges at not more than 48 inches o.c.

- 3. 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. 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.
- F. 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 LABORATORY ACCESSORIES

- A. Install accessories according to Shop Drawings, installation requirements in SEFA 2.3, and manufacturer's written instructions.
- B. Securely fasten adjustable shelving supports, stainless-steel shelves, and pegboards to partition framing, wood blocking, or reinforcements in partitions.
- C. Install shelf standards plumb and at heights to align shelf brackets for level shelves. Install shelving level and straight, closely fitted to other work where indicated.
- D. Securely fasten pegboards to partition framing, wood blocking, or reinforcements in partitions.

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 waterresistant covering. Tape to underside of countertop at a minimum of 48 inches o.c.

END OF SECTION 123553.19

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SECTION 123623.13 - PLASTIC-LAMINATE-CLAD 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 plastic-laminate countertops.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product, including high-pressure decorative laminate, adhesive for bonding plastic laminate and fire-retardant-treated materials.
 - 1. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.
- B. Sustainable Design Submittals:
 - 1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
 - 2. 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.
 - 3. Chain-of-Custody Certificates: For certified wood products. Include statement of costs.
 - 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 installation adhesives, indicating VOC content.
 - 7. Laboratory Test Reports: For installation adhesives, indicating compliance with requirements for low-emitting materials.
 - 8. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.
 - 9. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.
- C. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
 - 1. Show locations and sizes of cutouts and holes for plumbing fixtures faucets and other items installed in plastic-laminate countertops.
 - 2. Apply AWI Quality Certification Program label to Shop Drawings.
- D. Samples for Initial Selection:
 - 1. Plastic laminates.

- E. Samples for Verification:
 - 1. Plastic laminates, 8 by 10 inches, for each type, color, pattern, and surface finish, with one sample applied to core material and specified edge material applied to one edge.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: For the following:
 - 1. High-pressure decorative laminate.
 - 2. Adhesives.
- C. Evaluation Reports: For fire-retardant-treated materials, from ICC-ES.

1.5 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 inservice performance.
- B. Installer Qualifications: Fabricator of products.
- C. Testing Agency Qualifications: For testing agency providing classification marking for fireretardant-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.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver countertops until painting and similar operations that could damage countertops have been completed in installation areas. If countertops must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install countertops until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 degrees F and relative humidity between 25 and 55 percent during the remainder of the construction period.
- B. Field Measurements: Where countertops 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.
- C. Established Dimensions: Where countertops are indicated to fit to other construction, establish dimensions for areas where countertops are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE COUNTERTOPS

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades indicated for construction, installation, and other requirements.
 - 1. Provide labels from AWI certification program indicating that countertops, including installation, comply 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. Regional Materials: Wood products shall be manufactured within 500 miles of Project site.
- D. 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.
- E. High-Pressure Decorative Laminate: NEMA LD 3, Grade HGS.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Formica Corporation.
 - b. Lamin-Art, Inc.
 - c. Panolam Industries International, Inc.
 - d. Wilsonart International; Div. of Premark International, Inc.
- F. 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 selected by Architect from manufacturer's full range in the following categories:
- G. Edge Treatment: Square, substrate built up to minimum 1 ¹/₄ inch thick; covered with 3mm polyvinylchloride (PVC), machine applied.
- H. Back and End Splashes: same material, same construction
- I. Core Material: PS-1 Exterior-grade plywood, AC veneer grade, minimum 5 ply.
- J. Core Material at Sinks: PS-1 Exterior-grade plywood, AC veneer grade, minimum 5 ply.
- K. Core Thickness: 3/4 inch.
 - 1. Build up countertop thickness to 1-1/2 inches at front, back, and ends with additional layers of core material laminated to top.
- L. Backer Sheet: Provide plastic-laminate backer sheet, NEMA LD 3, Grade BKL, on underside of countertop substrate.
- M. Paper Backing: Provide paper backing on underside of countertop substrate.

2.2 WOOD MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard 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.
 - 1. Composite Wood Products: Products shall be made without urea formaldehyde.
 - 2. 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."
 - 3. Softwood Plywood: DOC PS 1.

2.3 FIRE-RETARDANT-TREATED MATERIALS

- A. Fire-Retardant-Treated Materials, General: Where fire-retardant-treated materials are indicated, use materials complying 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.
 - 1. Use treated materials that comply with requirements of referenced woodworking standard. Do not use materials that are warped, discolored, or otherwise defective.
 - 2. Use fire-retardant-treatment formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.
 - 3. Identify fire-retardant-treated materials with appropriate classification marking of qualified testing agency in the form of removable paper label or imprint on surfaces that will be concealed from view after installation.
- B. Fire-Retardant-Treated Lumber and Plywood: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, 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 beyond the centerline of the burners at any time during the test.
 - 1. Kiln dry lumber and plywood after treatment to a maximum moisture content of 19 and 15 percent, respectively.
 - 2. For items indicated to receive a stained or natural finish, use organic resin chemical formulation.
 - 3. Mill lumber after treatment within limits set for wood removal that do not affect listed fire-test-response characteristics, using a woodworking shop certified by testing and inspecting agency.
 - 4. Mill lumber before treatment and implement special procedures during treatment and drying processes that prevent lumber from warping and developing discolorations from drying sticks or other causes, marring, and other defects affecting appearance of treated woodwork.

2.4 ACCESSORIES

A. Grommets for Cable Passage through Countertops: 2-inch OD, black, molded-plastic grommets and matching plastic caps with slot for wire passage.

2.5 MISCELLANEOUS MATERIALS

- A. Adhesives: Do not use adhesives that contain urea formaldehyde.
- B. Adhesives: Use adhesives that meet 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. Adhesive for Bonding Plastic Laminate: Unpigmented contact cement.
 - 1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.
- D. Installation Adhesive:
 - 1. Adhesives shall have a VOC content of 70 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."

2.6 FABRICATION

- A. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.
- B. Fabricate countertops to dimensions, profiles, and details indicated. Provide front and end overhang of 1 inch over base cabinets. Ease edges to radius indicated for the following:
 1. Solid-Wood (Lumber) Members: 1/16 inch unless otherwise indicated.
- C. Complete fabrication, including assembly, 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.
- D. Shop cut openings to maximum extent possible to receive appliances, plumbing fixtures, 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.
 - 1. Seal edges of openings in countertops with a coat of varnish.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition countertops to average prevailing humidity conditions in installation areas.

B. Before installing countertops, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 INSTALLATION

- A. Grade: Install countertops to comply with same grade as item to be installed.
- B. Assemble countertops and complete fabrication at Project site to the extent that it was not completed in the shop.
 - 1. Provide cutouts for appliances, plumbing fixtures, electrical work, and similar items.
 - 2. Seal edges of cutouts by saturating with varnish.
- C. Field Jointing: Where possible, make in the same manner as shop jointing, using dowels, splines, adhesives, and 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.
 - 1. Secure field joints in plastic-laminate countertops with concealed clamping devices located 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 constant, heavy-clamping pressure at joints.
- D. 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.
- E. Scribe and cut countertops to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- F. Fire-Retardant-Treated Wood: Handle, store, and install fire-retardant-treated wood to comply with chemical treatment manufacturer's written instructions, including those for adhesives used to install woodwork.
- G. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
 - 1. Install countertops with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
 - 2. Secure backsplashes to tops with concealed metal brackets at 16 inches o.c..
 - 3. 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 countertops, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
- B. Clean countertops on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 123623

SECTION 123661.16 - SOLID SURFACING 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 surface material backsplashes.
 - 3. Solid surface material end splashes.
 - 4. Solid surface material apron fronts.

1.3 ACTION SUBMITTALS

- A. Product Data: For countertop materials.
- 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.
- C. Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.
 - 1. Show locations and details of joints.
 - 2. Show direction of directional pattern, if any.
- D. Samples for Initial Selection: For each type of material exposed to view.
- E. Samples for Verification: For the following products:
 - 1. Countertop material, 6 inches square.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

SOLID SURFACING COUNTERTOPS

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For solid surface material countertops to include in maintenance manuals. Include Product Data for care products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.

1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate countertops similar to that required for this Project, and whose products have a record of successful inservice performance.
- B. Installer Qualifications: Fabricator of countertops.

1.7 FIELD CONDITIONS

A. Field Measurements: Verify dimensions of countertops by field measurements after base cabinets are installed but before countertop fabrication is complete.

1.8 COORDINATION

A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

PART 2 - PRODUCTS

2.1 SOLID SURFACE COUNTERTOP MATERIALS

- A. Solid Surface Material: Homogeneous-filled plastic resin complying with ICPA SS-1.
 - 1. Manufacturers: Subject to compliance with the specification provide products by one of the following:
 - a. Avonite
 - b. E.I. DuPont
 - c. Formica
 - d. Wilsonart
 - 2. Type: Provide Standard type unless Special Purpose type is indicated.
 - 3. Colors and Patterns: As selected by Architect from manufacturer's full range.

2.2 COUNTERTOP FABRICATION

- A. Fabricate countertops according to solid surface material manufacturer's written instructions and to the AWI/AWMAC/WI's "Architectural Woodwork Standards."
 - 1. Grade: Custom.
- B. Configuration:
 - 1. Front: Straight, slightly eased at top.
 - 2. Backsplash: Straight, slightly eased at corner.
 - 3. End Splash: Matching backsplash.
- C. Countertops: 1/2-inch- thick, solid surface material.
- D. Backsplashes: 1/2-inch- thick, solid surface material.
- E. Fabricate tops with shop-applied edges 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.
- F. Joints: Fabricate countertops without joints.
- G. Cutouts and Holes:
 - 1. Counter-Mounted Plumbing Fixtures: Prepare countertops in shop for field cutting openings for counter-mounted fixtures. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.
 - 2. Fittings: Drill countertops in shop for plumbing fittings, undercounter soap dispensers, and similar items.

2.3 INSTALLATION MATERIALS

- A. Adhesive: Product recommended by solid surface material manufacturer.
 - 1. Adhesives shall have a VOC content of 70 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."
- B. Sealant for Countertops: Comply with applicable requirements in Section 079200 "Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates to receive solid surface material countertops and conditions under which countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of countertops.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install countertops level to a tolerance of 1/8 inch in 8 feet, 1/4 inch maximum. Do not exceed 1/64-inch difference between planes of adjacent units.
- B. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Predrill 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.
- C. Fasten subtops to cabinets by screwing through subtops into cornerblocks of base cabinets. Shim as needed to align subtops in a level plane.
- D. Secure countertops to subtops with adhesive according to solid surface material manufacturer's written instructions. 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.
- E. Bond joints with adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.
 - 1. Install metal splines in kerfs in countertop edges at joints. Fill kerfs with adhesive before inserting splines and remove excess immediately after adjoining units are drawn into position.
 - 2. Clamp units to temporary bracing, supports, or each other to ensure that countertops are properly aligned and joints are of specified width.
- F. Install backsplashes and end splashes by adhering to wall and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears.
- G. Install aprons to backing and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears. Fasten by screwing through backing. Predrill holes for screws as recommended by manufacturer.
- H. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.
 - 1. Seal edges of cutouts in particleboard subtops by saturating with varnish.
- I. Apply sealant to gaps at walls; comply with Section 079200 "Joint Sealants."

END OF SECTION 123661.16

SECTION 124813 - ENTRANCE FLOOR MATS 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:
 - 1. Roll-up aluminum link type mats.
 - 2. Recessed frames.

1.3 COORDINATION

A. Coordinate size and location of recesses in concrete to receive floor mats and frames.

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 floor mats and frames.
- B. Shop Drawings:
 - 1. Divisions between mat sections.
 - 2. Perimeter floor moldings.
- C. Samples: For the following products, in manufacturer's standard sizes:
 - 1. Floor Mat: Assembled sections of floor mat.
 - 2. Frame Members: Sample of each type and color.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For floor mats and frames 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 ENTRANCE FLOOR MATS AND FRAMES, GENERAL

- A. Structural Performance: Provide roll-up rail mats and frames capable of withstanding the following loads and stresses within limits and under conditions indicated:
 - 1. Uniform floor load of 300 lbf/sq. ft.
 - 2. Wheel load of 350 lb per wheel.
- B. Regulatory Requirements: 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.

2.2 ROLL-UP RAIL MATS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide C/S Group; Pedimat, or a comparable product by one of the following:
 - 1. Arden Architectural Specialties, Inc.
 - 2. Balco, Inc.
- B. Roll-up, Aluminum-Rail Hinged Mats: Extruded-aluminum tread rails 1-1/2 inches wide by 11/16 inch thick, sitting on continuous vinyl cushions.
 - 1. Tread Inserts: Mineral abrasive.
 - 2. Colors of Inserts: As selected by Architect from full range of industry colors.
 - 3. Rail Color: Clear.
 - 4. Hinges: Plastic.
 - 5. Mat Size: As indicated.

2.3 FRAMES

- A. Recessed Frames: Manufacturer's standard extrusion.
 - 1. Extruded Aluminum: ASTM B 221, Alloy 6063-T5.
 - a. Color: Clear anodized.

2.4 CONCRETE FILL AND GROUT MATERIALS

A. Provide concrete fill and grout equivalent in strength to cast-in-place concrete slabs for recessed mats and frames. Use aggregate no larger than one-third fill thickness.

2.5 FABRICATION

- A. Floor Mats: Shop fabricate units to greatest extent possible in sizes indicated. Unless otherwise indicated, provide single unit for each mat installation; do not exceed manufacturer's recommended maximum sizes for units that are removed for maintenance and cleaning. Where joints in mats are necessary, space symmetrically and away from normal traffic lanes. Miter corner joints in framing elements with hairline joints or provide prefabricated corner units without joints.
- B. Recessed Frames: As indicated, for permanent recessed installation, complete with corner pins or reinforcement and anchorage devices.

- 1. Fabricate edge-frame members in single lengths or, where frame dimensions exceed maximum available lengths, provide minimum number of pieces possible, with hairline joints equally spaced and pieces spliced together by straight connecting pins.
- C. Coat concealed surfaces of aluminum frames that contact cementitious material with manufacturer's standard protective coating.

2.6 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 substrates and floor conditions for compliance with requirements for location, sizes, minimum recess depth, and other conditions affecting installation of floor mats and frames.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install recessed mat frames and mats to comply with manufacturer's written instructions so that tops of mats will be flush with adjoining finished flooring. Set mats with tops at height recommended by manufacturer for most effective cleaning action; coordinate tops of mat surfaces with bottoms of doors that swing across mats to provide clearance between door and mat.
 - 1. For installation in terrazzo flooring areas, allow for grinding and polishing of terrazzo without grinding surface of recessed frames. Coordinate with other trades as required.
 - 2. Install necessary shims, spacers, and anchorages for proper location, and secure attachment of frames.
 - 3. Install grout and fill around frames and, if required to set mat tops at proper elevations, in recesses under mats. Finish grout and fill smooth and level.
 - 4. Delay setting mats until construction traffic has ended.
- B. Install surface-type units to comply with manufacturer's written instructions; coordinate with entrance locations and traffic patterns.
 - 1. Anchor fixed surface-type frame members to floor with devices spaced as recommended by manufacturer.

3.3 PROTECTION

A. After completing frame installation and concrete work, provide temporary filler of plywood or fiberboard in recesses and cover frames with plywood protective flooring. Maintain protection until construction traffic has ended and Project is near Substantial Completion.

END OF SECTION 124813

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SECTION 126600 - TELESCOPING STANDS

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. Electrically operated telescoping stands.

1.3 DEFINITIONS

A. Forward Folding: Wall-attached bleachers that open in the forward direction by moving the front row away from the stack to the fully extended position.

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 telescoping stands.
 - 2. Include load capacities, assembly characteristics, and furnished accessories.
 - 3. Include electrical characteristics of electrical components, devices, and accessories.
- 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.
 - 4. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.
 - 5. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.
- C. Shop Drawings: For telescoping stands in both stacked and extended positions.
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Include load capacities.
 - 3. Show seating layout, aisle widths, row-lettering and seat-numbering scheme, and wheelchair accessibility provisions.

- 4. Show locations and details for installing operator components, switches, and controls. Indicate motor size, electrical characteristics, drive arrangement, mounting, and grounding provisions.
- 5. Include diagrams for power, signal, and control wiring.
- D. Samples for Initial Selection: For each type of exposed product and for each color and texture required.
 - 1. Include Samples of accessories involving color and finish selection.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Welding certificates.
- C. Product Certificates: For each type of telescoping stand assembly.
- D. Material Certificates: For each type of flame-retardant treatment of upholstery fabric.
- E. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For telescoping stands to include in operation and maintenance manuals.
 - 1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
 - a. Procedures for conducting periodic inspections.
 - b. Precautions for cleaning materials and methods that could be detrimental to telescoping-stand finishes and performance.
 - c. Methods for maintaining upholstery fabric.

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.
- C. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- D. 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."

1.8 FIELD CONDITIONS

- A. Finished Spaces: Do not deliver or install telescoping stands until finishes in spaces to receive them are complete, including suspended ceilings, floors, and painting.
- B. Field Measurements: Indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Telescoping stands shall withstand the effects of gravity loads, operational loads, and other loads and stresses according to ICC 300.
- B. Accessibility Standard: Comply with applicable provisions in the DOJ's 2010 ADA Standards for Accessible Design and ICC A117.1.

2.2 TELESCOPING STANDS

- A. System Description: Operable system of multiple-tiered seating on interconnected folding platforms that close for storage, without being dismantled, into a nested stack. Telescoping-stand units permit opening and closing of adjacent, individual and multiple rows, and close with vertical faces of platforms in the same vertical plane.
 - 1. 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. Telescoping-Stands Standard: ICC 300.
- B. Wall-Attached Telescoping Stands: Forward-folding system, in which the bleachers open in the forward direction by moving the front row away from the stack to the fully extended position and the rear of bleacher understructure permanently attaches to wall construction.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Hussey Seating Company.
 - b. Interkal LLC.
 - c. Irwin Telescopic Seating Company; Irwin Seating Company.
 - 2. Row Spacing: 24 inches.
 - 3. Row Rise: one dimension between 11 and 12 inches.
 - 4. Seat Type: Benches.
 - 5. Operation: Electrically operated, with friction-type, integral power unit.
 - 6. Electrical Characteristics for Each Seating Section:
 - a. Horsepower: As required for operation.
 - b. Voltage: 115 V ac, single phase, 60 hertz.
 - 7. Electrical Controls:
 - a. Control Devices: Walk-along pendant control system.
 - b. Limit Switches: Automatically stop power system when telescoping stands reach fully opened or closed positions.

- c. Motion Monitor: Flashing light with self-contained warning horn, rated at 85 dB at 10 feet, mounted under telescoping seating for audio and visual warning during operation.
- d. Transformer: As required to coordinate current characteristics of motor and control station with building electrical system.

2.3 COMPONENTS

2.

- A. Benches: Seats and skirts.
 - 1. Material: Molded plastic with contour surfaces.
 - a. Color: As selected by Architect from manufacturer's standard.
 - Bench Height: Not less than 16 inches or more than 18 inches.
 - 3. Bench Depth: 10 inches.
- B. Wheelchair-Accessible Seating: Locate seating cutouts to provide wheelchair-accessible seating at locations indicated on Drawings.
 - 1. Equip tiers adjacent to wheelchair-accessible seating with front rails as required by ICC 300.
 - 2. Equip cutouts with full-width front closure panels that match decking construction and finish and that extend from underside of tiers adjacent to cutouts to 1-1/2 inches from finished floor.
- C. Deck: Plywood, 3/4 inch thick.
 - 1. Finish: Manufacturer's standard.
 - a. Color: As selected by Architect from manufacturer's standard colors.
- D. Risers: Steel sheet with manufacturer's standard, rust-inhibiting coating or hot-dip galvanized finish.
- E. Safety Rails: Steel, finished with manufacturer's standard powder coat system.
 - 1. Self-storing mid-aisle handrails located at centerline of each aisle with seating on both sides.
 - 2. End rails (guards) that are telescoping and self-storing.
 - 3. Back rails (guards) along rear of units where required by ICC 300.
 - 4. Fixed front rails (guards) along front of units where required by ICC 300.
 - 5. Fixed rails around accessible seating cutouts and truncations.
 - 6. Color: Manufacturer's standard neutral color.
- F. Understructure: Structural steel.
 - 1. Finish: Manufacturer's standard rust-inhibiting finish.
 - 2. Color: Manufacturer's standard.
- G. Support Column Wheels: Nonmarring, soft, rubber-face wheel assembly under each support column.
 - 1. Include wheels of size, number, and design required to support stands and operate smoothly without damaging the flooring surface, but no fewer than four per column or less than 4 inches in diameter and 1-1/2 inch wide.
- H. Control Devices:

- 1. Walk-Along Pendant: Manufacturer's standard unit, which plugs into first row of each operating section. Provide two units.
- I. Fasteners: Vibration proof, in manufacturer's standard size and material.

2.4 ACCESSORIES

- A. Steps:
 - 1. Slip-resistant, abrasive tread surfaces at aisles.
 - 2. Intermediate aisle steps, fully enclosed, at each aisle.
 - 3. Transitional top step, fully enclosed, at each aisle where last row of telescoping stands is adjacent to a cross aisle.
 - 4. Removable front steps, fully enclosed, at each aisle, that engage with front row to prevent accidental separation or movement and are equipped with a minimum of four skid-resistant feet.
- B. Closure Panels and Void Fillers:
 - 1. Aisle closures at foot level that produce flush vertical face at aisles when system is stored.
 - 2. End panels covering exposed ends of stands in the stored position.
 - 3. Panels at cutouts and truncations for accessible seating.
 - 4. Rear fillers including supports for closing openings between top row and rear wall of adjoining construction.
 - 5. Gap fillers for closing openings between stand units or between stand units and adjoining construction.

2.5 MATERIALS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. 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.
- C. Composite Wood Products: Products shall be made without urea formaldehyde.
- D. 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."
- E. Plywood: PS 1 as standard with manufacturer.
- F. Molded Plastic: High-density polyethylene; blow or injection molded, color-pigmented, textured, impact-resistant, with integral reinforcing ribs for attachment and anchoring points. Provide with UV inhibitors to retard fading.

2.6 FABRICATION

- A. Fabricate telescoping stands to operate easily without special tools or separate fasteners unless otherwise indicated.
- B. Round corners and edges of components and exposed fasteners to reduce snagging and pinching hazards.
- C. Form exposed work with flat, flush surfaces, level and true in line.
- D. Supports: Fabricate supports to withstand, without damage to components, the forces imposed by use of stands without failure or other conditions that might impair their usefulness.
 - 1. Cantilever bench seat supports to produce toe space uninterrupted by vertical bracing.

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. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install telescoping stands according to ICC 300 and manufacturer's written instructions.

3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Telescoping stands will be considered defective if they do not pass tests and inspections.

3.4 ADJUSTING

- A. Adjust backrests so that they are at proper angles and aligned with each other in uniform rows.
- B. Adjust hardware and moving parts to function smoothly, and lubricate, test, and adjust each telescoping stand unit to operate according to manufacturer's written instructions.
- C. Clean installed telescoping stands on exposed and semiexposed surfaces. Touch up factoryapplied finishes or replace components as required to restore damaged or soiled areas.
- D. Replace upholstery fabric damaged during installation or work of other trades.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to inspect, adjust, operate, and maintain telescoping stands.

END OF SECTION 126600

SECTION 129300 - SITE FURNISHINGS

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. Seating.
 - 2. Bicycle racks.
 - 3. Trash receptacles.
 - 4. Planters.
 - 5. Bollards.
 - 6. Rain Barrels
- B. Related Requirements:
 - 1. Section 033000 "Cast-in-Place Concrete" for installing pipe sleeves cast, installing anchor bolts cast, and formed voids in concrete footings.
 - 2. Section 061063 "Exterior Rough Carpentry" for Wood construction
 - 3. Section 312000 "Earth Moving" for excavation for installing concrete footings.

1.3 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.
- C. Samples: For each exposed product and for each color and texture specified.
- D. Samples for Initial Selection: For units with factory-applied finishes.
- E. Samples for Verification: For each type of exposed finish, not less than 6-inch-long linear components and 4-inch-square sheet components.
- F. Product Schedule: For site furnishings. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For site furnishings manufactured with preservative-treated wood.
 - 1. Indicate type of preservative used and net amount of preservative retained. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For site furnishings 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.
 - 1. Trash Receptacle Inner Containers: Five full-size units for each size indicated, but no fewer than two units.

PART 2 - PRODUCTS

2.1 SEATING B1 (Backless)

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Victor Stanley, Inc; CM-214 6' bench with Recycled plastic slats or a comparable product by one of the following:
 - 1. Columbia Cascade Company- Restoration
 - 2. Landscape Forms- Plainwell
- B. Frame: Cast iron.
- C. Seat and Back:
 - 1. Material:
 - a. Recycled Plastic Planks: Evenly spaced, parallel. Grey
 - 2. Seat Height: 17-3/4".
 - 3. Seat Surface Shape: Contoured or dished.
 - 4. Overall Width: 6 feet.
 - 5. Overall Depth: 22-1/4".
 - 6. Arms: each end.
 - a. Arm Material: Match frame.
 - 7. Warranty: 10 years.
 - 8. Seating Configuration.
 - a. Straight shape.

2.2 SEATING Wooden Seat Block

- A. Frame: Cedar.
- B. Seat :
 - 1. Material:
 - a. Wood Planks: Evenly spaced, parallel.
 - 2. Seat Height: As indicated.
 - 3. Overall Height: As indicated on plans.
 - 4. Overall Width: As indicated on plans.
 - 5. Overall Depth: As indicated on plans.

2.3 BICYCLE RACKS BR

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Landscape Forms; Ride or a comparable product by one of the following:
 - 1. Columbia Cascade Company.
 - 2. Urban Accessories, Inc.
 - 3. Forms+Surfaces
- B. Bicycle Rack Construction:
 - 1. Frame: Aluminum.
 - 2. Style: Double-side parking.
 - a. Overall Height: 26 Inches.
 - b. Overall Width: 3 ¹/₂ Inches.
 - c. Overall Depth: 28 Inches.
 - d. Capacity: Designed to accommodate no fewer than two bicycles.
 - 3. Security: Designed to lock wheel and frame.
 - 4. Installation Method: Surface flange anchored below finished grade to substrate indicated Cast in concrete Bolted to cast-in anchor bolts.
- C. Aluminum Finish: Color coated.
 - 1. Color: As selected by Architect from manufacturer's full range.

2.4 LITTER AND RECYCLING RECEPTACLES LR

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Victor Stanley, Inc; S-42 Litter and Recycling Receptacle or a comparable product by one of the following:
 - 1. Columbia Cascade Company.
 - 2. Forms+Surfaces.
 - 3. Landscape Forms.
- B. Steel Facing Surrounds: Evenly patterned, parallel flat steel straps, bars, or tubular shapes.
- C. Support Frames: Steel; welded.

D. Trash Receptacles:

- 1. Receptacle Shape and Form: Round cylinder; with opening for depositing trash in lid or top.
- 2. Lids and Tops: Matching facing panels secured by cable or chain, hinged, swiveled, or permanently secured.
 - a. Description: Flat rim ring lid with center opening.
- 3. Receptacle Height: 38-5/8".
- 4. Overall Width: 19".
- 5. Inner Container: Rigid plastic container with drain holes lift-out handles; designed to be removable and reusable.
- 6. Disposable Liners: Provide receptacle designed to accommodate disposable liners.
- 7. Capacity: Not less than 36 gal..
- 8. Service Access: Rmovable lid or top; inner container and disposable liner lift or slide-out for emptying; .
- E. HDPE Color: Black.
- F. Graphics: Surface-applied copy, content, and style according to manufacturer's standard.1. Copy: Litter and Recycle.

2.5 PLANTERS GP

- A. Wood Facing Surrounds: Evenly spaced cedar slats.
- B. Support Frames: Cedar post;
- C. Planter Shape and Form: As indicated.
- D. Overall Height: As indicated on plans.
- E. Overall Width: As indicated on plans.
- F. Overall Depth: As indicated on plans.
- G. Installation Method: Freestanding.
- H. Wood Finish: Sanded Unfinished.

2.6 RAIN BARREL RB

- A. Materials: Plastic.
- B. Basis-of-Design Product: Subject to compliance with requirements, provide <u>Spruce Creek Rain</u> <u>Barrel</u> 54 gallon capacity recycled content food grade UV stabilized polyethylene or a comparable product by one of the following:
 - 1. Rain Water <u>Solutions</u>.
 - 2. <u>Obis Systern NPL 315</u>

- C. Overall Height: 36".
- D. Overall Width: 22" diameter.
- E. Wall thickness: 3/16"
- F. Weight: 20 lbs.
- G. Installation Method: Freestanding.
- H. Accessories:
 - 1. Overflow fitting drain plus screw on covet
 - 2. Spigot at 4" height from base
 - 3. Insect screen
 - 4. T Connector

2.7 BOLLARDS BL

- 1. Basis-of-Design Product: Subject to compliance with requirements, provide Landscape Forms, Annapolis standard Bollard.or comparable product by one of the following:
- 2. Creative Pipe, Inc.
- 3. Urban Accessories, Inc.
- B. Bollard Construction:
 - 1. Structural steel tube, ASTM A 500, grade B.
 - 2. Bollard Top: Aluminum Casting
 - 3. Plastic Sleeve: Low density polyethylene, .22" thick, 26.625 inches long, textured
 - 4. Style: Manufacturer's standard Ornamental cap.
 - 5. Overall Height: 33".
 - 6. Overall Width: 6" diameter.
 - 7. Installation Method: Embedded.
 - 8. Color: Black.

2.8 MATERIALS

- A. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated; free of surface blemishes and complying with the following:
 - 1. Rolled or Cold-Finished Bars, Rods, and Wire: ASTM B 211.
 - 2. Extruded Bars, Rods, Wire, Profiles, and Tubes: ASTM B 221.
 - 3. Structural Pipe and Tube: ASTM B 429/B 429M.
 - 4. Sheet and Plate: ASTM B 209.
 - 5. Castings: ASTM B 26/B 26M.
- B. 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. Mechanical Tubing: Cold-rolled, electric-resistance-welded carbon or alloy steel tubing complying with ASTM A 513/A 513M, or steel tubing fabricated from steel complying with ASTM A 1011/A 1011M and complying with dimensional tolerances in ASTM A 500/A 500M; zinc coated internally and externally.
- 5. Sheet: Commercial steel sheet complying with ASTM A 1011/A 1011M.
- C. Wood: Surfaced smooth on four sides with eased edges; kiln dried, free of knots, solid stock of species indicated.
 - 1. Wood Species:
 - a. Eastern White or Red or Yellow Cedar: Select Grade or better.
 - b. Redwood: Construction heart or better, free-of-heart center.
 - c. Teak (Tectona Grandis): Clear Grade.
- D. Certified Wood: Wood products shall be certified as "FSC Pure" according to FSC STD-01-00 and FSC STD-40-004.
 - 1. Finish: Manufacturer's standard transparent wood-preservative treatment and sealer.
- E. Fiberglass: Multiple laminations of glass-fiber-reinforced polyester resin with UV-light stable, colorfast, nonfading, weather- and stain-resistant, colored polyester gel coat, and with manufacturer's standard finish.
- F. Plastic: Color impregnated, color and UV-light stabilized, and mold resistant.
 - 1. Polyethylene: Fabricated from virgin plastic HDPE resin.
 - 2. Polyethylene with Recycled Content: Fabricated from HDPE and other resins with postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- G. Anchors, Fasteners, Fittings, and Hardware: Galvanized steel or Manufacturer's standard, corrosion-resistant-coated or noncorrodible materials; commercial quality, tamperproof, vandal and theft resistant.
 - 1. Angle Anchors: For inconspicuously bolting legs of site furnishings to on-grade substrate; one per leg.
 - 2. Antitheft Hold-Down Brackets: For securing site furnishings to substrate; two per unit].
- H. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M; recommended in writing by manufacturer, for exterior applications.
- I. Erosion-Resistant Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydrauliccontrolled expansion cement formulation for mixing with potable water at Project site to create pourable anchoring, patching, and grouting compound; resistant to erosion from water exposure without needing protection by a sealer or waterproof coating; recommended in writing by manufacturer, for exterior applications.
- J. Galvanizing: Where indicated for steel and iron components, provide the following protective zinc coating applied to components after fabrication:
 - 1. Zinc-Coated Tubing: External, zinc with organic overcoat, consisting of a minimum of 0.9 oz./sq. ft. of zinc after welding, a chromate conversion coating, and a clear, polymer

film. Internal, same as external or consisting of 81 percent zinc pigmented coating, not less than 0.3 mil thick.

2. Hot-Dip Galvanizing: According to ASTM A 123/A 123M, ASTM A 153/A 153M, or ASTM A 924/A 924M.

2.9 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. Preservative-Treated Wood Components: Complete fabrication of treated items before treatment if possible. If cut after treatment, apply field treatment complying with AWPA M4 to cut surfaces.
- E. 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.
- F. Factory Assembly: Factory assemble components to greatest extent possible to minimize field assembly. Clearly mark units for assembly in the field.

2.10 GENERAL FINISH REQUIREMENTS

A. 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.

2.11 ALUMINUM FINISHES

A. Powder-Coat Finish: Manufacturer's standard polyester powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.

2.12 STEEL AND GALVANIZED-STEEL FINISHES

- A. Powder-Coat Finish: Manufacturer's standard polyester, powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.
- B. PVC Finish: Manufacturer's standard, UV-light stabilized, mold-resistant, slip-resistant, mattetextured, dipped or sprayed-on, PVC-plastisol finish, with flame retardant added; complying with coating manufacturer's written instructions for pretreatment, application, and minimum dry film thickness.

2.13 IRON FINISHES

A. Powder-Coat Finish: Manufacturer's standard polyester powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.

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

- 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. Posts Set into Voids in Concrete: Form or core-drill holes for installing posts in concrete to depth recommended in writing by manufacturer of site furnishings and 3/4 inch larger than OD of post. Clean holes of loose material, insert posts, and fill annular space between post and

concrete 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.

F. 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 129300

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SECTION 130123 - GREENHOUSE

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 Greenhouse structure and associated equipment.

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.
 - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

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. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regional materials, certificates indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating distance to Project, cost for each regional material, and fraction by weight that is considered regional.
- 3. Product Data for Credit EQ 4.1: For adhesives and sealants, documentation including printed statement of VOC content.
- 4. Product Data for Credit EQ 4.1: For solvent cements and adhesive primers, documentation including printed statement of VOC content.
- 5. Laboratory Test Reports for Credit EQ 4: For adhesives sealants used inside the weatherproofing system], 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 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.
- D. Delegated-Design Submittal: For structural calculations for greenhouse.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For Greenhouse and equipment to include in operation and maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect materials during delivery, storage and handling to comply with manufacturer's directions and as required to prevent damage or deterioration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design Greenhouse.
- B. Structural Performance:
 - Structural Performance: Except as noted, and as minimum, conform to the requirements and recommendations of both the "Standard for Design Loads in Greenhouse Structures" and its "Commentary" published by the National Greenhouse Manufacturers Association, 1998 Edition (NGMA Standards). Aluminum members shall be designed in accordance with the Aluminum Association's design manual "Specifications for Aluminum Structures."
 - 2. Greenhouse shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - a. Dead Load: Structure and equipment
 - b. Snow Load: As shown on drawings.
 - c. Wind Load: As shown on drawings.

2.2 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Atlas Manufacturing, Inc., Alapaha, GA
 - 2. Lundy Greenhouse Manufacturing, New Madison, OH
 - 3. National Greenhouse Company, Pana IL.
 - 4. Rough Brothers, Inc., Cincinnati, OH
 - 5. The Greenhouse Company of South Carolina, Immo, SC

2.3 SYSTEM DESCRIPTION

- A. Greenhouse: Clear span aluminum construction free of interior columns.
- 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.

2.4 MATERIALS

- A. Aluminum
 - 1. Extrusions
 - a. Primary Framing: Alloy 6061-T6 or 6063-HS
 - b. Secondary Framing: Alloy 6063-T6 or 6063-HS
 - 2. Sheet: Alloy 3003-H14
 - 3. Plates: Alloy 6061-T6 or 6063 HS
- B. Greenhouse manufacturer's extruded aluminum posts (side, gable, partition, end and corner) truss framing, rafters and purlins. All frame members will be visible. Design shall provide for uniform and set pattern, conforming to spacing indicated. Where design requirements can be met through use of manufacturer's standard components, such components shall be utilized.
- C. Connections: Galvanized bolts and prepunched aluminum plates with all field connections to be bolted.
- D. Anchor Bolts: Provide stainless steel "Hilti" expandable type anchor bolts or epoxy type anchors. Provide complete with nuts and washers.
- E. Rafters: Provide aluminum rafters extending from eaves to ridges.
- F. Roof Purlins: Provide purlins for roof, bolted by means of hot dipped galvanized bolts to top chord. Roof purlins will be set on top of top chord of truss. Vertical framework girts: provide channel girts for sidewalls, gables and partitions if applicable. Prefabricate all purlins and girts for attachment of glazing bars and connecting lugs.
- G. Wall Sills: Seat an extruded aluminum wall sill on all foundations. Sill shall be capable of receiving either side sash of fixed glazing as required.

- H. Condensation System: Provide system of integral gutters in roof framing and glazing bars designed to collect condensation and weep moisture to the exterior. Under gutter drip channels shall collect gutter condensate.
- I. Glazing Members: Provide extruded aluminum glazing bars held in place with stainless steel self-tapping screws. Place extruded aluminum glazing bars in the roof of sufficient size and mechanical properties to carry design loads specified. Bars shall be spaced to properly receive glass. Glass lite widths will divide the bay length into 3 lites maximum. The glass length will be from roof purlin to roof purlin or roof purlin to eave/vent header/ridge. Provide shoulders to receive roof glass and condensation grooves to conduct primary condensation to suitable disposal points. Bars shall extend in one piece from eave to ridge (on slopes without roof vents) and shall be supported by purlins.
 - 1. Lapped Glass: roof single system shall apply as standard with 3/8" laps in all vertical and roof glass glazing.
- J. Gables and Partitions: Glass gables and partitions with fixed glass from sill to gable rafter, except at door openings, shall be constructed using extruded aluminum shapes as indicated on the drawings. Partition systems shall be designed and detailed to provide for different movement of greenhouse frames and supports anticipated under specified loading conditions.

2.5 FASTENERS

- A. Non-load bearing screws and bolts shall be 18-8 stainless steel or 2024-T4 aluminum.
- B. All structure fasteners shall be Grade 5, high strength, hot-dipped galvanized bolts.

2.6 GLAZING MATERIALS

- A. Tempered clear float: full tempered clear float glass complying with ASTM C 1048, Federal Consumer Product Safety Commission Safety Standard 16 CFR-120C and ANSI Z97 I-1984.
- B. Polycarbonate: Provide extruded polycarbonate sheets in sizes to match adjoining glass and in locations in which piping penetrations are required; color: clear with minimum light transmission of 80%.

2.7 SETTING MATERIALS

A. Non-metallic Shrinkage-Resistant Grout: Premixed non-metallic non-corrosive, non-staining product containing selected silica sands, Portland cement, shrinkage compensating agents, plastizing and water reducing agents complying with CE-CRD-C621.

2.8 GREENHOUSE DOORS AND FRAMES

A. Provide heavy duty, tubular frame members fabricated with mechanical joints. Provide 3" thick, wide stile doors. Fabricate doors to facilitate replacement of glass or panels, without disassembly of stiles and rails. Provide snap-on extruded aluminum glazing stops, with exterior

stops anchored for non-removal. Glaze door lights with ¹/₄" tempered clear float glass glazed with captive plastic gaskets. Hardware preparation shall specifically allow installation of BHMA standard locksets, incorporating BHMA standard backsets and installation of lock cylinders specified under other sections.

B. Doors hung in aluminum jambs with integral weather-strip and stops with 6" x $\frac{1}{2}$ " thresholds.

2.9 VENTS

- Provide sash at each side of ridge, designed to open out in a continuous operation from end to A. end and with a weather tight hinge and weather tight fit between sash and vent header. 1.
 - Operation: provide rack and pinion apparatus to open sash with motor and controller.
- Inlet Opening: louvered inlet shutter. Β.

2.10 HEATING SYSTEM

Electric Greenhouse heater, 8.5KW to ensure 45 degree F. A.

2.11 BENCHES.

- Benches will have leg supports from 1 ¹/₂" square-galvanized tubing spaced 6'0" maximum. A. Bench tops of extruded aluminum perimeter sides with 1" square 18 ga. Cross pieces on 2/0" centers. Covering will be hot dipped ³/₄", #13 expanded metal.
- B. Stationary Benches: Legs and top support rails inset a minimum of 3" on each side and 6" on the ends.
- C. Floor mounted Benches: legs sitting on top of a concrete floor shall have a 4" x 4" x 1/4" welded foot plate with an anchor hole to anchor to the floor

PART 3 - EXECUTION

3.1 **EXAMINATION**

- Examine substrates and conditions, with Installer present, for compliance with requirements for A. installation tolerances and other conditions affecting performance of the Work.
- Prepare written report, endorsed by Installer, listing conditions detrimental to performance. B.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ERECTION AND INSTALLATION

Comply with Manufacturer's written instructions for erection and installation. A.

GREENHOUSE

B. Comply with NECA 1.

3.3 STARTUP SERVICE

- A. Perform startup service.
 - 1. Complete installation and startup checks according to manufacturer's written instructions.

3.4 ADJUSTING

A. Adjust hardware and moving parts to function smoothly, and lubricate as recommended by manufacturer.

3.5 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain units.

END OF SECTION 130123

SECTION 142123.16 - MACHINE-ROOM-LESS ELECTRIC TRACTION PASSENGER 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 machine-room-less electric traction passenger and service elevators.
- 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 made from steel sheet in hoistways.
 - 5. Section 096519 "Resilient Tile Flooring" for finish flooring in elevator cars.
 - 6. Section 099123 "Interior Painting" for field painting of hoistway entrance doors and frames.
 - 7. Section 271500 "Communications Horizontal Cabling" for telephone service for elevators.
 - 8. Section 283111 "Digital, Addressable Fire-Alarm System" for smoke detectors in elevator lobbies to initiate emergency recall operation, for heat detectors in shafts and machine rooms to disconnect power from elevator equipment before or on sprinkler activation, and for connection to elevator controllers.

1.3 DEFINITIONS

- A. Definitions in ASME A17.1/CSA B44 apply to work of this Section.
- B. Service Elevator: A passenger elevator that is also used to carry freight.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include capacities, sizes, performances, operations, safety features, finishes, and similar information.
 - 2. 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, 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 each type of exposed finish involving color selection.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Manufacturer Certificates: Signed by elevator manufacturer certifying that hoistway and pit layout and dimensions, as indicated on Drawings, and electrical service, as shown and specified, are adequate for elevator system being provided.
- C. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For elevators to include in emergency, operation, and maintenance manuals.
 - 1. Submit manufacturer's or Installer's standard operation and maintenance manual, according to ASME A17.1/CSA B44 including 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 five-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.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Elevator manufacturer or an authorized representative who is trained and approved by manufacturer.

1.8 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.

1.9 COORDINATION

- A. Coordinate installation of inserts, sleeves, block outs, elevator equipment with integral anchors, and other items that are embedded in concrete or masonry for elevator equipment. Furnish templates, inserts, sleeves, elevator equipment with integral anchors, and installation instructions and deliver to Project site in time for installation.
- B. Coordinate locations and dimensions of work specified in other Sections that relates 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 and pits.

1.10 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 year(s) 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. KONE Inc.
 - 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 requirements for accessible elevators in the United States Access Board's ADA-ABA Accessibility Guidelines and with ICC A117.1.

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. Elevator Number: 1.
 - 2. Rated Load: 3000 lb.
 - 3. Freight Loading Class for Service Elevator(s): Class A.
 - 4. Rated Speed: 150 fpm.
 - 5. Operation System: Selective-collective automatic operation.
 - 6. Auxiliary Operations:
 - a. Standby power operation.
 - b. Automatic operation of lights and ventilation fans.
 - 7. Security Features: Keyswitch operation.
 - 8. 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.
 - g. Ceiling: Satin stainless steel, No. 4 finish.
 - h. Handrails: 1/2 by 2 inches rectangular satin stainless steel, No. 4 finish, at sides and rear of car.
 - i. Floor prepared to receive resilient flooring (specified in Section 096519 "Resilient Tile Flooring").
 - 9. Hoistway Entrances:
 - a. Width: 42 inches.
 - b. Height: 84 inches.
 - c. Type: Single-speed side sliding.
 - d. Frames: Satin stainless steel, No. 4 finish.
 - e. Doors: Satin stainless steel, No. 4 finish.
 - f. Sills: Aluminum.
 - 10. Hall Fixtures: Satin stainless steel, No. 4 finish.
 - 11. Additional Requirements:

- a. Provide inspection certificate in each car, mounted under acrylic cover with frame made from satin stainless steel, No. 4 finish.
- b. Provide hooks for protective pads in all cars and one complete set(s) of full-height protective pads.
- C. Elevator Description:
 - 1. Elevator Number: 2.
 - 2. Front and Rear Opening.
 - 3. Rated Load: 3500 lb.
 - 4. Freight Loading Class for Service Elevator(s): Class A.
 - 5. Rated Speed: 150 fpm.
 - 6. Operation System: Selective-collective automatic operation.
 - 7. Auxiliary Operations:
 - a. Standby power operation.
 - b. Automatic operation of lights and ventilation fans.
 - c. Independent service for service elevator.
 - 8. Security Features: Keyswitch operation.
 - 9. Car Enclosures:
 - a. Inside Height: Not less than 93 inches to underside of ceiling.
 - b. Front Walls (Return Panels): Satin stainless steel, No. 4 finish.
 - c. Car Fixtures: Satin stainless steel, No. 4 finish.
 - d. Side and Rear Wall Panels: Satin stainless steel, No. 4 finish.
 - e. Reveals: Satin stainless steel, No. 4 finish.
 - f. Door Faces (Interior): Satin stainless steel, No. 4 finish.
 - g. Door Sills: Aluminum.
 - h. Ceiling: Satin stainless steel, No. 4 finish.
 - i. Handrails: 1/2 by 2 inches rectangular satin stainless steel, No. 4 finish, at sides of car.
 - j. Floor prepared to receive resilient flooring (specified in Section 096519 "Resilient Tile Flooring").
 - 10. Hoistway Entrances:
 - a. Width: 42 inches.
 - b. Height: 84 inches.
 - c. Type: Single-speed center opening.
 - d. Frames: Satin stainless steel, No. 4 finish.
 - e. Doors: Satin stainless steel, No. 4 finish.
 - f. Sills: Aluminum.
 - 11. Hall Fixtures: Satin stainless steel, No. 4 finish.
 - 12. Additional Requirements:
 - a. Provide inspection certificate in each car, mounted under acrylic cover with frame made from satin stainless steel, No. 4 finish.
 - b. Provide hooks for protective pads in service car and one complete set(s) of fullheight protective pads.

2.4 TRACTION SYSTEMS

- A. Elevator Machines: Permanent magnet, variable-voltage, variable-frequency, ac-type hoisting machines and solid-state power converters.
 - 1. Provide regenerative system.

- 2. Provide regenerative system that complies with the IgCC.
- 3. Limit total harmonic distortion of regenerated power to 5 percent per IEEE 519.
- 4. Provide means for absorbing regenerated power when elevator system is operating on standby power.
- 5. Provide line filters or chokes to prevent electrical peaks or spikes from feeding back into building power system.
- B. Inserts: Furnish required concrete and masonry inserts and similar anchorage devices for installing guide rails, machinery, and other components of elevator work. Device installation is specified in another Section.
- C. Machine Beams: Provide steel framing to support elevator hoisting machine and deflector sheaves from the building structure. Comply with Section 055000 "Metal Fabrications" for materials and fabrication.
- D. Car Frame and Platform: Bolted- or welded-steel units.
- E. Guides: Roller guides or polymer-coated, non-lubricated sliding guides. Provide guides at top and bottom of car and counterweight frames.

2.5 OPERATION SYSTEMS

- A. General: Provide manufacturer's standard microprocessor operation systems as required to provide type of operation indicated.
- B. Auxiliary Operations:
 - 1. Single-Car Standby Power Operation: On activation of standby power, car is returned to a designated floor and parked with doors open. 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 main lobby. Manual operation causes automatic operation to cease.
 - 2. Single-Car 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, opens its doors, and shuts down.
 - 3. Automatic Operation of Lights and Fan: When elevator is stopped and unoccupied with doors closed, lighting, ventilation fan, and cab displays are de-energized after five minutes and are re-energized before car doors open.
- C. Security features shall not affect emergency firefighters' service.
 - 1. Keyswitch Operation: Push buttons are activated and deactivated by security keyswitches at hall push-button stations. Key is removable in either position.

2.6 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.

2.7 CAR ENCLOSURES

- A. General: Provide steel-framed car enclosures with non-removable wall panels, with car roof, access doors, power door operators, and ventilation.
 - 1. Provide standard railings complying with ASME A17.1/CSA B44 on car tops where required by ASME A17.1/CSA B44.
- B. Materials and Finishes: Manufacturer's standards, but not less than the following:
 - 1. Subfloor: Exterior, underlayment grade plywood, not less than 5/8-inch nominal thickness.
 - 2. Floor Finish: Specified in Section 096519"Resilient Tile Flooring."
 - 3. Stainless-Steel Wall Panels: Flush, formed-metal construction; fabricated from stainlesssteel sheet.
 - 4. Fabricate car with 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 stainless-steel sheet] or by laminating stainless-steel sheet to exposed faces and edges of enameled or powder-coated steel doors using adhesive that fully bonds metal to metal without telegraphing or oil-canning.
 - 7. Sight Guards: Provide sight guards on car doors.
 - 8. Sills: Extruded or machined metal, with grooved surface, 1/4 inch thick.
 - 9. Metal Ceiling: Flush panels, with downlights in the center of each panel. Align ceiling panel joints with joints between wall panels.
 - 10. Light Fixture Efficiency: Not less than 35 lumens/W.
 - 11. Ventilation Fan Efficiency: Not less than 3.0 cfm/W.

2.8 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: 1-1/2 hours.
- C. Materials and Fabrication: Manufacturer's standards, but not less than the following:
 - 1. Stainless-Steel Frames: Formed from stainless-steel sheet.
 - 2. Stainless-Steel Doors: Flush, hollow-metal construction; fabricated from stainless-steel sheet or by laminating stainless-steel sheet to exposed faces and edges of enameled or powder-coated steel doors using adhesive that fully bonds metal to metal without telegraphing or oil-canning.
 - 3. Sight Guards: Provide sight guards on doors matching door edges.
 - 4. Sills: Extruded or machined metal, with grooved surface, 1/4 inch thick.
 - 5. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M.

2.9 SIGNAL EQUIPMENT

- A. General: Provide hall-call and car-call buttons that light when activated and remain lit until call has been fulfilled. Provide vandal-resistant buttons and lighted elements illuminated with LEDs.
- B. Car-Control Stations: Provide manufacturer's standard recessed car-control stations. Mount in return panel adjacent to car door unless otherwise indicated.
 - 1. Mark buttons and switches for required use or function. 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.
- C. Emergency Communication System: Two-way voice communication system, with visible signal, which dials preprogrammed number of monitoring station and does not require handset use. System is contained in flush-mounted cabinet, with identification, instructions for use, and battery backup power supply.
- D. Car Position Indicator: Provide 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. Include travel direction arrows if not provided in car-control station.
- E. Hall Push-Button Stations: Provide one hall push-button station at each landing.
 - 1. Provide manufacturer's standard wall-mounted units.
 - 2. Equip units with buttons for calling elevator and for indicating desired direction of travel.
- F. 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.
- G. 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.
 - 1. At manufacturer's option, audible signals may be placed on cars.
- H. Standby Power Elevator Selector Switches: Provide switches, as required by ASME A17.1/CSA B44, where indicated. Adjacent to switches, provide illuminated signal that indicates when normal power supply has failed.
- I. Emergency Pictorial Signs: Fabricate from materials 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 unless otherwise indicated.

2.10 FINISH MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, commercial steel, Type B, exposed, matte finish.
- B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, commercial steel, Type B, pickled.
- C. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304.
- D. Stainless-Steel Bars: ASTM A 276, Type 304.
- E. Stainless-Steel Tubing: ASTM A 554, Grade MT 304.
- F. Aluminum Extrusions: ASTM B 221, Alloy 6063.
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, and pits 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, 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 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 each 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: Limit temporary use for construction purposes to one elevator. 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 elevator(s).
- B. Check operation of each 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 SERVICE

- A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' 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 with response time of two hours or less.
 - 3. Include 24-hour-per-day, 7-day-per-week emergency callback service with response time of two hours or less.

END OF SECTION 142123.16