Robert Poole Building #056
Additions and Renovations
May 9, 2016

ADDENDUM NO. 5

This Addendum is issued pursuant to the Instructions to Bidders and Conditions of the Contract. This Addendum serves to clarify, revise, and supersede information in the Bid Documents, and previously issued Addenda.

The bidder shall acknowledge receipt of this Addendum in the appropriate space on the Bid Form.

Bid Date: Thursday May 12, 2016 at 4:00 PM.

Bid Date: Extended only for Bid Packages 22A (Electrical) and 26A (Plumbing & HVAC) to Tuesday May 17, 2016 at 4:00 PM.

The following items will become part of the Bid Documents for this project:

1. Revision to Spec Section 000200-1, Invitation to Bid, revise fourth line:

"Bids for Bid Package 22A Plumbing & HVAC, and Bid Package 26A Electrical will be due on: May 17, 2016 at 4:00 PM. All other Bid Packages are due on May 12, 2016 at 4:00 PM."

2. Cam Construction General Notes dated May 9, 2016, attached.
3. JRS Architects responses to Cam RFI #3 dated April 29, 2016, attached.
4. JRS Architects Addendum #4 dated May 4, 2016, attached.
5. JRS Architects Addendum #5 dated May 6, 2016, attached.

Attachments

Cam Construction General Notes
JRS responses to Cam RFI 3
JRS Architects Addendum 4
JRS Architects Addendum 5

END OF ADDENDUM NO. 5

Robert Poole Building #056
Additions and Renovations
May 9, 2016

Addendum No. 5

CAM CONSTRUCTION – General Notes and Clarifications

1. Bid Package Metals 5A Clarifications:
   a. Reference Keynote 39 on A201, A202, and A203 – provide (20) lintels for a 4' opening, (20) lintels for a 7' opening, and (20) lintels for a 10' opening.
   b. This package to furnish (6) downspout boots.
2. Metals Bid Package 5A – bidders should include the installation of brick relieving angle where bolted to masonry backup, similar to detail 8/S-004.
3. Assume helical pier bearing at elevation 196.00 with top helical pier elevation at 222.50 for pile caps, and top helical pier elevation at 223.50 for grade beams. Therefore, pile lengths not to exceed thirty (30') ft. Provide alternate pricing for installing additional 5' sections of helical piers extending beyond elevation 192.50 for pile caps and 193.50 for grade beams.
4. Masonry Restoration Bid Package 4B – bidders should include cutting the existing cast stone and masonry wall for the installation of the tube steel beams – see detail 5/A512.
5. Masonry Bid Package 4A – this package should include all attachment hardware for cast stone.
6. Window Treatment Bid Package 12A – bidders are to include all aluminum window blind pockets (enclosures) as shown and specified.
7. Carpentry Bid Package 6A – bidders to include furnishing and installing all interior and exterior expansion joint assemblies, including insulation where shown, including but not limited to details: 4/A442, 2 and 8/A431, 1, 2 and 3/A421, and 2/A412.
8. Revision to JRS Addendum #2, page 5, change FFE at Greenhouse 2 on drawing C-1.33 to read "229.30" not "239.30".
9. Clarification to Bid Packages 21A Fire Protection and 22A Plumbing and HVAC: Bidders of Package 22A are to provide the 4" (domestic) and 6" (fire) incoming water services per Utility Plan C-1.22 from 5' outside building. Bid Package 22A should provide a flange connection within 5' inside the building for the 6" fire service. Fire Protection bidders of Package 21A shall provide a 6" backflow preventer at fire service flanged connection per Spec Division 21, and run fire piping to Fire Pump Room 021 per Drawing FP-113.

Robert Poole
CAM RFI#3
April 29, 2016

1. STV – Utility note U17 on C-1.22 states 2-4" conduits for the incoming telecommunication; however drawing T100 states 4-4" conduits. Which is correct? *Response: T100 is correct, there are four conduits. Drawing T100 was changed to 4 conduits in Addendum 2.*
a. The detail on C-2.04 also shows this as 2-4" conduits, concrete encased. Please confirm this ductbank is to be concrete encased. *Response pending in Addendum 5.*
b. ESP How many conduits are required inside from the connecting link, to the MDF (two or four)? *Response: Four 4" Conduits as shown on T101.*

2. ESP Detail 2, note 2 on TY501 states: "Owner shall provide video surveillance NVRS, Switches, software and cameras". Can you please verify/confirm this note? *Response: Revised in Addendum 3 per Revision 3, Sketch TYAD 3.01. "Contractor shall provide…."*

3. ESP Detail 2, note 5 on TY501 states: "All cables shall be run in cable tray, J-hooks no more than 6' apart and within EMT conduit." To ensure I understand this note correctly, you can confirm that cables may be ran in cable tray, j-hooks or conduit pending the installation application? All cables that are concealed should be able to be ran in cable tray and J-hooks, all exposed work is to be ran in EMT. *Response: Generally, your understanding is correct. Where cable tray is not present, cables shall be installed in J-hooks. Where ceilings and cable tray are not present, cables shall be run in conduits.*

4. Brinjac Detail 7 on E502 shows a detail for column grounding; however this is not shown on the site/floor plans. Please indicate where this is required. *Response: Column grounding was intended to be shown for new construction foundation columns, at approximately every 100'. Columns are now indicated on drawing E-213 and E-215 in Addendum 5.*

5. Brinjac Detail 14 on E502 shows a detail for ground rod wet wells; however these are not shown on the site/floor plans. Please indicate where this is required. *Response: Site plan E-010, keyed note 9 indicates the use of the ground rod wet well detail for ground rods associated with the generator set, located in the driveway area in front of the genset.*
a. Please confirm that another trade besides electrical will be responsible for the concrete pad in this detail. *Response: There is no delineation of required work for the installation (including the concrete berm around the grating, however it is expected that the electrical contractor would work with the site contractor to coordinate the installation of the ground rods with the driveway finish work. CAM needs to confirm scope of work.*

6. ESP Detail 4 on drawing T000 does not indicate the wire size or type is used to interconnect the electrical panels to the telecom ground bars, and to the structural steel. Please indicate what size/type of wire we are to utilize for this task. *Response: Minimum 6 AWG, Green, 1 conductor ground wire. Wire gauge must be increased where required due to distances. This shall be determined in the field based on exact distance and routing.*

7. Brinjac Lighting Control Wiring - Specification 260933 Para 3.3 A/, B - Lighting control installation: This specification calls for all lighting control wiring to be in conduit, is this correct? Most other projects this wiring is plenum rated cable above the ceiling and conduit in exposed areas. *Response: In concealed spaces, plenum rated wiring without conduit is acceptable for lighting control cabling.*

8. JRS Drawing A601 calls out acoustic ceiling types as AP1 thru AP4. The finish schedule calls out acoustic ceiling

types as AT1 thru AT4. *Response: See Addendum 4, AT1 through AT4 is correct.*

9. Brinjac The new P-113 indicates the new 4" domestic water line which is good. The FP-113 indicates the 6" fire line piped south to north thru B Bldg. to the Fire Pump room (enlarged plan and detail 2/FP 113 and 3/FP 113). We can find no reference to double check valve backflow preventer within the building. The water meter vault appears be equipped with a 6" detector check with 4" bypass and 4" meter. Please verify the need and location for double check valve backflow preventer within the building. *Response: The backflow preventer is shown on drawing FP113 in the crawl space between column lines A2 and A3. Per discussions with the Baltimore City Water Authority, the backflow preventer is required in the building even though there is a form of backflow prevention in the pit.*

10. JRS Windborne debris impact resistance is listed in 085113 2.2.I. This is usually reserved for hurricane zones. Is this actually required for this project? *Response: Delete, see Addendum 4.*

11. JRS In section 088000, glass types GL-2 and GL-4 are noted as, "safety glazing required". These types are currently listed with annealed inboard lites. Should this be changed to tempered so the glass will be safety glass? *Response: See Addendum 4, tempered may be required depending on the location.*

12. JRS Please confirm window types W11-W16 (listed on A603) are not part of the project. *Response: Confirmed, see Addendum 4.*

13. JRS Is door 160 part of the project? If so, which storefront opening should it be assigned to? *Response: Door 160 is at Greenhouse 2.*

14. JRS Are doors 123-1, 123-2, and 124 to be wood as listed on the door schedule? Or should they be aluminum since they are in storefront frames? *Response: See Addendum 4, SF10 and SF11 are Hollow Metal frames. Doors in those frames are wood, as shown.*

15. JRS What finish is the aluminum entrance door hardware? *See Addendum 4.*

16. JRS Please answer the following gym equipment questions:

a. Section 116623, paragraph 2.2.C. specifies the finish of the backstops in a color as selected by A/E. Will colors be limited to the standard colors offered by the manufacturer? *See Addendum 4.*

b. Section 116623, paragraph 2.2.H.4 specifies edge padding, the backboard detailed is fan and not able to have edge padding. Can this paragraph be deleted? *Yes, see Addendum 4.*

c. Section 116623, paragraph 2.2.I. specifies a fixed, non-break-away goal. Since height adjusters are provided, it is strongly recommended that these be break-away goals. Will break-away goals be required? *Response: Provide breakaway goals, see Addendum 4.*

d. Section 116623, paragraph 2.4.B. specifies only a volleyball net and not the posts and other accessories required for a complete and operable system. Will a complete volleyball system be required or just the net? *Posts will be required, see Addendum 4.*

e. Drawing E 215 shows power supplies for (9) basketball hoops but drawing A 554 shows only (8) basketball hoops. How many basketball hoops are required, (9) or (8)? *Response: 8, one power connection has been deleted from the electrical drawing.*

f. Section 116653, paragraph 2.4.E. specifies wireless control system for the divider curtain but drawing E 215 shows key-switch operation for the curtains. Are the curtains to be operated by wireless control or key-switch? *Response: key switch*

g. Section 126600, paragraph 1.7.A. specifies that the wood needs to be supplied by an FSC accredited certification

body. Is FSC certified wood required for the bleachers? *Response: Yes, certified wood is required, see paragraph 2.5.B.*

h. Section 126600, paragraph 2.2.B.3. specifies row rise between 11 and 12 inches. This is higher than the standard rise for manufacturers, which is between 9-5/8" to 10-1/4" and may result in damage to the understructure after continued use. Can standard rise between 9-5/8" and 10-1/4" be used? *Response: Rise range is increased in Addendum 4*

i. Section 126600, paragraph 2.2.B.6.b. specifies single phase power, standard power is three phase. Can manufacturers standard three phase power be used? *Response: Three phase may be submitted as an alternate provided there is no additional cost to the owner.*

j. Section 126600, paragraph 2.3.C. specifies 3/4" thick decks, manufacturers standard deck thickness is 5/8" thick. Can standard 5/8" thick decking be used? *Response: Yes, see Addendum 4.*

17. JRS Please clarify where the Manually Operated Roller Shades and the Motor Operated Roller shades are located. *Response: Manually operated shades are located at all exterior windows except for Collaboration Stair 224 which is motorized.*

18. JRS Sheet # A136 along with specifications in section 116143 do not specify number of curtain panels or width of panels. Normally, when track is installed on the perimeter of the room, as in this case, the curtains will be divided up into several sections to provide diverse staging options for the end user. Any clarification would be appreciated. *Response: 4 panels, see Addendum 4.*

19. JRS Specifications in section 116143 call for a black curtain. Drawings are noted as having a cyclorama curtain. Cyclorama curtains are generally white of very light in color in order to project color on. There are no specifications listed for cyclorama curtains in section 116143. Please clarify. *Response: Curtain is black, see Addendum 4.*

20. Brinjac In reference to theatrical lighting and controls: Specifications section 26 55 61 call for all LED fixtures that are not line-dimmable but have on-board dimming. Specifications also call for SlimDim 1200W dimmers. With the current lighting package, these dimmers are incompatible and have no lighting fixtures to work with. Connecting specified instruments to these dimmer modules will cause damage to the lighting fixtures' on-board electronics. Could you please provide clarification on this? *Response: SlimDim equipment shall have non-dim relays, not dimmer modules.*

21. Brinjac Regarding the geothermal wells:

a. M010 Geothermal Well states the grout is to be 1.2 BTU (H*FT*F). New regulations and COMAR requirements only allow for the k value of the grout to be 1.0 BTU. Please advise. *Response: A lower k value is better and therefore acceptable.*

b. Drawing M503, note 3 states that the geothermal well field is to be sloped back up towards the manifolds. Please confirm at what elevation and percentage the geothermal system is to be sloped. This requires deeper excavations/means and methods if requires. Please advise. *Response: Provide 1/8" per 100 feet of slope back to the manifold.*

c. Spec Section 232113.34, 2.2.A, states the thermal conductivity of the grouting compound must be 1.5 BTU/hr-ft-F or greater. New regulations and COMAR requirements only allow for the k value of the grout to be 1.0 BTU. Please advise. *Response: A lower k value is better and therefore acceptable.*

d. Is temporary steel and or PVC well casing acceptable on this project? *Response: No*

e. Drawing M010 and Drawing M503 show a geothermal vault. Is it acceptable to utilize a HDPE Vault with HDPE manifold on the interior? *Response: Provide the vault per the drawings and specifications*

22. Brinjac Please provide the plan view location of the 60a ECB and 100a ECB as shown on the Electrical Riser, Drawing E 500, Note 23. *Response: Large Scale plan on drawing E400 has been revised to show location of disconnecting means.*

23. Brinjac Specification section 263213-1.2-A-2 calls out for a sub-base fuel tank; and 263213-2.5-A calls for a skid-mounted fuel tank. Which is required? *Response: A sub-base tank mounted to the skids of the generator set.*
a. If sub-base, we recommend pad vibration isolators rather than springs due to fluctuating weight of diesel in the tank. Will this be acceptable? Springs also add 4-5" between the pad and tank which allow for debris and vermin to access the generator. *Response: Pad vibrator isolators between the sub-base tank and the concrete pad are acceptable, however provide spring-type vibration isolators between engine/generator mounts and steel skid.*
b. What is the distance from the generator to the proper line? This has an effect on the generator enclosure to meet local codes. *Response: The plan distance from the genset to the property line is approximately 25'. We are unaware of any local code requirements for sound attenuation. Please provide reference so that we can modify specifications if required.*

24. Brinjac The control diagram on M402 indicates DDC modulating (SCR) control of the heater element. The PUH spec does not require an SCR with the heater, and there doesn't seem to be a spec for the CUH. Also the PUH spec indicates an integral thermostat, and no thermostats are shown on the plans, so is DDC control required at all? *Response: DDC control is not required for Unit heaters.*

25. Albrecht Structural items:
a. Please provide lintel configuration and size above curtainwalls 3, 4, 5, and 6 (1A and 2A/A204) at doors 100H-1 and 100H-2, as this is an 18' span and angles back an additional 4'. Reference 4/A403 and 8/S-504. *Response: Lintel configuration for curtain wall spans exceeding 8'-0" is shown on 8/S-004 as noted on the elevations on S-231 and S-232.*

26. Brinjac Please provide a revised riser diagram to illustrate the addition of the sewage ejector pump. *Response: See drawing issued with Addendum 5.*

27. Brinjac What is the extent of the existing under slab sanitary sewer piping to remain in place for reuse in Bldg A and B? *Response: All existing underslab piping is to be replaced or abandoned in place.*

28. JRS Glass specs apparently are contradictory. The types are calling for Low- E but going by the performance listed they all don't need a low-E. See the attached list from a glass supplier for recommended glass types, and advise of any revisions. *Response: The glazing schedule was developed to attempt to balance a number of admittedly competing needs: varying levels of daylight, controlling heat loss and gain, and requirements for penetration resistance. Alternate means of achieving these goals will certainly be considered.*

Additions & Renovations at Robert Poole Building #56
Maryland Stadium Authority
Baltimore City Public Schools
JRS Architects
May 4, 2016

ADDENDUM #4

This Addendum is issued pursuant to the Instructions to Bidders and Conditions of the Contract. This Addendum serves to clarify, revise, and supersede information in the Project Manual, Drawings, and previously issued Addenda. Portions of the Addendum affecting the Contract Documents will be incorporated into the Contract by enumeration of the Addendum in the Owner/Contractor Agreement.

The Bidder shall acknowledge receipt of this Addendum in the appropriate space on the Bid Form.

ATTACHMENTS

This Addendum includes the following attached Sheets:
M219, New Work Third Floor Plan C – Ductwork, rev 2, 4/29/16
M221, New Work Roof Plan C – Ductwork, rev 1, 4/29/16
E219, New Work Third Floor Plan C – Power, rev 2, 4/29/16
E608, Electrical Panel Schedules, rev 3, 4/29/16

This Addendum includes the following attached Addendum Drawings:
LAD 4.01, Addendum 4, 5/3/16

This Addendum includes the attached Specification Sections:
03 4500 Precast Architectural Concrete, dated 5/3/16, issued with this Addendum
11 0000 Miscellaneous Equipment, dated 4/28/16, reissued with this Addendum
32 3113 Chain Link Fences and Gates, dated 5/3/16, reissued with this Addendum

REVISIONS TO DIVISION 01 GENERAL REQUIREMENTS

Section	Paragraph	Change
Table of Contents	Division 3	ADD: “034500 Precast Architectural Concrete, 5/3/16, 14 pages”
Table of Contents	Division 11	DELETE: “110000 Miscellaneous Equipment, 3/31/16, 2 pages” ADD: “110000 Miscellaneous Equipment, 4/28/16, 2 pages”
Table of Contents	Division 32	DELETE: “Chain Link Fences and Gates, 3/31/16, 8 pages” ADD: “Chain Link Fences and Gates, 5/3/16, 9 pages”

REVISIONS TO DIVISIONS 02 - 16 SPECIFICATION SECTIONS

Section	Paragraph	Change
03 4500		ADD: Section 034500 Precast Architectural Concrete, 5/3/16
08 5113	2.2	DELETE: “I. Windborne-Debris…having jurisdiction” in its entirety.
08 7100	2.23	ADD: “D. All exposed hardware except surface closers, ferrous hinges, and continuous hinges shall be satin stainless steel, US32D.

Section	Paragraph	Change
		1. Factory finish surface closers to match satin stainless steel. 2. Butt hinges at exterior doors and doors in wet areas shall be satin stainless steel. Butt hinges at all other locations shall be satin chrome plated US26D. 3. Continuous geared hinges shall have a clear anodized finish. 4. Thresholds shall be mill finish."
08 8000	2.2.C	ADD: "Note that specific glazing types may or may not generally include tempered glass. The requirement for safety glazing supersedes description in glazing type."
08 8000	3.9.A Glass Type GL-2	DELETE: "11. Safety glazing required."
08 8000	3.9.A Glass Type GL-4	DELETE: "11. Safety glazing required."
11 0000		DELETE: Section in its entirety. ADD: 11 0000 Miscellaneous Equipment, dated 4/28/16
11 6623	2.2.C	At end of sentence ADD: "from manufacturers full range of standard colors."
11 6623	2.2.H.4	DELETE paragraph in its entirety.
11 6623	2.2.I	DELETE: "Goal: Porter Model No. 00225-000 high strength Super Goal" ADD: "Goal: Porter Model No. 00245-500 Ultra Flex Goal"
11 6623	2.4	ADD: " D. Post Standards: Removable, paired volleyball post standards as indicated. Fixed height. Designed for easy removal from permanently placed floor insert supports. Fabricated from manufacturer's standard metal pipe or tubing, with nonmarking plastic or rubber end cap or floor bumper to protect permanent flooring. Finished with manufacturer's standard factory-applied, polyester powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness or plated metal finish. 1. Nominal Pipe or Tubing Diameter: 3-1/2-inch OD at base. 2. Net Height Adjuster: Manufacturer's standard mechanism for height adjustment, complete with fittings; designed for positioning net at heights indicated. a. Net Heights: Between for ages 12 and under net height and boys'/men's volleyball net height, 84 and 95-5/8 inches or more. 3. Height Markers: Clearly marked at regulation play heights for elementary school, girls/women, and boys/men."
12 2413	2.2	After "Single Rollers" ADD: "(at all exterior windows except Collaboration Stair 224)"
12 6600	2.2.B.3	DELETE: "11", ADD: "9-5/8".
12 6600	2.3.C	DELETE: "3/4 inch thick" ADD "5/8 inch thick minimum."
32 3113		DELETE: Entire Section dated 3/31/16. ADD: Section 32 3113 Chain Link Fences and Gates, dated 5/3/16.

REVISIONS TO DRAWING SHEETS

Drawing	Location	Change
L1.02	5	ADD note: "Brick veneer and mortar to match architecture; refer to specification section 042000 Unit Masonry"
L1.02	5	ADD to Stainless Steel Dowel call out: "2 ft. O.C. MIN"
L1.02	5	DELETE: "Header Course", ADD: "Rowlock Course" to match brick pattern shown on drawing
L1.04	2	ADD note "Refer to specification section 099726-EXTERIOR CEMENTITIOUS COATING ON EXISTING CONCRETE"
L1.05	6	ADD note "Provide 18 foot clear Gate opening with two 9 foot swing gates at the service area."
L1.06	3	ADD call out: "Stainless Steel Dowel; 2 ft. O.C. both ways" (SS Dowels are shown without call outs)
L1.06	3	ADD note: "Brick veneer and mortar to match architecture; refer to specification section 042000 Unit Masonry"
L1.06	3	DELETE: "Header Course", ADD: "Rowlock Course" to match brick pattern shown on drawing
L1.06	9	ADD call out: "Stainless Steel Dowel; 2 ft. MIN" (SS Dowel is shown without call out)
L1.06	9	ADD note: "Brick veneer and mortar to match architecture; refer to specification section 042000 Unit Masonry"
L1.06	9	DELETE: "Header Course", ADD "Rowlock Course" to match brick pattern shown on drawing
L1.06	9	Changed material of the sign wall to Precast Architectural Concrete; adjacent seat wall cap remains Arch Cast Stone as shown on the attached Sketch LAD 4.01.
L1.07	6	ADD note "Brick veneer and mortar to match architecture; refer to specification section 042000 Unit Masonry"
L1.07	6	DELETE: "Header Course", ADD: "Rowlock Course" to match brick pattern shown on drawing
L1.07	7	ADD note: "Brick veneer and mortar to match architecture; refer to specification section 042000 Unit Masonry"
L1.07	7	DELETE: "Header Course", ADD: "Rowlock Course" to match brick pattern shown on drawing
A 136	1	At Room 231 Theater/Dance, Note “Cyclorama Curtain Track…”, DELETE: “Cyclorama” ADD: Provide four panels, each the length of one wall.”
A 601	Finish Abbreviations Legend	DELETE: “AP1”, ADD: “AT1” DELETE: “AP2”, ADD: “AT2” DELETE: “AP3”, ADD: “AT3” DELETE: “AP4”, ADD: “AT4”
A 602	Door Schedule	At Door 160: ADD: “160”, “Greenhouse 2”.
A 603	Window Schedule	DELETE: Types W11, W14, W15, and W16.
A 606	10, Type SF10	ADD Note: “Hollow Metal Frame”.
A 606	11, Type SF11	ADD Note: “Hollow Metal Frame”.
A 606	12, Type SF12	ADD Note: “This type is a thermally broken system.”
M219		REVISE: Kiln ductwork drawing and notes as shown on the

Drawing	Location	Change
		attached reissued sheet.
M221		ADD: Kiln ventilator gooseneck as shown on the attached reissued sheet.
E219		REVISE: Power Kiln power as shown on the attached reissued sheet.
E608		REVISE: Panel RP8 (Section 2) as shown on the attached reissued sheet.
T 000	4, Notes	ADD: "10. Grounding wire minimum 6 AWG, Green, 1 conductor ground wire. Wire gauge must be increased where required due to distances as determined in the field based on exact distance and routing."
TY 501	2, Note 5	ADD: "Where cable tray is not present, cables shall be installed in J-hooks. Where ceilings and cable tray are not present, cables shall be run in conduits."

END OF ADDENDUM 4

SECTION 034500 - PRECAST ARCHITECTURAL 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:

1. Architectural precast concrete cladding units.
2. Insulated, architectural precast concrete units.

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for installing connection anchors in concrete.
2. Section 047200 "Cast Stone Masonry" for wet- or dry-cast cast stone facings, trim, and accessories.

1.3 DEFINITIONS

A. Design Reference Sample: Sample of approved architectural precast concrete color, finish and texture, preapproved by Architect.

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.

C. Design Mixtures: For each precast concrete mixture. Include compressive strength and water-absorption tests.

D. Shop Drawings:

1. Detail fabrication and installation of architectural precast concrete units.
2. Indicate locations, plans, elevations, dimensions, shapes, and cross sections of each unit.
3. Indicate joints, reveals, drips, chamfers, and extent and location of each surface finish.
4. Indicate details at corners.
5. Indicate type, size, and length of welded connections by AWS standard symbols. Detail loose and cast-in hardware and connections.
6. Indicate locations, tolerances, and details of anchorage devices to be embedded in or attached to structure or other construction.
7. Indicate location of each architectural precast concrete unit by same identification mark placed on panel.
8. If design modifications are proposed to meet performance requirements and field conditions, submit design calculations and Shop Drawings. Do not adversely affect the appearance, durability, or strength of units when modifying details or materials and maintain the general design concept.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

B. Material Certificates: For the following items:

1. Cementitious materials.
2. Admixtures.

C. Material Test Reports: For aggregates.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A precast concrete erector qualified and designated by PCI's Certificate of Compliance to erect Category A (Architectural Systems) for non-load-bearing members.

B. Fabricator Qualifications: A firm that assumes responsibility for engineering architectural precast concrete units to comply with performance requirements. This responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

1. Designated as a PCI-certified plant for Group A, Category A1 - Architectural Cladding and Load Bearing Units or designated as an APA-certified plant for production of architectural precast concrete products.

C. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

D. Quality-Control Standard: For manufacturing procedures and testing requirements, quality-control recommendations, and dimensional tolerances for types of units required, comply with PCI MNL 117, "Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products."

E. Mockups: Before production of architectural precast concrete units, construct full-sized mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for materials and execution.

1. Build mockup as directed by Architect including architectural precast concrete complete with anchors, connections, flashings, and joint fillers.
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 undamaged at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver architectural precast concrete units in such quantities and at such times to limit unloading units temporarily on the ground or other rehandling.

B. Support units during shipment on nonstaining shock-absorbing material.

C. Store units with adequate dunnage and bracing and protect units to prevent contact with soil, to prevent staining, and to prevent cracking, distortion, warping or other physical damage.

D. Place stored units so identification marks are clearly visible, and units can be inspected.

E. Handle and transport units in a manner that avoids excessive stresses that cause cracking or damage.

F. Lift and support units only at designated points indicated on Shop Drawings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Fabricators: Subject to compliance with requirements, available fabricators offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Nelson Precast – (410) 522-7190
2. American Artstone (507) 233-3700
3. Arban & Carosi – (703) 491-5121
4. Arban Precast Stone, LTD. – (703) 221-8005
5. Back River Pre-Cast, LLC. – (410) 833-3394
6. High Concrete Group, LLC. – (877) 844-4418
7. Oldcastle Precast – (888) 965-3227
8. The Shockey Precast Group – (540) 667-7700
9. Universal Concrete Products – (610) 323-0700

2.2 PERFORMANCE REQUIREMENTS

A. Design Standards: Comply with ACI 318 and design recommendations of PCI MNL 120, "PCI Design Handbook - Precast and Prestressed Concrete," applicable to types of architectural precast concrete units indicated.

2.3 MOLD MATERIALS

A. Molds: Rigid, dimensionally stable, non-absorptive material, warp and buckle free, that provides continuous and true precast concrete surfaces within fabrication tolerances indicated; nonreactive with concrete and suitable for producing required finishes.

1. Mold-Release Agent: Commercially produced form-release agent that does not bond with, stain or adversely affect precast concrete surfaces and does not impair subsequent surface or joint treatments of precast concrete.

2.4 REINFORCING MATERIALS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

C. Galvanized Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed bars, with ASTM A 767/A 767M, Class II zinc coating and chromate treatment. Galvanize after fabrication and bending.

D. Epoxy-Coated Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed bars, ASTM A 775/A 775M or ASTM A 934/A 934M epoxy coated.

E. Steel Bar Mats: ASTM A 184/A 184M, fabricated from ASTM A 615/A 615M, Grade 60, deformed bars, assembled with clips.

F. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, fabricated from[**galvanized-**]steel wire into flat sheets.

G. Deformed-Steel Welded Wire Reinforcement: ASTM A 497/A 497M, flat sheet.

H. Supports: Suspend reinforcement from back of mold or use bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place according to PCI MNL 117.

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. Regional Materials: Concrete shall be manufactured within 500 miles of Project site.

C. Portland Cement: ASTM C 150/C 150M, Type I or Type III, gray, unless otherwise indicated.

1. For surfaces exposed to view in finished structure, use gray or white cement, of same type, brand, and mill source.

D. Supplementary Cementitious Materials:

1. Metakaolin: ASTM C 618, Class N.
2. White Silica Fume: ASTM C 1240, with optional chemical and physical requirement.
3. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

E. Normal-Weight Aggregates: Except as modified by PCI MNL 117, ASTM C 33/C 33M, with coarse aggregates complying with Class 5S. Stockpile fine and coarse aggregates for each type of exposed finish from a single source (pit or quarry) for Project.

1. Face-Mixture-Coarse Aggregates: Selected, hard, and durable; free of material that reacts with cement or causes staining; to match selected finish sample.

a. Gradation: To match design reference sample.

2. Face-Mixture-Fine Aggregates: Selected, natural or manufactured sand compatible with coarse aggregate; to match approved finish sample.

F. Coloring Admixture: ASTM C 979/C 979M, synthetic or natural mineral-oxide pigments or colored water-reducing admixtures, temperature stable, and nonfading.

G. Water: Potable; free from deleterious material that may affect color stability, setting, or strength of concrete and complying with chemical limits of PCI MNL 117.

H. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.

I. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and to not contain calcium chloride, or more than 0.15 percent chloride ions or other salts by weight of admixture.

1. Water-Reducing Admixtures: 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. Water-Reducing and Accelerating Admixture: ASTM C 494/C 494M, Type E.
5. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
6. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
7. Plasticizing Admixture: ASTM C 1017/C 1017M, Type I.
8. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.
9. Corrosion Inhibiting Admixture: ASTM C 1582/C 1582M.

2.6 STEEL CONNECTION MATERIALS

A. Carbon-Steel Shapes and Plates: ASTM A 36/A 36M.

B. Carbon-Steel-Headed Studs: ASTM A 108, AISI 1018 through AISI 1020, cold finished, AWS D1.1/D1.1M, Type A or Type B, with arc shields and with minimum mechanical properties of PCI MNL 117, Table 3.2.3.

C. Carbon-Steel Plate: ASTM A 283/A 283M, Grade C.

D. Malleable Iron Castings: ASTM A 47/A 47M, Grade 32510 or Grade 35028.

E. Carbon-Steel Castings: ASTM A 27/A 27M, Grade 60-30.

F. High-Strength, Low-Alloy Structural Steel: ASTM A 572/A 572M.

G. Carbon-Steel Structural Tubing: ASTM A 500/A 500M, Grade B or Grade C.

H. Wrought Carbon-Steel Bars: ASTM A 675/A 675M, Grade 65.

I. Deformed-Steel Wire or Bar Anchors: ASTM A 496/A 496M or ASTM A 706/A 706M.

J. Carbon-Steel Bolts and Studs: ASTM A 307, Grade A or ASTM F 1554, Grade 36; carbon-steel, hex-head bolts and studs; carbon-steel nuts, ASTM A 563; and flat, unhardened steel washers, ASTM F 844.

K. Zinc-Coated Finish: For exterior steel items[, steel in exterior walls,] and items indicated for galvanizing, apply zinc coating by [hot-dip process according to ASTM A 123/A 123M or ASTM A 153/A 153M] [electrodeposition according to ASTM B 633, SC 3, Types 1 and 2].

1. For steel shapes, plates, and tubing to be galvanized, limit silicon content of steel to less than 0.03 percent or to between 0.15 and 0.25 percent or limit sum of silicon and 2.5 times phosphorous content to 0.09 percent.
2. Galvanizing Repair Paint: High-zinc-dust-content paint with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035B or SSPC-Paint 20.

L. Shop-Primed Finish: Prepare surfaces of nongalvanized steel items, except those surfaces to be embedded in concrete, according to requirements in SSPC-SP 3 and shop-apply lead- and chromate-free, rust-inhibitive primer, complying with performance requirements in MPI 79 according to SSPC-PA 1.

M. Welding Electrodes: Comply with AWS standards.

2.7 STAINLESS-STEEL CONNECTION MATERIALS

A. Stainless-Steel Plate: ASTM A 666, Type 304, Type 316, or Type 201.

B. Stainless-Steel Bolts and Studs: ASTM F 593, Alloy Group 1 or 2 hex-head bolts and studs; ASTM F 594, Alloy Group 1 or 2 stainless-steel nuts; and flat, stainless-steel washers.

1. Lubricate threaded parts of stainless-steel bolts with an antiseize thread lubricant during assembly.

C. Stainless-Steel-Headed Studs: ASTM A 276, Alloy 304 or Alloy 316, with minimum mechanical properties of PCI MNL 117, Table 3.2.3.

2.8 ACCESSORIES

A. Precast Accessories: Provide clips, hangers, high-density plastic or steel shims, and other accessories required to install architectural precast concrete units.

2.9 GROUT MATERIALS

A. Sand-Cement Grout: Portland cement, ASTM C 150/C 150M, Type I, and clean, natural sand, ASTM C 144 or ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 to 3 parts sand, by volume, with minimum water required for placement and hydration. Water-soluble chloride ion content less than 0.06 percent by weight of cement when tested according to ASTM C 1218/C 1218M.

B. Nonmetallic, Nonshrink Grout: Packaged, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, plasticizing and water-reducing agents, complying with ASTM C 1107/C 1107M, Grade A for drypack and Grades B and C for flowable grout and of consistency suitable for application within a 30-minute working time. Water-soluble chloride ion content less than 0.06 percent by weight of cement when tested according to ASTM C 1218/C 1218M.

C. Epoxy-Resin Grout: Two-component, mineral-filled epoxy resin; ASTM C 881/C 881M, of type, grade, and class to suit requirements.

2.10 CONCRETE MIXTURES

A. Prepare design mixtures for each type of precast concrete required.

1. Use a single design mixture for units with more than one major face or edge exposed.

B. Limit metakaolin and white silica fume to 10 percent of portland cement by weight.

C. Design mixtures may be prepared by a qualified independent testing agency or by qualified precast plant personnel at architectural precast concrete fabricator's option.

D. Limit water-soluble chloride ions to maximum percentage by weight of cement permitted by ACI 318 or PCI MNL 117 when tested according to ASTM C 1218/C 1218M.

E. Normal-Weight Concrete Mixtures: Proportion full-depth mixture or face and backup mixtures or full-depth mixtures, at fabricator's option by either laboratory trial batch or field test data methods according to ACI 211.1, with materials to be used on Project, to provide normal-weight concrete with the following properties:

1. Compressive Strength (28 Days): 5000 psi minimum.
2. Maximum Water-Cementitious Materials Ratio: 0.45.

F. Water Absorption: 6 percent by weight or 14 percent by volume, tested according to ASTM C 642, except for boiling requirement.

G. When included in design mixtures, add other admixtures to concrete mixtures according to manufacturer's written instructions.

2.11 MOLD FABRICATION

A. Molds: Accurately construct molds, mortar tight, of sufficient strength to withstand pressures due to concrete-placement operations and temperature changes and for prestressing and detensioning operations. Coat contact surfaces of molds with release agent before reinforcement is placed. Avoid contamination of reinforcement and prestressing tendons by release agent.

B. Maintain molds to provide completed architectural precast concrete units of shapes, lines, and dimensions indicated, within fabrication tolerances specified.

1. Form joints are not permitted on faces exposed to view in the finished work.
2. Edge and Corner Treatment: Uniformly chamfered.

2.12 FABRICATION

A. Cast-in Anchors, Inserts, Plates, Angles, and Other Anchorage Hardware: Fabricate anchorage hardware with sufficient anchorage and embedment to comply with design requirements. Accurately position for attachment of loose hardware, and secure in place during precasting operations. Locate anchorage hardware where it does not affect position of main reinforcement or concrete placement.

1. Weld-headed studs and deformed bar anchors used for anchorage according to AWS D1.1/D1.1M and AWS C5.4, "Recommended Practices for Stud Welding."

B. Furnish loose hardware items including steel plates, clip angles, seat angles, anchors, dowels, cramps, hangers, and other hardware shapes for securing architectural precast concrete units to supporting and adjacent construction.

C. Cast-in reglets, slots, holes, and other accessories in architectural precast concrete units as indicated by manufacturer.

D. Reinforcement: Comply with recommendations in PCI MNL 117 for fabricating, placing, and supporting reinforcement.

1. Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy the bond with concrete. When damage to epoxy-coated reinforcing exceeds limits specified in ASTM A 775/A 775M, repair with patching material compatible with coating material and epoxy coat bar ends after cutting.
2. Accurately position, support, and secure reinforcement against displacement during concrete-placement and consolidation operations. Completely conceal support devices to prevent exposure on finished surfaces.
3. Place reinforcing steel and prestressing strands to maintain at least 3/4-inch minimum concrete cover. Increase cover requirements for reinforcing steel to 1-1/2 inches when units are exposed to corrosive environment or severe exposure conditions. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position while placing concrete. Direct wire tie ends away from finished, exposed concrete surfaces.
4. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh spacing and wire tie laps, where required by design. Offset laps of adjoining widths to prevent continuous laps in either direction.

E. Reinforce architectural precast concrete units to resist handling, transportation, and erection stresses and specified in-place loads.

F. Place concrete in a continuous operation to prevent cold joints or planes of weakness from forming in precast concrete units.

G. Thoroughly consolidate placed concrete by internal and external vibration without dislocating or damaging reinforcement and built-in items, and minimize pour lines, honeycombing, or entrapped air voids on surfaces. Use equipment and procedures complying with PCI MNL 117.

1. Place self-consolidating concrete without vibration according to PCI TR-6, "Interim Guidelines for the Use of Self-Consolidating Concrete in Precast/Prestressed Concrete Institute Member Plants." Ensure adequate bond between face and backup concrete, if used.

H. Comply with PCI MNL 117 for hot- and cold-weather concrete placement.

I. Identify pickup points of architectural precast concrete units and orientation in structure with permanent markings, complying with markings indicated on Shop Drawings. Imprint or permanently mark casting date on each architectural precast concrete unit on a surface that does not show in finished structure.

J. Cure concrete, according to requirements in PCI MNL 117, by moisture retention without heat or by accelerated heat curing using low-pressure live steam or radiant heat and moisture. Cure units until compressive strength is high enough to ensure that stripping does not have an effect on performance or appearance of final product.

K. Discard and replace architectural precast concrete units that do not comply with requirements, including structural, manufacturing tolerance, and appearance, unless repairs meet requirements in PCI MNL 117 and Architect's approval.

2.13 FABRICATION TOLERANCES

A. Fabricate architectural precast concrete units to shapes, lines, and dimensions indicated so each finished unit complies with PCI MNL 117 product tolerances as well as position tolerances for cast-in items.

B. Position Tolerances: For cast-in items measured from datum line location, as indicated on Shop Drawings.

1. Weld Plates: Plus or minus 1 inch.
2. Inserts: Plus or minus 1/2 inch.
3. Handling Devices: Plus or minus 3 inches.
4. Reinforcing Steel and Welded Wire Reinforcement: Plus or minus 1/4 inch where position has structural implications or affects concrete cover; otherwise, plus or minus 1/2 inch.
5. Reinforcing Steel Extending out of Member: Plus or minus 1/2 inch of plan dimensions.
6. Tendons: Plus or minus 1/4 inch, vertical; plus or minus 1 inch, horizontal.
7. Location of Rustication Joints: Plus or minus 1/8 inch.
8. Location of Opening within Panel: Plus or minus 1/4 inch.
9. Location of Flashing Reglets: Plus or minus 1/4 inch.
10. Location of Flashing Reglets at Edge of Panel: Plus or minus 1/8 inch.
11. Reglets for Glazing Gaskets: Plus or minus 1/8 inch.
12. Electrical Outlets, Hose Bibs: Plus or minus 1/2 inch.
13. Location of Bearing Surface from End of Member: Plus or minus 1/4 inch.
14. Allowable Rotation of Plate, Channel Inserts, and Electrical Boxes: 2-degree rotation or 1/4 inch maximum over the full dimension of unit.
15. Position of Sleeve: Plus or minus 1/2 inch.
16. Location of Window Washer Track or Buttons: Plus or minus 1/8 inch.

2.14 FINISHES

A. Exposed faces shall be free of joint marks, grain, and other obvious defects. Corners, including false joints shall be uniform, straight, and sharp. Finish exposed-face surfaces of architectural precast concrete units to match approved design reference sample and mockups and as follows:

1. Design Reference Sample: Architectural sample fine grained texture and buff color resembling sand-rubbed Indiana limestone.
2. PCI's "Architectural Precast Concrete - Color and Texture Selection Guide," of plate numbers indicated.
3. As-Cast Surface Finish: Provide surfaces to match approved sample for acceptable surface, air voids, sand streaks, and honeycomb.
4. Acid-Etched Finish: Use acid and hot-water solution, equipment, application techniques, and cleaning procedures to expose aggregate and surrounding matrix surfaces. Protect hardware, connections, and insulation from acid attach.
5. Honed Finish: Use continuous mechanical abrasion with fine grit, followed by filling and rubbing procedures.
6. Sand-Embedment Finish: Use selected stones placed in a sand bed in bottom of mold, with sand removed after curing.

B. Finish exposed top surfaces of architectural precast concrete units to match face-surface finish.

C. Finish unexposed surfaces of architectural precast concrete units with as cast finish.

2.15 SOURCE QUALITY CONTROL

A. Quality-Control Testing: Test and inspect precast concrete according to PCI MNL 117 requirements. If using self-consolidating concrete, also test and inspect according to PCI TR-6, ASTM C 1610/C 1610M, ASTM C 1611/C 1611M, ASTM C 1621/C 1621M, and ASTM C 1712.

B. Strength of precast concrete units is considered deficient if units fail to comply with ACI 318 requirements for concrete strength.

C. Testing: If there is evidence that strength of precast concrete units may be deficient or may not comply with ACI 318 requirements, precaster will employ an independent testing agency to obtain, prepare, and test cores drilled from hardened concrete to determine compressive strength according to ASTM C 42/C 42M and ACI 318.

1. A minimum of three representative cores shall be taken from units of suspect strength, from locations directed by Architect.
2. Test cores in an air-dry condition.
3. Strength of concrete for each series of three cores is considered satisfactory if average compressive strength is equal to at least 85 percent of 28-day design compressive strength and no single core is less than 75 percent of 28-day design compressive strength.
4. Report test results in writing on same day that tests are performed, with copies to Architect, Contractor, and precast concrete fabricator. Test reports include the following:

    a. Project identification name and number.
    b. Date when tests were performed.
    c. Name of precast concrete fabricator.
    d. Name of concrete testing agency.
    e. Identification letter, name, and type of precast concrete unit(s) represented by core tests; design compressive strength; type of break; compressive strength at breaks, corrected for length-diameter ratio; and direction of applied load to core in relation to horizontal plane of concrete as placed.

D. Patching: If core test results are satisfactory and precast concrete units comply with requirements, clean and dampen core holes and solidly fill with precast concrete mixture that has no coarse aggregate, and finish to match adjacent precast concrete surfaces.

E. Defective Units: Discard and replace recast architectural concrete units that do not comply with acceptability requirements in PCI MNL 117, including concrete strength, manufacturing tolerances, and color and texture range. Chipped, spalled, or cracked units may be repaired, subject to Architect's approval. Architect reserves the right to reject precast units that do not match approved samples, sample panels, and mockups. Replace unacceptable units with precast concrete units that comply with requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting structural frame or foundation and conditions for compliance with requirements for installation tolerances, bearing surface tolerances, and other conditions affecting performance of the Work.

B. Do not install precast concrete units until supporting cast-in-place concrete has attained minimum allowable design compressive strength and supporting steel or other structure is structurally ready to receive loads from precast concrete units.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install clips, hangers, bearing pads, and other accessories required for connecting architectural precast concrete units to supporting members and backup materials.

B. Erect architectural precast concrete level, plumb, and square within specified allowable tolerances. Provide temporary supports and bracing as required to maintain position, stability, and alignment of units until permanent connections are completed.

1. Install temporary steel or plastic spacing shims as precast concrete units are being erected. Tack weld steel shims to each other to prevent shims from separating.
2. Maintain horizontal and vertical joint alignment and uniform joint width as erection progresses.
3. Remove projecting lifting devices and grout fill voids within recessed lifting devices flush with surface of adjacent precast surfaces when recess is exposed.
4. Unless otherwise indicated, maintain uniform joint widths of 3/4 inch.

C. Connect architectural precast concrete units in position by bolting, welding, grouting, or as otherwise indicated on Shop Drawings. Remove temporary shims, wedges, and spacers as soon as practical after connecting and grouting are completed.

1. Do not permit connections to disrupt continuity of roof flashing.

D. Welding: Comply with applicable requirements in AWS D1.1/D1.1M and AWS D1.4/D1.4M for welding, welding electrodes, appearance, quality of welds, and methods used in correcting welding work.

1. Protect architectural precast concrete units and bearing pads from damage by field welding or cutting operations, and provide noncombustible shields as required.
2. Welds not specified shall be continuous fillet welds, using no less than the minimum fillet as specified by AWS.
3. Clean weld-affected metal surfaces with chipping hammer followed by brushing, and apply a minimum 4.0-mil-thick coat of galvanized repair paint to galvanized surfaces according to ASTM A 780/A 780M.

4. Visually inspect welds and remove, reweld, or repair incomplete and defective welds.

E. At bolted connections, use lock washers, tack welding, or other approved means to prevent loosening of nuts after final adjustment.

1. Where slotted connections are used, verify bolt position and tightness. For sliding connections, properly secure bolt but allow bolt to move within connection slot.
2. For slip-critical connections, use one of the following methods to assure proper bolt pretension:

a. Turn-of-Nut: According to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
b. Calibrated Wrench: According to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
c. Twist-off Tension Control Bolt: ASTM F 1852.
d. Direct-Tension Control Bolt: ASTM F 1852.

3. For slip-critical connections, use method and inspection procedure approved by Architect and coordinated with inspection agency.

F. Grouting or Dry-Packing Connections and Joints: Grout connections where required or indicated. Retain flowable grout in place until hard enough to support itself. Alternatively, pack spaces with stiff dry-pack grout material, tamping until voids are completely filled. Place grout and finish smooth, level, and plumb with adjacent concrete surfaces. Promptly remove grout material from exposed surfaces before it affects finishes or hardens. Keep grouted joints damp for not less than 24 hours after initial set.

3.3 ERECTION TOLERANCES

A. Erect architectural precast concrete units level, plumb, square, and in alignment without exceeding the noncumulative erection tolerances of PCI MNL 117, Appendix I.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections and prepare test reports.

B. Visually inspect field welds and test according to ASTM E 165 or to ASTM E 709 and ASTM E 1444. High-strength bolted connections are subject to inspections.

C. Testing agency will report test results promptly and in writing to Contractor and Architect.

D. Repair or remove and replace work where tests and inspections indicate that it does not comply with specified requirements.

E. Additional testing and inspecting, at Contractor's expense, shall be performed to determine compliance of replaced or additional work with specified requirements.

3.5 REPAIRS

A. Repair architectural precast concrete units if permitted by Architect. Architect reserves the right to reject repaired units that do not comply with requirements.

B. Mix patching materials and repair units so cured patches blend with color, texture, and uniformity of adjacent exposed surfaces and show no apparent line of demarcation between original and repaired work, when viewed in typical daylight illumination from a distance of 20 feet.

C. Prepare and repair damaged galvanized coatings with galvanizing repair paint according to ASTM A 780/A 780M.

D. Wire brush, clean, and paint damaged prime-painted components with same type of shop primer.

E. Remove and replace damaged architectural precast concrete units when repairs do not comply with requirements.

3.6 CLEANING

A. Clean surfaces of precast concrete units exposed to view.

B. Clean mortar, plaster, fireproofing, weld slag, and other deleterious material from concrete surfaces and adjacent materials immediately.

C. Clean exposed surfaces of precast concrete units after erection and completion of joint treatment to remove weld marks, other markings, dirt, and stains.

1. Perform cleaning procedures, if necessary, according to precast concrete fabricator's recommendations. Protect other work from staining or damage due to cleaning operations.
2. Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes or damage adjacent materials.

END OF SECTION 034500

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

A. Kiln 1: 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. Features: Include thermal ceramics firebrick, hard ceramic element holders, thermocouple protection tubes, solid 14 gauge aluminuminized steel stand, reflective coating, thick 8 gauge thermocouples, stainless clips secure lids to bands, corrosion resistant case, case clamps, easy open easy load spring hinge, one touch intuitive kiln control, solid wide view peephole plugs, reversible bottoms, molded ceramic industrial grade element connection block.
   3. Quantity: 1

B. Kiln 2: Basis of Design Product: Subject to compliance with requirements, provide the following or approved equal:
   1. Skutt Ceramic Products, Inc.; Model KM-1231-3 PK
      a. 11.6 cu. ft. capacity.
      b. Temperature: Cone 10, 2350 degrees F.
      c. Three Phase, 208 Volts, 51.5 A, 17300 Watts.
   2. Features: Include thermal ceramics firebrick, hard ceramic element holders, thermocouple protection tubes, solid 14 gauge aluminuminized steel stand, reflective coating, thick 8 gauge thermocouples, stainless clips secure lids to bands, corrosion resistant case, case clamps, easy open easy load spring hinge, one touch intuitive kiln control, solid wide view peephole plugs, reversible bottoms, molded ceramic industrial grade element connection block.
   3. Quantity: 1.

2.2 Accessories:

A. Provide vent kits as required for each kiln. Coordinate duct connections.

B. Furniture Kit for each kiln: 2 full shelves, 1 half shelf

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 323113 - CHAIN LINK FENCES AND GATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings 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. Chain-link fences.
2. Swing gates.

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for cast-in-place concrete post footings.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Inspect and discuss electrical roughing-in, equipment bases, and other preparatory work specified elsewhere.
2. Review required testing, inspecting, and certifying procedures.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:

a. Fence and gate posts, rails, and fittings.
b. Chain-link fabric, reinforcements, and attachments.
c. Accessories: Privacy slats.
d. Gates and hardware.

B. Shop Drawings: For each type of fence and gate assembly.

1. Include plans, elevations, sections, details, and attachments to other work.
2. Include accessories, hardware, gate operation, and operational clearances.

C. Samples for Verification: For each type of component with factory-applied finish, prepared on Samples of size indicated below:

1. Polymer-Coated Components: In 6-inch lengths for components and on full-sized units for accessories.

D. Delegated-Design Submittal: For structural performance of chain-link fence and gate frameworks and mounting, 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 and testing agency.

B. Product Certificates: For each type of chain-link fence.

C. Product Test Reports: For framework strength according to ASTM F 1043, for tests performed by manufacturer and witnessed by a qualified testing agency or a qualified testing agency.

D. Field quality-control reports.

E. Sample Warranty: For special warranty.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing fence grounding; member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

B. Mockups: Build mockups to set quality standards for fabrication and installation.

1. Build mockup for typical chain-link fence and gate, including accessories.

a. Size: 10-foot length of fence.

1.7 FIELD CONDITIONS

A. Field Measurements: Verify layout information for chain-link fences and gates shown on Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

1.8 WARRANTY

A. Special Warranty: Installer agrees to repair or replace components of chain-link fences and gates that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

    a. Failure to comply with performance requirements.
    b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
    c. Faulty operation of gate operators and controls.

2. Warranty Period: 15 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 chain-link fence and gate frameworks.

B. Structural Performance: Chain-link fence and gate frameworks shall withstand the design wind loads and stresses for fence height(s) and under exposure conditions indicated according to ASCE/SEI 7.

1. Design Wind Load: 110 Mph.

    a. Minimum Post Size and Maximum Spacing: Determine according to CLFMI WLG 2445, based on mesh size and pattern specified.

2.2 CHAIN-LINK FENCE FABRIC

A. General: Provide fabric in one-piece heights measured between top and bottom of outer edge of selvage knuckle or twist according to "CLFMI Product Manual" and requirements indicated below:

1. Fabric Height: As indicated on Drawings.
2. Steel Wire for Fabric: Wire diameter of 0.1494 inch.

    a. Mesh Size: 2 inches.
    b. Polymer-Coated Fabric: ASTM F 668, Class 2b over zinc-coated steel wire.

        1) Color: Black, according to ASTM F 934.

    c. Coat selvage ends of metallic-coated fabric before the weaving process with manufacturer's standard clear protective coating.

3. Selvage: Knuckled at both selvages.

2.3 FENCE FRAMEWORK

A. Posts and Rails: ASTM F 1043 for framework, including rails, braces, and line; terminal; and corner posts. Provide members with minimum dimensions and wall thickness according to ASTM F 1043 based on the following:

1. Fence Height: 72 inches.
2. Heavy-Industrial-Strength Material: Group IA, round steel pipe, Schedule 40.

    a. Line Post: 2.375 inches in diameter.
    b. End, Corner, and Pull Posts: 2.875 inches in diameter.

3. Horizontal Framework Members: Intermediate top and bottom rails according to ASTM F 1043.

    a. Top Rail: 1.66 inches in diameter.

4. Brace Rails: ASTM F 1043.
5. Metallic Coating for Steel Framework:

    a. Type A: Not less than minimum 2.0-oz./sq. ft. average zinc coating according to ASTM A 123/A 123M or 4.0-oz./sq. ft. zinc coating according to ASTM A 653/A 653M.

6. Polymer coating over metallic coating.

    a. Color: Black, according to ASTM F 934.

2.4 TENSION WIRE

A. Metallic-Coated Steel Wire: 0.177-inch-diameter, marcelled tension wire according to ASTM A 817 or ASTM A 824, with the following metallic coating:

1. Type II: Zinc coated (galvanized) by hot-dip process, with the following minimum coating weight:

    a. Class 4: Not less than 1.2 oz./sq. ft. of uncoated wire surface.

2.5 SWING GATES

A. General: ASTM F 900 for gate posts and double swing gate types.

1. Gate Leaf Width: Double leaf 18’-0” opening.
2. Framework Member Sizes and Strength: Based on gate fabric height of more than 72 inches.

B. Pipe and Tubing:

1. Zinc-Coated Steel: ASTM F 1043 and ASTM F 1083; protective coating and finish to match fence framework.
2. Gate Posts: Round tubular steel- 4".
3. Gate Frames and Bracing: Round tubular steel.

C. Frame Corner Construction: Welded or assembled with corner fittings.

D. Hardware:

1. Hinges: 360-degree inward and outward swing.
2. Hinges, hot dip galvanized pressed steel or malleable iron, structurally capable of supporting gate leaf and allow opening and closing without binding. Non-lift-off type hinge design shall permit gate to swing 180° (3.14 rad)
3. Latch: Galvanized forked type capable of retaining gate in closed position and have provision for padlock. Latch shall permit operation from either side of gate.
4. Double gates: Provide galvanized drop rod with center gate stop pipe or receiver to secure inactive leaf in the closed position. Provide galvanized pressed steel locking latch, requiring one padlock for locking both gate leaves, accessible from either side.
5. Keeper to secure open leafs: Provide galvanized gate hold back keeper for each gate leaf over 5' wide. Gate keeper shall consist of mechanical device for securing free end of gate when in full open position.
6. Latch, hinges, moveable parts may be field coated with liquid PVC.
7. Closer: Manufacturer's standard.

2.6 FITTINGS

A. Provide fittings according to ASTM F 626.

B. Post Caps: Provide for each post.

1. Provide line post caps with loop to receive tension wire or top rail.

C. Rail and Brace Ends: For each gate, corner, pull, and end post.

D. Rail Fittings: Provide the following:

1. Top Rail Sleeves: Pressed-steel or round-steel tubing not less than 6 inches long.
2. Rail Clamps: Line and corner boulevard clamps for connecting intermediate and bottom rails to posts.

E. Tension and Brace Bands: Pressed steel.

F. Tension Bars: Steel, length not less than 2 inches shorter than full height of chain-link fabric. Provide one bar for each gate and end post, and two for each corner and pull post, unless fabric is integrally woven into post.

G. Truss Rod Assemblies: Steel, hot-dip galvanized after threading rod and turnbuckle or other means of adjustment.

H. Tie Wires, Clips, and Fasteners: According to ASTM F 626.

1. Standard Round Wire Ties: For attaching chain-link fabric to posts, rails, and frames, according to the following:

a. Hot-Dip Galvanized Steel: 0.148-inch-diameter wire; galvanized coating thickness matching coating thickness of chain-link fence fabric.

I. Finish:

1. Metallic Coating for Pressed Steel or Cast Iron: Not less than 1.2 oz./sq. ft. of zinc.

a. Polymer coating over metallic coating.

2.7 PRIVACY SLATS

A. Fiber-Glass-Reinforced Plastic Slats: UV-light-stabilized fiber-glass-reinforced plastic, not less than 0.06 inch thick, sized to fit mesh specified for direction indicated, with vandal-resistant fasteners and lock strips.

B. Color: As selected by Architect from manufacturer's full range.

C. Location: On gates and panels of trash enclosure.

2.8 GROUT AND ANCHORING CEMENT

A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout, recommended in writing by manufacturer, for exterior applications.

B. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating, and that is recommended in writing by manufacturer for exterior applications.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for a certified survey of property lines and legal boundaries, site clearing, earthwork, pavement work, and other conditions affecting performance of the Work.

1. Do not begin installation before final grading is completed unless otherwise permitted by Architect.

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

3.2 PREPARATION

A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

3.3 CHAIN-LINK FENCE INSTALLATION

A. Install chain-link fencing according to ASTM F 567 and more stringent requirements specified.

1. Install fencing on established boundary lines inside property line.

B. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacings indicated, in firm, undisturbed soil.

C. Post Setting: Set posts in concrete and with brackets at indicated spacing into firm, undisturbed soil.

1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.
2. Concrete Fill: Place concrete around posts to dimensions indicated and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.

a. Exposed Concrete: Extend 1 inch above grade; shape and smooth to shed water.

D. Terminal Posts: Install terminal end, corner, and gate posts according to ASTM F 567 and terminal pull posts at changes in horizontal or vertical alignment of 15 degrees or more. For runs exceeding 500 feet, space pull posts an equal distance between corner or end posts.

E. Line Posts: Space line posts uniformly at 96 inches o.c.

F. Post Bracing and Intermediate Rails: Install according to ASTM F 567, maintaining plumb position and alignment of fence posts. Diagonally brace terminal posts to adjacent line posts with truss rods and turnbuckles. Install braces at end and gate posts and at both sides of corner and pull posts.

1. Locate horizontal braces at midheight of fabric 72 inches or higher, on fences with top rail, and at two-third fabric height on fences without top rail. Install so posts are plumb when diagonal rod is under proper tension.

G. Tension Wire: Install according to ASTM F 567, maintaining plumb position and alignment of fence posts. Pull wire taut, without sags. Fasten fabric to tension wire with 0.120-inch-diameter hog rings of same material and finish as fabric wire, spaced a maximum of 24 inches o.c. Install tension wire in locations indicated before stretching fabric. Provide horizontal tension wire at the following locations:

1. Extended along top and bottom of fence fabric. Install top tension wire through post cap loops. Install bottom tension wire within 6 inches of bottom of fabric and tie to each post with not less than same diameter and type of wire.

H. Top Rail: Install according to ASTM F 567, maintaining plumb position and alignment of fence posts. Run rail continuously through line post caps, bending to radius for curved runs and terminating into rail end attached to posts or post caps fabricated to receive rail at terminal posts. Provide expansion couplings as recommended in writing by fencing manufacturer.

I. Intermediate and Bottom Rails: Secure to posts with fittings.

J. Chain-Link Fabric: Apply fabric to outside of enclosing framework. Leave 2-inch bottom clearance between finish grade or surface and bottom selvage unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Anchor to framework so fabric remains under tension after pulling force is released.

K. Tension or Stretcher Bars: Thread through fabric and secure to end, corner, pull, and gate posts, with tension bands spaced not more than 15 inches o.c.

L. Tie Wires: Use wire of proper length to firmly secure fabric to line posts and rails. Attach wire at one end to chain-link fabric, wrap wire around post a minimum of 180 degrees, and attach other end to chain-link fabric according to ASTM F 626. Bend ends of wire to minimize hazard to individuals and clothing.

1. Maximum Spacing: Tie fabric to line posts at 12 inches o.c. and to braces at 24 inches o.c.

M. Fasteners: Install nuts for tension bands and carriage bolts on the side of fence opposite the fabric side. Peen ends of bolts or score threads to prevent removal of nuts.

N. Privacy Slats: Install slats in direction indicated, securely locked in place.

1. Vertically, for privacy factor of 70 to 75.

3.4 GATE INSTALLATION

A. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach fabric as for fencing. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests.

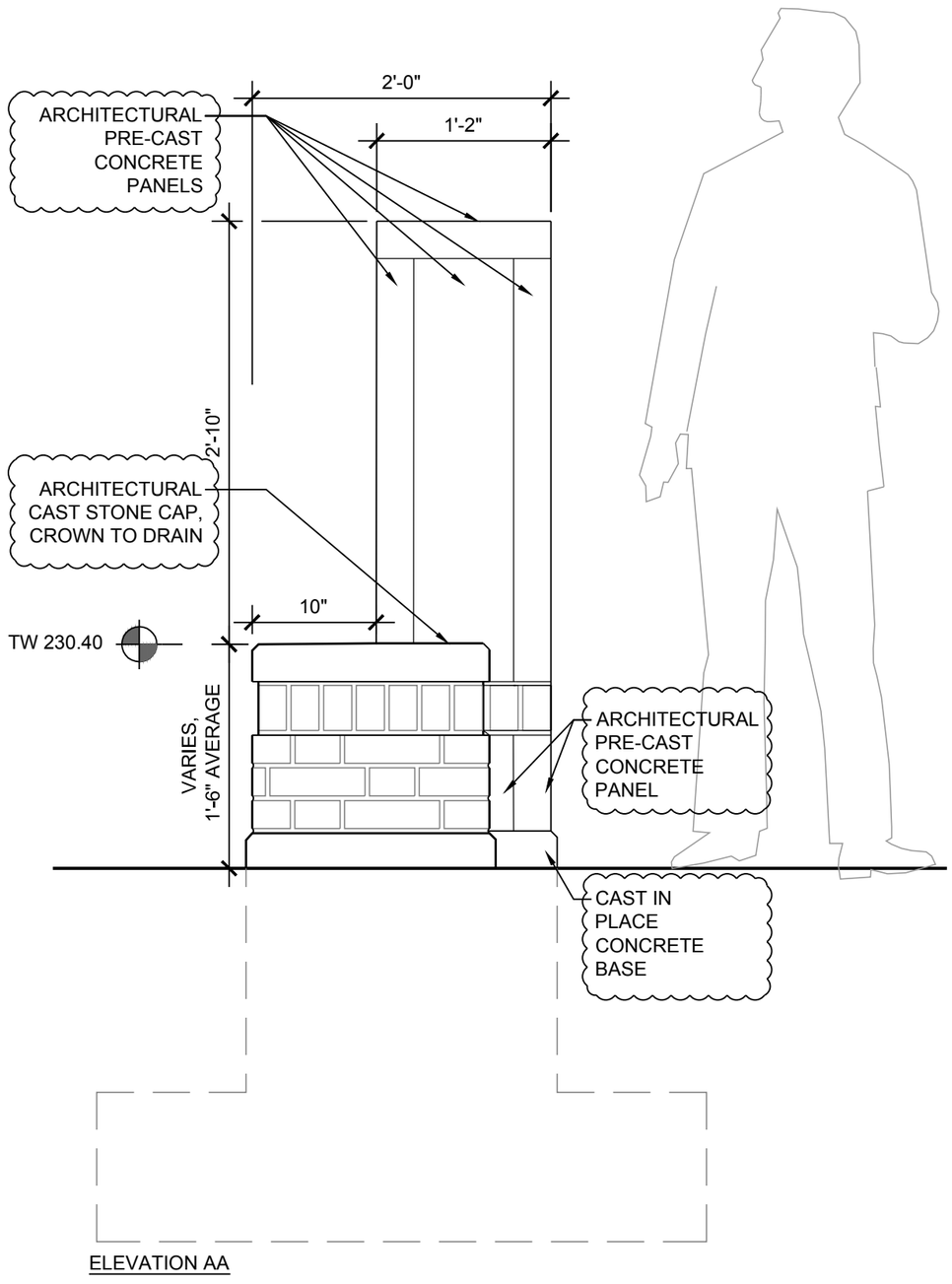
B. Prepare test reports.

3.6 ADJUSTING

A. Gates: Adjust gates 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. Lubricate hardware and other moving parts.

END OF SECTION 323113



ELEVATION AA

LAD 4.01: MATERIAL CLARIFICATIONS

9 ENTRY SIGN AND SEAT WALL □Partial C□an□es□

1"□1'-0"

DATE: 05/03/16

CHANGE TO DRAWING: L1.06

REV:

DRAWING NO.: LAD 4.01

SCALE: AS NOTED

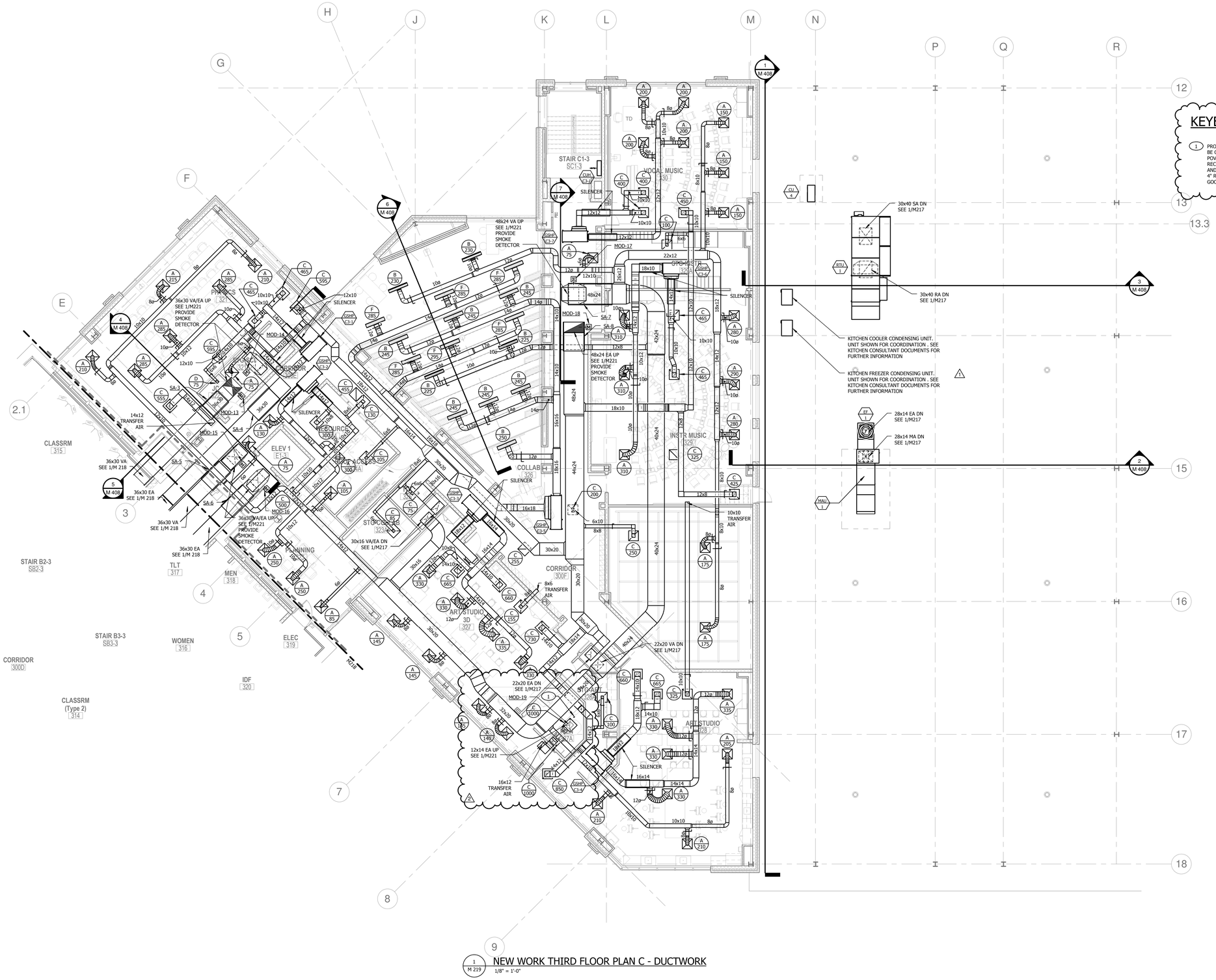
Baltimore City Public Schools

Additions & Renovations at Robert Poole Building #056

1300 W 36TH ST., BALTIMORE, MD 21211

MAHAN RYKIEL ASSOCIATES INC
The Stieff Silver Building. 800 Wyman Park Drive, Suite 100. Baltimore, MD 21211 410.235.6001

ADDENDUM 4



KEYED NOTES:

1. PROVIDE KILN ENVIROVENT 2 OR APPROVED EQUAL. UNIT TO BE CEILING MOUNTED, LOCATED ABOVE KILN LOCATION. POVIDE VENT DUCTWORK PER MANUFACTURERS RECOMMENDATIONS(4" PVC). COORDINATE PLUG LOCATION AND WALL SWITCH WITH ELECTRICAL DOCUMENTS. PROVIDE 4" RD DUCT THROUGH ROOF AND TERMINATE WITH GOOESNECK AND PROTECTIVE WIRE MESH SCREEN.

1/M 219 NEW WORK THIRD FLOOR PLAN C - DUCTWORK

1/8" = 1'-0"

NOTE:
CONTRACTOR SHALL CHECK & VERIFY ALL DIMENSIONS & EXISTING CONDITIONS AT SITE.

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No.	DATE	DESCRIPTION
1	04/22/16	ADDENDUM #2
2	04/29/16	ADDENDUM #4

BID ISSUE

PROJECT No.: 152-01

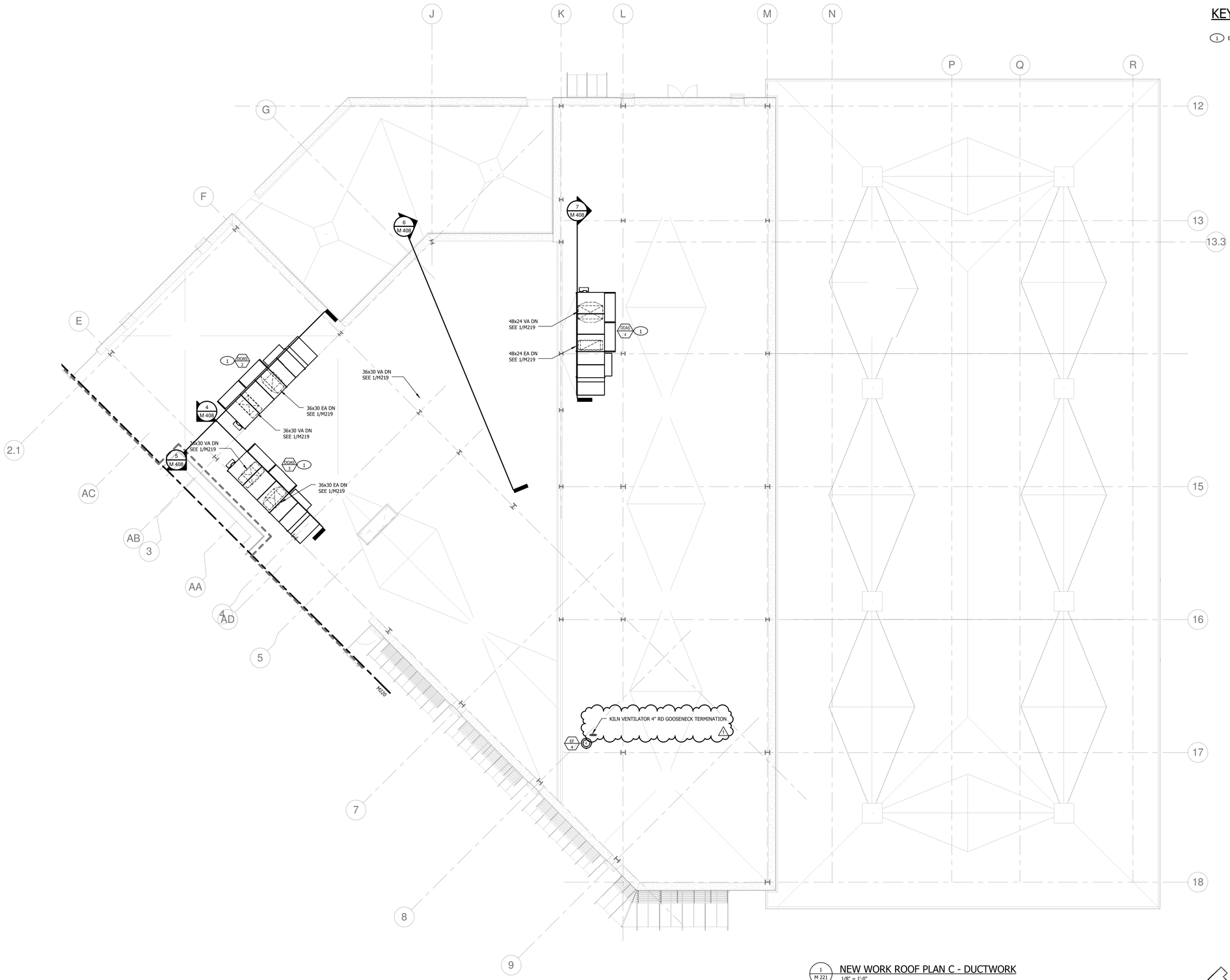
DATE: 03/31/16

SCALE: AS NOTED

DRAWING NAME
NEW WORK THIRD FLOOR PLAN C - DUCTWORK

M 219

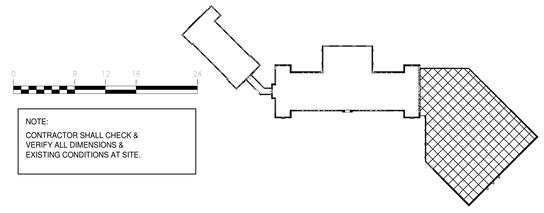
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KEYED NOTES:

1 EXTERIOR HVAC EQUIPMENT AND DUCTWORK TO BE FIELD PAINTED.

1 / M 221 NEW WORK ROOF PLAN C - DUCTWORK
1/8" = 1'-0"



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No.	DATE	DESCRIPTION
1	04/29/16	ADDENDUM #4

BID ISSUE

PROJECT No.: 152-01

DATE: 03/31/16

SCALE: AS NOTED

DRAWING NAME
NEW WORK ROOF PLAN C - DUCTWORK

M 221

4/29/2016 11:44:58 AM



1 E 219 NEW WORK THIRD FLOOR PLAN C - POWER

1/8" = 1'-0"

GENERAL NOTES:

A. FOR DEVICES BOXES SHOWN AS BEING MOUNTED BACK TO BACK IN A STUD WALL, OFFSET ONE BOX TO BE IN THE ADJACENT STUD SPACE. OUTLET BOXES IN ADJACENT ROOMS SHALL NOT BE INSTALLED SIDE BY SIDE IN THE SAME STUD SPACE.

B. FOR COUNTERTOP RECEPTACLES, CONFIRM REACH DISTANCE FROM EDGE OF COUNTERTOP TO FACE OF DEVICE DOES NOT EXCEED 24". IF DEVICE FACE EXCEEDS 24" REACH LIMIT, PROVIDE BOX EXTENSION TO BRING FACE TO 24" FROM EDGE OF COUNTERTOP.

KEYED NOTES:

1. FOR RECEPTACLES INDICATED AS CONTROLLED/SWITCHED, ROUTE RECEPTACLE CIRCUIT THROUGH ASSOCIATED ROOM LIGHTING CONTROLLER TO PROVIDE OCCUPANCY SENSOR CONTROL OF RECEPTACLES. REFER TO DRAWING E-501 FOR DETAILS OF CIRCUIT OPERATION AND CONTROL.
2. RECEPTACLE FOR COW (COMPUTERS ON WHEELS) CABINET. COORDINATE FINAL LOCATION WITH EQUIPMENT IN THE FIELD.
3. MOUNT RECEPTACLE BEHIND ACCESSIBLE PANEL ON OR ADJACENT TO ELECTRIC WATER COOLER CHILLER UNIT. EXTEND CIRCUIT THROUGH ELECTRICAL ROOM LIGHTING CONTROL UNIT FOR TIMECLOCK CONTROL OF CIRCUIT.
4. MOUNT RECEPTACLE IN CASEWORK 2" BELOW COUNTERTOP. TYPICAL FOR DEVICES IN THIS LOCATION.
5. REFER TO DRAWING E-217 FOR CONTINUATION OF CIRCUIT.
6. EXTEND CIRCUIT THROUGH ROOM LIGHTING CONTROLLER IN ROOM 321. REFER TO DRAWING E-501 FOR DETAILS OR CIRCUIT OPERATION AND CONTROL.
7. EXTEND CIRCUIT THROUGH ROOM LIGHTING CONTROLLER IN ROOM 329. REFER TO DRAWING E-501 FOR DETAILS OR CIRCUIT OPERATION AND CONTROL.
8. PROVIDE MUSHROOM TYPE, KEYED RESET (STI 2000 SERIES OR EQUAL) EMERGENCY SHUT-OFF SWITCH FOR CONTROL OF GAS SOLENOID VALVE. PROVIDE FINAL CONNECTION TO VALVE AS NECESSARY. MOUNT AT 48" AFF.
9. PROVIDE NEMA 6-20 RECEPTACLE FOR COPIER. COORDINATE FINAL LOCATION WITH EQUIPMENT IN THE FIELD.
10. PROVIDE NEMA 6-50 RECEPTACLE FOR KILN. COORDINATE FINAL LOCATION WITH EQUIPMENT IN THE FIELD.
11. FOR RECEPTACLES INDICATED AS CONTROLLED/SWITCHED, ROUTE CIRCUIT THROUGH SENSOR RELAY (LUTRON POW-PAK OR APPROVED EQUAL) FOR CONNECTION TO LOCAL OCCUPANCY SENSOR.
12. COORDINATE MOUNTING HEIGHT WITH ASSOCIATED DATA OUTLET AND SUPPLIED EQUIPMENT IN THE FIELD.
13. PROVIDE CEILING MOUNTED L21-20 RECEPTACLE FOR POWER CONNECTION OF STUDIO LIGHTING SYSTEM "SLIM-DIM" MODULES.
14. APPROXIMATE LOCATION FOR CONDUIT STUBS FROM FIRST FLOOR ELECTRICAL ROOM.
15. POWER CONNECTION TO DOOR MAGNETIC HOLD OPEN. COORDINATE FINAL LOCATION IN THE FIELD.
16. PROVIDE TWO DUPLEX RECEPTACLES IN CEILING MOUNTED A/V CABINET. COORDINATE FINAL LOCATION WITH EQUIPMENT SUPPLIER IN THE FIELD.
17. PROVIDE 240V-100A-3P NEMA TYPE 1 NON-FUSED SAFETY SWITCH. PROVIDE FINAL CONNECTION TO KILN.
18. RECEPTACLE FOR KILN VENT SYSTEM. PROVIDE FACTORY APPLIED "CONTROLLED" SYMBOL. PROVIDE SINGLE POLE TOGGLE SWITCH FOR RECEPTACLE CONTROL ADJACENT TO ROOM EXHAUST SWITCH. PROVIDE ENGRAVED SWITCHPLATE WITH WORDING "KILN VENT".

NOTE:
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No.	DATE	DESCRIPTION
1	04/27/16	ADDENDUM #3
2	04/29/16	ADDENDUM #4

BID ISSUE

PROJECT No.: 152-01

DATE: 03/31/16

SCALE: AS NOTED

DRAWING NAME
NEW WORK THIRD FLOOR PLAN C - POWER

E 219

4/29/2016 11:34:52 AM

PANEL DESIGNATION CP8 | BUS AMP 225A | MIN. A.I.C. 10,000 | MAIN BREAKER 150A
LOCATION ELEC. 319 | PHASE 3 | WIRE 4 | VOLTAGE 208Y/120
MOUNTING SURFACE | NOTES: 200% NEUTRAL
TOTAL POLES 42

CKT NO	DESCRIPTION	BREAKER AMP	POLES	LOAD (KW) A	B	C	WIRE NO	SIZE	GND. SIZE	COND SIZE	COND SIZE	GND. SIZE	WIRE SIZE	NO	LOAD (KW) A	B	C	BREAKER POLES	AMP	DESCRIPTION	CKT NO
1	RECPS.-313	20	1	1.1			2	10	10	3/4	3/4	12	12	2	1.1			1	20	RECPS.-315	2
3	RECPS.-311	20	1		1.1		2	10	10	3/4	3/4	12	12	2		1.1		1	20	RECPS.-314	4
5	RECPS.-312	20	1			1.1	2	12	12	3/4	3/4	10	10	2			1.1	1	20	RECPS.-303	6
7	RECPS.-305	20	1	1.1			2	10	10	3/4	3/4	10	10	2	1.1			1	20	RECPS.-302	8
9	RECPS.-304	20	1		1.1		2	10	10	3/4	3/4	10	10	2		1.1		1	20	RECPS.-306	10
11	RECPS.-301A	20	1			1.1	2	10	10	3/4	3/4	12	12	2			0.4	1	20	RECPS.-301	12
13	RECPS.-321	20	1	0.4			2	12	12	3/4	3/4	12	12	2	1.1			1	20	RECPS.-327	14
15	RECPS.-328	20	1		1.1		2	12	12	3/4	3/4	10	10	2		1.1		1	20	RECPS.-329	16
17	RECPS.-330	20	1			1.1	2	10	10	3/4	3/4	12	12	2			0.7	1	20	RECPS.-A/V-311,313	18
19	RECPS.-A/V-301A,302	20	1	0.7			2	10	10	3/4	3/4	10	10	2	0.4			1	20	RECPS.-A/V-304	20
21	RECPS.-A/V-305,306	20	1		0.7		2	10	10	3/4	3/4	10	10	2		0.7		1	20	RECPS.-A/V-301,303	22
23	RECPS.-A/V-312,314	20	1			0.7	2	12	12	3/4	3/4	12	12	2			0.7	1	20	RECPS.-A/V-315,321	24
25	RECPS.-A/V-327,328	20	1	0.7			2	12	12	3/4	3/4	12	12	2	0.7			1	20	RECPS.-A/V-329,330	26
27	SPARE	20	1		0.0											0.0		1	20	SPARE	28
29	SPARE	20	1			0.0											0.0	1	20	SPARE	30
31	SPARE	20	1	0.0											0.0			1	20	SPARE	32
33	SPARE	20	1		0.0											0.0		1	20	SPARE	34
35	SPARE	20	1			0.0											0.0	1	20	SPARE	36
37	SPARE	20	1	0.0											0.0			1	20	SPARE	38
39	SPARE	20	1		0.0											0.0		1	20	SPARE	40
41	SPARE	20	1			0.0											0.0	1	20	SPARE	42
	SIDE TOTAL KW LOAD			4	4	4									4	4	3			SIDE TOTAL KW LOAD	

NEC LOAD SUMMARY PANEL **CP8**

NOTES:	LTS.	RECPS.	HVAC	MISC.	KITCH.		TOTAL	
	0.0	23.0	0.0	0.0	0.0	0.0	23.0	KVA (CONNECTED)
RECPS - 100% FIRST 10 kVA, 50% REMAINING (NEC 220.44)	125%	72%	100%	100%	100%	0%	72%	DEMAND FACTOR
KITCH. - BETWEEN 100% & 65% (NEC 220.56)	0.0	16.5	0.0	0.0	0.0	0.0	16.5	KVA (DEMAND)
NON-COINCIDENTAL - 0% (NEC 220.60)							**46**	AMPS (DEMAND)

PANEL DESIGNATION LP8 | BUS AMP 225A | MIN. A.I.C. 14,000 | MAIN BREAKER 125A
LOCATION ELEC. 319 | PHASE 3 | WIRE 4 | VOLTAGE 480Y/277
MOUNTING SURFACE | NOTES:
TOTAL POLES 42

CKT NO	DESCRIPTION	BREAKER AMP	POLES	LOAD (KW) A	B	C	WIRE NO	SIZE	GND. SIZE	COND SIZE	COND SIZE	GND. SIZE	WIRE SIZE	NO	LOAD (KW) A	B	C	BREAKER POLES	AMP	DESCRIPTION	CKT NO
1	LIGHTS - SECOND FLR. CORR.	20	1	0.7			2	10	10	3/4	3/4	10	10	2	3.6			1	20	LIGHTS - SECOND FLR.	2
3	LIGHTS - SECOND FLR.	20	1		3.8		2	10	10	3/4	3/4	10	10	2		2.4		1	20	LIGHTS - SECOND FLR.	4
5	LIGHTS - SECOND FLR.	20	1			2.4	2	10	10	3/4	3/4	10	10	2			0.5	1	20	LIGHTS - SECOND FLR. CORR.	6
7	LIGHTS - SECOND FLR.	20	1	2.2			2	10	10	3/4	3/4	10	10	2	2.7			1	20	LIGHTS - SECOND FLR.	8
9	LIGHTS - SECOND FLR.	20	1		1.5		2	10	10	3/4	3/4	10	10	2		1.1		1	20	LIGHTS - THIRD FLR. CORR.	10
11	LIGHTS - THIRD FLR.	20	1			2.7	2	10	10	3/4	3/4	10	10	2			2.5	1	20	LIGHTS - THIRD FLR.	12
13	LIGHTS - THIRD FLR.	20	1	2.3			2	10	10	3/4	3/4	10	10	2	2.2			1	20	LIGHTS - THIRD FLR.	14
15	LIGHTS - THIRD FLR. CORR.	20	1		0.4		2	10	10	3/4	3/4	10	10	2		2.5		1	20	LIGHTS - THIRD FLR.	16
17	LIGHTS - THIRD FLR.	20	1			2.1	2	10	10	3/4	3/4	10	10	2			1.9	1	20	LIGHTS - THIRD FLR.	18
19	LIGHTS - EXTERIOR - CUPOLA	20	1	0.6			2	10	10	3/4								1	20	SPARE	20
21	SPARE	20	1		0.0											0.0		1	20	SPARE	22
23	SPARE	20	1			0.0											0.0	1	20	SPARE	24
25	SPARE	20	1	0.0												0.0		1	20	SPARE	26
27	SPARE	20	1		0.0												0.0	1	20	SPARE	28
29	SPARE	20	1			0.0												1	20	SPARE	30
31	SPACE - PFFB		1	0.0												0.0		1		SPACE - PFFB	32
33	SPACE - PFFB		1		0.0												0.0	1		SPACE - PFFB	34
35	SPACE - PFFB		1			0.0												1		SPACE - PFFB	36
37	SPACE - PFFB		1	0.0												0.0		1		SPACE - PFFB	38
39	SPACE - PFFB		1		0.0												0.0	1		SPACE - PFFB	40
41	SPACE - PFFB		1			0.0												1		SPACE - PFFB	42
	SIDE TOTAL KW LOAD			6	6	7									8	6	5			SIDE TOTAL KW LOAD	

NEC LOAD SUMMARY PANEL **LP8**

NOTES:	LTS.	RECPS.	HVAC	MISC.	KITCH.		TOTAL	
	37.9	0.0	0.0	0.0	0.0	0.0	37.9	KVA (CONNECTED)
RECPS - 100% FIRST 10 kVA, 50% REMAINING (NEC 220.44)	125%	100%	100%	100%	100%	0%	125%	DEMAND FACTOR
KITCH. - BETWEEN 100% & 65% (NEC 220.56)	47.4	0.0	0.0	0.0	0.0	0.0	47.4	KVA (DEMAND)
NON-COINCIDENTAL - 0% (NEC 220.60)							**57**	AMPS (DEMAND)

PANEL DESIGNATION RP8 (SECTION 1) | BUS AMP 225A | MIN. A.I.C. 10,000 | MAIN BREAKER 225A
LOCATION ELEC. 319 | PHASE 3 | WIRE 4 | VOLTAGE 208Y/120
MOUNTING SURFACE | NOTES: *-PROVIDE GFCI CIRCUIT BREAKER
TOTAL POLES 42

10 | 9 | 11 SECTION 2 TOTAL KW LOAD

CKT NO	DESCRIPTION	BREAKER AMP	POLES	LOAD (KW) A	B	C	WIRE NO	SIZE	GND. SIZE	COND SIZE	COND SIZE	GND. SIZE	WIRE SIZE	NO	LOAD (KW) A	B	C	BREAKER POLES	AMP	DESCRIPTION	CKT NO
1	RECP.-313 (CONTROLLED)	20	1	0.7			2	12	12	3/4	3/4	12	12	2	1.1			1	20	RECPS.-313	2
3	RECPS.-311 (CONTROLLED)	20	1		0.7		2	12	12	3/4	3/4	12	12	2		1.1		1	20	RECPS.-311	4
5	RECPS.-315 (CONTROLLED)	20	1			0.9	2	12	12	3/4	3/4	12	12	2			0.9	1	20	RECPS.-315	6
7	RECPS.-314 (CONTROLLED)	20	1	0.7			2	12	12	3/4	3/4	12	12	2	1.1			1	20	RECPS.-314	8
9	RECPS.-312 (CONTROLLED)	20	1		0.7		2	12	12	3/4	3/4	12	12	2		1.3		1	20	RECPS.-312	10
11	RECPS.-303 (CONTROLLED)	20	1			0.7	2	10	10	3/4	3/4	10	10	2			1.3	1	20	RECPS.-303	12
13	RECPS.-305 (CONTROLLED)	20	1	0.7			2	10	10	3/4	3/4	10	10	2	1.3			1	20	RECPS.-305	14
15	RECPS.-302 (CONTROLLED)	20	1		0.7		2	10	10	3/4	3/4	10	10	2		1.1		1	20	RECPS.-302	16
17	RECPS.-304 (CONTROLLED)	20	1			0.7	2	10	10	3/4	3/4	10	10	2			1.1	1	20	RECPS.-304	18
19	RECPS.-309	20	1	0.9			2	8	8	3/4	3/4	8	8	2	0.9			1	20	RECPS.-307, 309A	20
21	RECPS.-ROOF	20	1		0.4		2	10	10	3/4	3/4	8	8	2		0.9		1	20	RECPS.-307	22
23	RECPS.-308	20	1			0.7	2	12	12	3/4	3/4	10	10	3			0.5	2	20	RECP.-COPIER 309A	24
25	RECP.-C.O.W. 310	20	1	0.2			2	12	12	3/4							0.5			----------	26
27	RECPS.-306	20	1		0.9		2	8	8	3/4	3/4	8	8	2		0.7		1	20	RECPS.-306 (CONTROLLED)	28
29	ELECTRIC WATER COOLER-*	20	1			0.5	2	10	10	3/4	3/4	10	10	2			0.9	1	20	RECPS.-CORRIDOR	30
31	RECPS.-301A	20	1	1.1			2	10	10	3/4	3/4	10	10	2	0.7			1	20	RECPS.-301A (CONTROLLED)	32
33	RECPS.-301	20	1		0.7		2	10	10	3/4	3/4	10	10	2		0.7		1	20	RECPS.-301	34
35	RECPS.-301	20	1			1.3	2	10	10	3/4	3/4	10	10	2			0.7	1	20	RECPS.-301	36
37	RECPS.-301 (CONTROLLED)	20	1	0.9			2	10	10	3/4	3/4	12	12	2	1.1			1	20	RECPS.-321	38
39	RECPS.-321	20	1		0.9		2	12	12	3/4	3/4	12	12	2		0.7		1	20	RECPS.-321 (CONTROLLED)	40
41	RECPS.-322	20	1			0.7	2	12	12	3/4	3/4	12	12	2			0.9	1	20	RECPS.-323A, 324	42
	SIDE TOTAL KW LOAD			5	5	6									7	6	6			SIDE TOTAL KW LOAD	

PANEL DESIGNATION RP8 (SECTION 2) | BUS AMP 225A | MIN. A.I.C. 10,000 | MAIN BREAKER MLO
LOCATION ELEC. 319 | PHASE 3 | WIRE 4 | VOLTAGE 208Y/120
MOUNTING SURFACE | NOTES:
TOTAL POLES 42

CKT NO	DESCRIPTION	BREAKER AMP	POLES	LOAD (KW) A	B	C	WIRE NO	SIZE	GND. SIZE	COND SIZE	COND SIZE	GND. SIZE	WIRE SIZE	NO	LOAD (KW) A	B	C	BREAKER POLES	AMP	DESCRIPTION	CKT NO
43	RECP.-C.O.W. 323A	20	1	0.2			2	12	12	3/4	3/4	12	12	2	0.9			1	20	RECPS.-323	44
45	RECP.-COPIER 323	20	2		0.5		3	12	12	3/4	3/4	12	12	2		1.3		1	20	RECPS.-327	46
47	----------					0.5					3/4	12	12	2			0.7	1	20	RECPS.-327 (CONTROLLED)	48
49	RECPS.-329	20	1	1.4			2	10	10	3/4	3/4	10	10	2	0.9			1	20	RECPS.-328 (CONTROLLED)	50
51	RECPS.-327A, 328A	20	1		1.1		2	12	12	3/4	1 1/4	10	4	3		5.0		2	60	RECP.-KILN 327A	52
53	RECP. - KILN VENT 327A	20	1			0.5	2	12	12	3/4							5.0			----------	54
55	SPARE	20	1	0.0							3/4	10	10	2	1.1			1	20	RECPS.-329	56
57	RECPS.-330 (CONTROLLED)	20	1			0.7	2	10	10	3/4	3/4	10	10	2			0.9	1	20	RECPS.-330	58
59	RECPS.-329 (CONTROLLED)	20	1		0.7		2	10	10	3/4	3/4	10	10	2		0.4		1	20	RECPS.-329A	60
61	ELECTRIC WATER COOLER-*	20	1	0.5			2	10	10	3/4	3/4	10	10	2	0.7			1	20	RECPS.-CORRIDOR	62
63	RECPS.-326	20	1		0.5		2	12	12	3/4	3/4	12	12	2		0.4		1	20	RECPS.-ROOF	64
65	RECPS.-ROOF	20	1			0.4	2	12	12	3/4	3/4	12	12	2			0.7	1	15	EF-4 - KILN	66
67	RECP.-319	20	1	0.2			2	12	12	3/4	3/4	12	12	2	1.1			1	20	RECPS.-326	68
69	WATER METER ANTENNAE	20	1		0.2		2	10	10	3/4	3/4	12	12	2		1.1		1	20	RECPS.-(FLOORBOXES) 301	70
71	RECPS.-(FLOORBOXES) 301	20	1			1.1	2	12	12	3/4	3/4	12	12	2			1.4	1	20	RECPS.-(FLOORBOXES) 321	72
73	RECPS.-(FLOORBOXES) 321	20	1	1.1			2	12	12	3/4	3/4	10	10	2	0.4			1	20	MAIN LIGHTS-27	74
75	TRACK LIGHTS 328	20	1		0.7		2	10	10	3/4	1 1/4	8	4	4		5.8		3	70	KILN - 327A	76
77	SPARE	20	1			0.0											5.8			----------	78
79	SPARE	20	1	0.0												5.8				----------	80
81	SPARE	20	1		0.0												0.0		20	SPARE	82
83	SPARE	20	1			0.0											0.0	1	20	SPARE	84
	SIDE TOTAL KW LOAD			3	4	3									11	14	14			SIDE TOTAL KW LOAD	

NEC LOAD SUMMARY PANEL **RP8**

NOTES:	LTS.	RECPS.	HVAC	MISC.	KITCH.		TOTAL	
	1.1	51.8	0.7	30.0	0.0	1.0	84.6	KVA (CONNECTED)
RECPS - 100% FIRST 10 kVA, 50% REMAINING (NEC 220.44)	125%	60%	100%	100%	100%	0%	74%	DEMAND FACTOR
KITCH. - BETWEEN 100% & 65% (NEC 220.56)	1.4	30.9	0.7	30.0	0.0	0.0	63.0	KVA (DEMAND)
NON-COINCIDENTAL - 0% (NEC 220.60)							**175**	AMPS (DEMAND)

PANEL DESIGNATION ESBRP8 (SECTION 1) | BUS AMP 225A | MIN. A.I.C. 10,000 | MAIN BREAKER 150A
LOCATION ELEC. 319 | PHASE 3 | WIRE 4 | VOLTAGE 208Y/120
MOUNTING SURFACE | NOTES:
TOTAL POLES 42

0 | 0 | 0 SECTION 2 TOTAL KW LOAD

CKT NO	DESCRIPTION	BREAKER AMP	POLES	LOAD (KW) A	B	C	WIRE NO	SIZE	GND. SIZE	COND SIZE	COND SIZE	GND. SIZE	WIRE SIZE	NO	LOAD (KW) A	B	C	BREAKER POLES	AMP	DESCRIPTION	CKT NO
1	RECP.-219 (IDF)	30	1	2.9			2	10	10	3/4	3/4	10	10	2	2.9			1	30	RECP.-219 (IDF)	2
3	RECP.-219 (IDF)	30	1		2.9		2	10	10	3/4	3/4	12	12	2		0.5		1	20	RECPS.-219 (IDF)	4
5	RECPS.-219 (IDF)	20	1			0.5	2	12	12	3/4	3/4	12	12	2			0.2	1	20	ACCESS CONTROL 219	6
7	SECURITY 219	20	1	0.2			2	12	12	3/4	3/4	10	10	2	2.9			1	30	RECP.-320 (IDF)	8
9	RECP.-320 (IDF)	30	1		2.9		2	10	10	3/4	3/4	10	10	2		2.9		1	30	RECP.-320 (IDF)	10
11	RECPS.-320 (IDF)	20	1			0.5	2	12	12	3/4	3/4	12	12	2			0.5	1	20	RECPS.-320 (IDF)	12
13	ACCESS CONTROL 320	20	1	0.2			2	12	12	3/4	3/4	12	12	2	0.2			1	20	SECURITY 320	14
15	SS-5	15	2		0.1		3	12	12	3/4	3/4	12	12	3		0.1		2	15	SS-6	16
17	----------					0.1											0.1			----------	18
19	CU-3	15	2	0.9			3	10	10	3/4	3/4	10	10	3	0.9			2	15	CU-4	20
21	----------				0.9											0.9				----------	22
23	CU-5	15	2			0.9	3	10	10	3/4	3/4	10	10	3			0.9	2	15	CU-6	24
25	----------			0.9											0.9					----------	26
27	CU-8	15	2		0.9		3	10	10	3/4								1	20	SPARE	28
29	----------					0.9											0.0	1	20	SPARE	30
31	MAU-1/EF-1	25	3	2.4			4	10	10	3/4					0.0			1	20	SPARE	32
33	----------				2.4											0.0		1	20	SPARE	34
35	----------					2.4											0.0	1	20	SPARE	36
37	KITCHEN COOLER	20	3	0.9			4	10	10	3/4	3/4	8	4	2.5				3	30	KITCHEN FREEZER	38
39	----------				0.9										2.5					----------	40
41	----------					0.9											2.5			----------	42
	SIDE TOTAL KW LOAD			8	11	6									10	7	4			SIDE TOTAL KW LOAD	

NEC LOAD SUMMARY PANEL **ESBRP8**

NOTES:	LTS.	RECPS.	HVAC	MISC.	KITCH.		TOTAL	
	0.0	19.4	24.6	0.8	2.7	0.0	47.5	KVA (CONNECTED)
RECPS - 100% FIRST 10 kVA, 50% REMAINING (NEC 220.44)	125%	76%	100%	100%	100%	0%	90%	DEMAND FACTOR
KITCH. - BETWEEN 100% & 65% (NEC 220.56)	0.0	14.7	24.6	0.8	2.7	0.0	42.8	KVA (DEMAND)
NON-COINCIDENTAL - 0% (NEC 220.60)							**119**	AMPS (DEMAND)

PANEL SCHEDULES

CP8
RP8-1
ESBRP8-1
LP8
RP8-2
ESBRP8-2

JRS ARCHITECTS
2010 Clipper Park Rd.
Suite 101
Baltimore, MD 21211
410.235.7256

ASSOCIATE ARCHITECT
SCHRADER GROUP ARCHITECTURE LLC
161 LEVERINGTON AVE. SUITE 105
PHILADELPHIA, PA 19127

LANDSCAPE ARCHITECT
MAHAN RYKIEL ASSOCIATES
800 WYMAN PARK DR. SUITE 100
BALTIMORE, MD 21211

CIVIL ENGINEER
STV, INC.
7125 AMBASSADOR RD, SUITE 200
BALTIMORE, MD 21244

STRUCTURAL ENGINEER
ALBRECHT ENGINEERING
3500 BOSTON ST, SUITE 329
BALTIMORE, MD 21224

MEP ENGINEER
BRINJAC ENGINEERING
1800 N. CHARLES ST, SUITE 310
BALTIMORE, MD 21201

FOOD SERVICE
NYIKOS ASSOCIATES
18219A FLOWER HILL WAY
GAITHERSBURG, MD 20879

AVIT CONSULTANT
EDUCATIONAL SYSTEMS PLANNING
49 OLD SOLOMONS ISLAND RD, SUITE 301
ANNAPOLIS, MD 21401

Baltimore City Public Schools
Additions & Renovations at Robert Poole Building #056
1300 W 36TH ST., BALTIMORE, MD 21211

I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND.
LICENSE NO.: 19294
EXPIRATION DATE: 12/14/2016

No.	DATE	DESCRIPTION
1	04/22/16	ADDENDUM #2
2	04/27/16	ADDENDUM #3
3	04/29/16	ADDENDUM #4

BID ISSUE

PROJECT No.: 152-01
DATE: 03/31/16
SCALE: AS NOTED
DRAWING NAME
ELECTRICAL PANEL SCHEDULES

E 608

4/29/2016 11:30 AM J:\PROJ\JRS_ARCHITECTS, INC\#15.05A56.00--BCPS--ROBERT POOLE RENOVATION ADDITION\C_DRAWINGS ENG's, CAD's\A_DRAWINGS\MEP\ESER--15.05A56.00.DWG
JON BRAHAN

Additions & Renovations at Robert Poole Building #56
Maryland Stadium Authority
Baltimore City Public Schools
JRS Architects
May 6, 2016

ADDENDUM #5

This Addendum is issued pursuant to the Instructions to Bidders and Conditions of the Contract. This Addendum serves to clarify, revise, and supersede information in the Project Manual, Drawings, and previously issued Addenda. Portions of the Addendum affecting the Contract Documents will be incorporated into the Contract by enumeration of the Addendum in the Owner/Contractor Agreement.

The Bidder shall acknowledge receipt of this Addendum in the appropriate space on the Bid Form.

ATTACHMENTS

This Addendum includes the following attached Sheets:

A 602 Door Schedule, Frames, Details, revision 4, 5/6/16
S-211 Truss Elevation and Details, revision 1, 5/6/16
M118 New Work Third Floor Plan B – Mechanical Piping, revision 2, 5/6/16
M211 New Work Basement & First Floor Plan A – Ductwork, revision 2, 5/6/16
M217 New Work Second Floor Plan C – Ductwork, rev 1, 5/6/16
M220 New Work Roof Plan B – Ductwork, rev 1, 5/6/16
P119 New Work Third Floor Plan C – Plumbing, rev 2, 5/6/16
P400 Enlarged Plans – Plumbing, rev 3, 5/6/16
P401 Enlarged Plans – Plumbing, rev 3, 5/6/16
P510 Sanitary and Vent – Area A & B – Plumbing, rev 2, 5/6/16
E111 New Work Basement & First Floor Plan A – Lighting, rev 2, 5/6/16
E114 New Work First Floor Plan B – Lighting, rev 1, 5/6/16
E115 New Work First Floor Plan C – Lighting, rev 1, 5/6/16
E119 New Work Third Floor Plan C – Lighting, rev 2, 5/6/16
E213 New Work Basement Plan B – Power, rev 2, 5/6/16
E215 New Work First Floor plan C – Power, rev 1, 5/6/16
E400 Enlarged Floor Plans – Electrical, rev 1, 5/6/16
E503 Electrical Details, rev 1, 5/6/16
E604 Electrical Panel Schedules, rev 2, 5/6/16
FP115 New Work First Floor plan C – Fire Protection, rev 1, 5/6/16
FP117 New Work Second Floor Plan C – Fire Protection, rev 1, 5/6/16

This Addendum includes the attached Addendum Drawings:

AAD 5.01, Workroom Entrance, revising sheet A556, 5/5/16
ADD S5.01, Typical Masonry Partition Detail, revision to S-004, 5/6/16
ADD S5.02, Wall Plate WP-1 Detail, revision to S-501, 5/6/16
ADD S5.03, Wall Plate WP-2 Detail, revision to S-501, 5/6/16
ADD S5.04, Column Pocket in Concrete Wall, revision to S-402, 5/6/16

This Addendum includes the attached Specification Sections:

23 0900 Instrumentation and Control for HVAC, 5/6/16

23 2113.34 Thermal Enhanced Bentonite Grout, 5/6/16
23 2114 Ground Loop Heat Pump Piping, 5/6/16
26 0933 Lighting – Preset and Dimming Control Equipment, 5/6/16
26 5100 Lighting, 5/6/16
26 5561 Theatrical Lighting, 5/6/16

REVISIONS TO DIVISIONS 02 - 16 SPECIFICATION SECTIONS

Section	Paragraph	Change
055113	2.7.B	DELETE: "2. Perforated metal infill…to top rail."
055213	2.2.B	After "Cast or formed metal" DELETE: Remainder of the sentence. After "Cast or formed metal" ADD: ", provide stainless steel brackets at interior rails and galvanized steel brackets at exterior rails."
08 4113	2.1.G.1	DELETE: "U-factor of not more than 0.77", ADD: "U-factor of not more than 0.49".
092900	3.3.A	DELETE: "8. Acoustically enhanced…classroom ceilings."
095113	2.4	DELETE: Paragraph 2.4.B in its entirety. ADD: " B. Basis-Of-Design Product: Subject to conformance with the specification provide Rockfon Artic SQ 601 as the basis of design or an equivalent product by one of the following manufacturers: 1. Armstrong Cirrus 533 HRC 2. Certainteed 3. USG Interiors, Inc."
23 0900		DELETE: 23 0900 Instrumentation and Control for HVAC, 3/31/16 ADD: 23 0900 Instrumentation and Control for HVAC, 5/6/16, attached
23 2113.34		DELETE: 23 2113.34 Thermal Enhanced Bentonite Grout, 3/31/16 ADD: 23 2113.34 Thermal Enhanced Bentonite Grout, 5/6/16, attached
23 2114		DELETE: 23 2114 Ground Loop Heat Pump Piping, 3/31/16 ADD: 23 2114 Ground Loop Heat Pump Piping, 5/6/16, attached
26 0933		DELETE: 26 0933 Lighting – Preset and Dimming Control Equipment, 3/31/16 ADD: 26 0933 Lighting – Preset and Dimming Control Equipment, 5/6/16, attached
26 5100		DELETE: 26 5100 Lighting, 3/31/16 ADD: 26 5100 Lighting, 5/6/16, attached
26 5561		DELETE: 26 5561 Theatrical Lighting, 3/31/16 ADD: 26 5561 Theatrical Lighting, 5/6/16, attached

REVISIONS TO DRAWING SHEETS

Drawing	Location	Change
C1.22	Utility Notes	At note U17 DELETE: "Provide 2-4" conduit", ADD: "Provide 4-4" conduit" DELETE: "Refer to sheet C-2.04 for detail."
A 114	1	DELETE cased opening 101C-2 as shown on the attached sketch AAD 5.01.
A502	9	DELETE Note: "New PTD steel handrail brackets", ADD Note: "New stainless steel handrail brackets".
A556	A	DELETE cased opening 101C-2 as shown on the attached sketch AAD 5.01.
A602	Door Schedule	Make changes shown on the reissued sheet A602, revision 4, 5/6/16,

Drawing	Location	Change
		attached.
S-004	1	REVISE Detail as shown on the attached sketch, ADD S5.01.
S-211		DELETE S-211 dated 3/31/16 ADD S-211, revision 1, dated 5/6/16
S-402	1	REVISE Detail as shown on the attached sketch, ADD S5.04.
S-501	11	REVISE Detail as shown on the attached sketch, ADD S5.02.
S-501	12	REVISE Detail as shown on the attached sketch, ADD S5.03.
M118		REVISE Sheet as shown on the attached sheet, M118, New Work Third Floor Plan B – Mechanical Piping, rev 2, 5/6/16
M211		REVISE Sheet as shown on the attached sheet, M211 New Work Basement & First Floor Plan A – Ductwork, revision 2, 5/6/16
M217		REVISE Sheet as shown on the attached sheet, M217 New Work Second Floor Plan C – Ductwork, rev 1, 5/6/16
M220		REVISE Sheet as shown on the attached sheet, M220 New Work Roof Plan B – Ductwork, rev 1, 5/6/16
P119		REVISE Sheet as shown on the attached sheet, P119 New Work Third Floor Plan C – Plumbing, rev 2, 5/6/16
P400		REVISE Sheet as shown on the attached sheet, P400 Enlarged Plans – Plumbing, rev 3, 5/6/16
P401		REVISE Sheet as shown on the attached sheet, P401 Enlarged Plans – Plumbing, rev 3, 5/6/16
P510		REVISE Sheet as shown on the attached sheet, P510 Sanitary and Vent – Area A & B – Plumbing, rev 2, 5/6/16
E111		REVISE Sheet as shown on the attached sheet, E111 New Work Basement & First Floor Plan A – Lighting, rev 2, 5/6/16
E114		REVISE Sheet as shown on the attached sheet, E114 New Work First Floor Plan B – Lighting, rev 1, 5/6/16
E115		REVISE Sheet as shown on the attached sheet, E115 New Work First Floor Plan C – Lighting, rev 1, 5/6/16
E119		REVISE Sheet as shown on the attached sheet, E119 New Work Third Floor Plan C – Lighting, rev 2, 5/6/16
E213		REVISE Sheet as shown on the attached sheet, E213 New Work Basement Plan B – Power, rev 2, 5/6/16
E215		REVISE Sheet as shown on the attached sheet, E215 New Work First Floor plan C – Power, rev 1, 5/6/16
E400		REVISE Sheet as shown on the attached sheet, E400 Enlarged Floor Plans – Electrical, rev 1, 5/6/16
E503		REVISE Sheet as shown on the attached sheet, E503 Electrical Details, rev 1, 5/6/16
E604		REVISE Sheet as shown on the attached sheet, E604 Electrical Panel Schedules, rev 2, 5/6/16
FP115		REVISE Sheet as shown on the attached sheet, FP115 New Work First Floor plan C – Fire Protection, rev 1, 5/6/16
FP117		REVISE Sheet as shown on the attached sheet, FP117 New Work Second Floor Plan C – Fire Protection, rev 1, 5/6/16

END OF ADDENDUM 5

SECTION 23 09 00 - INSTRUMENTATION AND CONTROL FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes control equipment for HVAC systems and components, including control components for terminal heating and cooling units not supplied with factory-wired controls.

B. Related Sections include the following:

1. Division 01 Section “Construction Waste Management”

2. Division 01 Section "LEED Requirements" for additional LEED requirements.

3. Section 230519 "Meters and Gages for HVAC Piping" for measuring equipment that relates to this Section.

1.3 DEFINITIONS

A. DDC: Direct digital control.

B. I/O: Input/output.

C. LonWorks: A control network technology platform for designing and implementing interoperable control devices and networks.

D. MS/TP: Master slave/token passing.

E. PC: Personal computer.

F. PID: Proportional plus integral plus derivative.

G. RTD: Resistance temperature detector.

1.4 SYSTEM PERFORMANCE

A. Comply with the following performance requirements:

1. Graphic Display: Display graphic with minimum 20 dynamic points with current data within 10 seconds.

2. Graphic Refresh: Update graphic with minimum 20 dynamic points with current data within 8 seconds.

3. Object Command: Reaction time of less than two seconds between operator command of a binary object and device reaction.

4. Object Scan: Transmit change of state and change of analog values to control units or workstation within six seconds.

5. Alarm Response Time: Annunciate alarm at workstation within 45 seconds. Multiple workstations must receive alarms within five seconds of each other.

6. Program Execution Frequency: Run capability of applications as often as five seconds, but selected consistent with mechanical process under control.

7. Performance: Programmable controllers shall execute DDC PID control loops, and scan and update process values and outputs at least once per second.

8. Reporting Accuracy and Stability of Control: Report values and maintain measured variables within tolerances as follows:
   a. Water Temperature: Plus or minus 1 deg F.
   b. Water Flow: Plus 5 percent of full scale.
   c. Water Pressure: Plus 2 percent of full scale.
   d. Space Temperature: Plus or minus 1 deg F.
   e. Ducted Air Temperature: Plus or minus 1 deg F.
   f. Outside Air Temperature: Plus or minus 2 deg F.
   g. Dew Point Temperature: Plus or minus 1 deg F.
   h. Temperature Differential: Plus or minus 0.25 deg F.
   i. Relative Humidity: Plus or minus 5 percent.
   j. Airflow (Measuring Stations): Plus 5 percent of full scale.
   k. Airflow (Terminal): Plus 10 percent of full scale.
   l. Air Pressure (Space): Plus or minus 0.01-inch wg.
   m. Air Pressure (Ducts): Plus or minus 0.1-inch wg.
   n. Carbon Dioxide: Plus or minus 50 ppm.

1.5 ACTION SUBMITTALS

A. Product Data: Include manufacturer's technical literature for each control device. Indicate dimensions, capacities, performance characteristics, electrical characteristics, finishes for materials, and installation and startup instructions for each type of product indicated.

1. DDC System Hardware: Bill of materials of equipment indicating quantity, manufacturer, and model number. Include technical data for operator workstation equipment, interface equipment, control units, transducers/transmitters, sensors, actuators, valves, relays/switches, control panels, and operator interface equipment.

2. Control System Software: Include technical data for operating system software, operator interface, color graphics, and other third-party applications.

3. Controlled Systems: Instrumentation list with element name, type of device, manufacturer, model number, and product data. Include written description of sequence of operation including schematic diagram.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Bill of materials of equipment indicating quantity, manufacturer, and model number.

2. Schematic flow diagrams showing fans, pumps, coils, dampers, valves, and control devices.

3. Wiring Diagrams: Power, signal, and control wiring.

4. Details of control panel faces, including controls, instruments, and labeling.

5. Written description of sequence of operation.

6. Schedule of dampers including size, leakage, and flow characteristics.

7. Schedule of valves including flow characteristics.

8. DDC System Hardware:
   a. Wiring diagrams for control units with termination numbers.
   b. Schematic diagrams and floor plans for field sensors and control hardware.
   c. Schematic diagrams for control, communication, and power wiring, showing trunk data conductors and wiring between operator workstation and control unit locations.

9. Control System Software: List of color graphics indicating monitored systems, data (connected and calculated) point addresses, output schedule, and operator notations.

10. Controlled Systems:
    a. Schematic diagrams of each controlled system with control points labeled and control elements graphically shown, with wiring.

b. Scaled drawings showing mounting, routing, and wiring of elements including bases and special construction.
c. Written description of sequence of operation including schematic diagram.
d. Points list.

1.6 INFORMATIONAL SUBMITTALS

A. Data Communications Protocol Certificates: Certify that each proposed DDC system component complies with ASHRAE 135.

B. Data Communications Protocol Certificates: Certify that each proposed DDC system component complies with LonWorks.

C. Qualification Data: For Installer and manufacturer.

D. Software Upgrade Kit: For Owner to use in modifying software to suit future systems revisions or monitoring and control revisions.

E. Field quality-control test reports.

F. Warranty: Sample of special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For HVAC instrumentation and control system to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Maintenance instructions and lists of spare parts for each type of control device and compressed-air station.

2. Interconnection wiring diagrams with identified and numbered system components and devices.

3. Keyboard illustrations and step-by-step procedures indexed for each operator function.

4. Inspection period, cleaning methods, cleaning materials recommended, and calibration tolerances.

5. Calibration records and list of set points.

B. Software and Firmware Operational Documentation: Include the following:

1. Software operating and upgrade manuals.

2. Program Software Backup: On a magnetic media or compact disc, complete with data files.

3. Device address list.

4. Printout of software application and graphic screens.

5. Software license required by and installed for DDC workstations and control systems.

1.8 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. Replacement Materials: One replacement diaphragm or relay mechanism for each unique valve motor, controller, thermostat and positioning relay.

2. Maintenance Materials: One thermostat adjusting key(s).

B. The system shall be modular and shall permit expansion of both capacity and functionality through the addition of sensors, actuators, building controllers, application specific controllers and operator devices. Provide a minimum of 25% spare capacity for all point types.

C. System architectural design shall eliminate dependence upon any single device for alarm reporting and control execution.

D. System shall include operating and software licenses for a minimum of 15 users.

1.9 QUALITY ASSURANCE

A. Installer Qualifications: Automatic control system manufacturer's authorized representative who is trained and approved for installation of system components required for this Project.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with ASHRAE 135 for DDC system components.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Factory-Mounted Components: Where control devices specified in this Section are indicated to be factory mounted on equipment, arrange for shipping of control devices to equipment manufacturer.

B. System Software: Update to latest version of software at Project completion.

1.11 COORDINATION

A. Coordinate location of thermostats, humidistats, and other exposed control sensors with plans and room details before installation.

B. Coordinate equipment with Section 281000 "Access Control" to achieve compatibility with equipment that interfaces with that system.

C. Coordinate equipment with Section 27500 "Intercom and Clock" to achieve compatibility with equipment that interfaces with that system.

D. Coordinate equipment with Section 283100 "Fire Detection and Alarm" to achieve compatibility with equipment that interfaces with that system.

E. Coordinate supply of conditioned electrical branch circuits for control units and operator workstation.

F. Coordinate equipment with Section 262416 "Panelboards" to achieve compatibility with starter coils and annunciation devices.

G. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Section 033000 "Cast-in-Place Concrete."

1.12 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components that fail in materials or workmanship within specified warranty period.

1. Warranty Period:
   a. Two year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 CONTROL SYSTEM

A. Manufacturers:

1. Honeywell International Inc.; Home & Building Control.

2. Johnson Controls, Inc.; Controls Group.

3. Siemens Building Technologies, Inc.

4. Trane; Worldwide Applied Systems Group

B. Control system shall consist of sensors, indicators, actuators, final control elements, interface equipment, other apparatus, and accessories to control mechanical systems.

C. Control system shall consist of sensors, indicators, actuators, final control elements, interface equipment, other apparatus, accessories, and software connected to distributed controllers operating in multiuser, multitasking environment on token-passing network and programmed to control mechanical systems. An operator workstation permits interface with the network via dynamic color graphics with each mechanical system, building floor plan, and control device depicted by point-and-click graphics.

D. Control system shall include the following:

1. Building clock control system specified in Section 275000 "Intercom and Clock"

2. Fire alarm system specified in Section 283100 "Fire Detection and Alarm."

2.3 DDC EQUIPMENT

A. Operator Workstation: One PC-based microcomputer(s) with minimum configuration as follows:

1. Motherboard: With 8 integrated USB 2.0 ports, integrated Intel Pro 10/100 (Ethernet), integrated audio, bios, and hardware monitoring.

2. Processor: Intel Pentium 4.

3. Random-Access Memory: 2 GB.

4. Graphics: Video adapter, minimum 1600 x 1200 pixels, 2-GB video memory, with TV out.

5. Monitor: 17 inches, LCD color.

6. Keyboard: QWERTY, 105 keys in ergonomic shape.

7. Floppy-Disk Drive: 1.44 MB.

8. Hard-Disk Drive: 80 GB.

9. CD-ROM Read/Write Drive: 48x24x48.

10. Mouse: Three button, optical.

11. Uninterruptible Power Supply: 2 kVa.

12. Operating System: Microsoft Windows with high-speed Internet access.
    a. ASHRAE 135 Compliance: Workstation shall use ASHRAE 135 protocol and communicate using ISO 8802-3 (Ethernet) datalink/physical layer protocol.
    b. Retain subparagraph below if compliance with LonWorks is required.

c. LonWorks Compliance: Control units shall use LonTalk protocol and communicate using EIA/CEA 709.1 datalink/physical layer protocol.

13. Printer: Color, ink-jet type as follows:

14. Application Software:
    a. I/O capability from operator station.
    b. System security for each operator via software password and access levels.
    c. Automatic system diagnostics; monitor system and report failures.
    d. Database creation and support.
    e. Automatic and manual database save and restore.
    f. Dynamic color graphic displays with up to **10** screen displays at once.
    g. Custom graphics generation and graphics library of HVAC equipment and symbols.
    h. Alarm processing, messages, and reactions.
    i. Trend logs retrievable in spreadsheets and database programs.
    j. Alarm and event processing.
    k. Object and property status and control.
    l. Automatic restart of field equipment on restoration of power.
    m. Data collection, reports, and logs. Include standard reports for the following:
        1) Current values of all objects.
        2) Current alarm summary.
        3) Disabled objects.
        4) Alarm lockout objects.
        5) Logs.
    n. Custom report development.
    o. Utility and weather reports.
    p. Workstation application editors for controllers and schedules.
    q. Maintenance management.

15. Custom Application Software:
    a. English language oriented.
    b. Full-screen character editor/programming environment.
    c. Allow development of independently executing program modules with debugging/simulation capability.
    d. Support conditional statements.
    e. Support floating-point arithmetic with mathematic functions.
    f. Contains predefined time variables.

B. Diagnostic Terminal Unit: Portable notebook-style, PC-based microcomputer terminal capable of accessing system data by connecting to system network with minimum configuration as follows:

1. System: With one integrated USB 2.0 port, integrated Intel Pro 10/100 (Ethernet), integrated audio, bios, and hardware monitoring.

2. Processor: Intel Pentium 4.

3. Random-Access Memory: 512 MB.

4. Graphics: Video adapter, minimum 1024 x 768 pixels, 512-MB video memory.

5. Monitor: 17 inches, LCD color.

6. Keyboard: QWERTY 105 keys in ergonomic shape.

7. Floppy-Disk Drive: 1.44 MB.

8. Hard-Disk Drive: 800 MB.

9. CD-ROM Read/Write Drive: 48x24x48.

10. Pointing Device: Touch pad or other internal device.

C. Building controllers: shall provide fully distributed building control independent of the operational status of the operator workstation and system server

1. All control logic shall be operator defined and fully adjustable and or programmable through operator interface.

2. Provide connection between all building controllers and the primary controlling LAN.

3. Each building controller shall permit mutli-user operation from multiple workstations and portable operator terminals connected either locally or over the primary controlling LAN

4. Provide a communication power for operator interface through a terminal at each building controller.

5. Owner shall be capable of uploading the most current versions of all energy management programs, DDC programs, database parameters, and all other data and programs in the memory of each building controller to the operator workstation through the LAN, Ethernet, or laptop PC.

6. Units monitor or control each I/O point; process information; execute commands from other control units, devices, and operator stations; and download from or upload to operator workstation or diagnostic terminal unit.

7. Stand-alone mode control functions operate regardless of network status. Functions include the following:
   a. Global communications.
   b. Discrete/digital, analog, and pulse I/O.
   c. Monitoring, controlling, or addressing data points.
   d. Software applications, scheduling, and alarm processing.
   e. Testing and developing control algorithms without disrupting field hardware and controlled environment.

8. Standard Application Programs:
   a. Electric Control Programs: Demand limiting, duty cycling, automatic time scheduling, start/stop time optimization, night setback/setup, on-off control with differential sequencing, staggered start, antishort cycling, PID control, DDC with fine tuning, and trend logging.
   b. HVAC Control Programs: Optimal run time, supply-air reset, and enthalpy switchover.

c. Geothermal Control Programs: Control function of condenser-water reset and equipment sequencing.
d. Dedicated Outdoor Air Unit Control programs.
e. Programming Application Features: Include trend point; alarm processing and messaging; weekly, monthly, and annual scheduling; energy calculations; run-time totalization; and security access.
f. Remote communications.
g. Maintenance management.
h. Units of Measure: Inch-pound and SI (metric).

9. Local operator interface provides for download from or upload to operator workstation or diagnostic terminal unit.

10. ASHRAE 135 Compliance: Control units shall use ASHRAE 135 protocol and communicate using ISO 8802-3 (Ethernet) datalink/physical layer protocol.

D. On Site DDC Controller: Shall be minimum of 14" display with capability of showing full graphic with manual change over switch for winter / summer operations. Controller shall permit the following functions:

1. Configure system.

2. Monitor and supervise control all points

3. Modify control set points.

4. Override input and output values.

5. Enter time schedules.

6. View and acknowledge alarms and messages.

7. Receive, store and display trend logs and management reports.

8. Upload / download programs and database.

9. Report printability

10. Display full graphic of all equipment n school with plan operation.

E. Advanced application specific controller (AAC) and application specific controllers (ASC)

1. AAC and ASC shall provide intelligent, stand alone control of mechanical equipment

2. Provide all control capabilities and hardware system components below:
a. Share information with other building controllers
b. Provide self testing diagnostic capabilities, allowing each controller to alarm to the building controller, LAN interface device, or operator workstation
c. Provide capability of modifying all point data, control algorithms, and software within the AAC/ASC from the workstation

d. Provide sufficient memory to perform required control functions and communicate with other devices
e. Provide any volative memory with a battery backup of fifty hours and battery life of five years.

F. Local supervisory LAN gateway/routers

1. Microprocessor based communication devices act as gateway between the supervisory LAN operator workstation and primary LAN

2. Supervisory gateway shall permit the following:
   a. Centralized overall system supervision
   b. Operator interface
   c. Management report generation
   d. Alarm annunciation
   e. Access to trend data
   f. Communication with control units
   g. Configure systems
   h. Monitor and supervise control of all points
   i. Modify control setpoints
   j. Override input and output values
   k. Enter time schedules
   l. View and acknowledge alarms and messages
   m. Receive, store and display trend logs and management reports
   n. Upload/download programs and databases

3. Provide a minimum one hundred hour self-charging battery backup for the supervisory gateway, programs, and associated data.

G. Graphical User Interface

1. Building picture with navigation

2. Floor plans

3. Thermographic indicators of space temperature

4. Navigation to equipment status, alarms, reports and dashboards

5. 3D equipment graphics

6. System graphics

7. System level dashboards

H. System Functionality and operational requirements

1. Time, Calendar, Holiday scheduling

2. Temporary Override schedule

3. Optimal start/stop based on space and outdoor air temperatures

4. Night setback, morning warm up

5. Economizer operation

6. Peak demand limiting/load shedding

7. Dead band control

8. Alarm management

9. Collection and analysis of data

10. Acquisition and storage of data

11. Time program commands

12. Standard reports and logs
    a. All points alarm, override
    b. Current value of all points
    c. Reports shall be exportable in CSV, HTML, XML or PDF format

I. I/O Interface: Hardwired inputs and outputs may tie into system through controllers. Protect points so that shorting will cause no damage to controllers.

1. Binary Inputs: Allow monitoring of on-off signals without external power.

2. Pulse Accumulation Inputs: Accept up to 10 pulses per second.

3. Analog Inputs: Allow monitoring of low-voltage (0- to 10-V dc), current (4 to 20 mA), or resistance signals.

4. Binary Outputs: Provide on-off or pulsed low-voltage signal, selectable for normally open or normally closed operation with three-position (on-off-auto) override switches and status lights.

5. Analog Outputs: Provide modulating signal, either low voltage (0- to 10-V dc) or current (4 to 20 mA) with status lights, two-position (auto-manual) switch, and manually adjustable potentiometer.

6. Tri-State Outputs: Provide two coordinated binary outputs for control of three-point, floating-type electronic actuators.

7. Universal I/Os: Provide software selectable binary or analog outputs.

J. Power Supplies: Transformers with Class 2 current-limiting type or overcurrent protection; limit connected loads to 80 percent of rated capacity. DC power supply shall match output current and voltage requirements and be full-wave rectifier type with the following:

1. Output ripple of 5.0 mV maximum peak to peak.

2. Combined 1 percent line and load regulation with 100-mic.sec. response time for 50 percent load changes.

3. Built-in overvoltage and overcurrent protection and be able to withstand 150 percent overload for at least 3 seconds without failure.

K. Power Line Filtering: Internal or external transient voltage and surge suppression for workstations or controllers with the following:

1. Minimum dielectric strength of 1000 V.

2. Maximum response time of 10 nanoseconds.

3. Minimum transverse-mode noise attenuation of 65 dB.

4. Minimum common-mode noise attenuation of 150 dB at 40 to 100 Hz.

2.13 UNITARY CONTROLLERS

A. Unitized, capable of stand-alone operation with sufficient memory to support its operating system, database, and programming requirements, and with sufficient I/O capacity for the application.

1. Configuration: Local keypad and display; diagnostic LEDs for power, communication, and processor; wiring termination to terminal strip or card connected with ribbon cable; memory with bios; and **72**-hour battery backup.

2. Operating System: Manage I/O communication to allow distributed controllers to share real and virtual object information and allow central monitoring and alarms. Perform scheduling with real-time clock. Perform automatic system diagnostics; monitor system and report failures.

3. ASHRAE 135 Compliance: Communicate using read (execute and initiate) and write (execute and initiate) property services defined in ASHRAE 135. Reside on network using MS/TP datalink/physical layer protocol and have service communication port for connection to diagnostic terminal unit.

4. LonWorks Compliance: Communicate using EIA/CEA 709.1 datalink/physical layer protocol using LonTalk protocol.

5. Enclosure: Dustproof rated for operation at 32 to 120 deg F.

6. Enclosure: Waterproof rated for operation at 40 to 150 deg F.

2.14 ALARM PANELS

A. Unitized cabinet with suitable brackets for wall or floor mounting. Fabricate of 0.06-inch-thick, furniture-quality steel or extruded-aluminum alloy, totally enclosed, with hinged doors and keyed lock and with manufacturer's standard shop-painted finish.

B. Indicating light for each alarm point, single horn, acknowledge switch, and test switch, mounted on hinged cover.

1. Alarm Condition: Indicating light flashes and horn sounds.

2. Acknowledge Switch: Horn is silent and indicating light is steady.

3. Second Alarm: Horn sounds and indicating light is steady.

4. Alarm Condition Cleared: System is reset and indicating light is extinguished.

5. Contacts in alarm panel allow remote monitoring by independent alarm company.

2.15 ANALOG CONTROLLERS

A. Step Controllers: 6- or 10-stage type, with heavy-duty switching rated to handle loads and operated by electric motor.

B. Electric, Outdoor-Reset Controllers: Remote-bulb or bimetal rod-and-tube type, proportioning action with adjustable throttling range, adjustable set point, scale range minus 10 to plus 70 deg F, and single- or double-pole contacts.

C. Electronic Controllers: Wheatstone-bridge-amplifier type, in steel enclosure with provision for remote-resistance readjustment. Identify adjustments on controllers, including proportional band and authority.

1. Single controllers can be integral with control motor if provided with accessible control readjustment potentiometer.

D. Fan-Speed Controllers: Solid-state model providing field-adjustable proportional control of motor speed from maximum to minimum of 55 percent and on-off action below minimum fan speed. Controller shall briefly apply full voltage, when motor is started, to rapidly bring motor up to minimum speed. Equip with filtered circuit to eliminate radio interference.

E. Receiver Controllers: Single- or multiple-input models with control-point adjustment, direct or reverse acting with mechanical set-point adjustment with locking device, proportional band adjustment, authority adjustment, and proportional control mode.

1. Remote-control-point adjustment shall be plus or minus 20 percent of sensor span, input signal of 3 to 13 psig.

2. Proportional band shall extend from 2 to 20 percent for 5 psig.

3. Authority shall be 20 to 200 percent.

4. Air-supply pressure of 18 psig, input signal of 3 to 15 psig, and output signal of zero to supply pressure.

5. Gages: 3-1/2 inches in diameter, 2.5 percent wide-scale accuracy, and range to match transmitter input or output pressure.

2.16 TIME CLOCKS

A. Manufacturers:

1. ATC-Diversified Electronics.

2. Grasslin Controls Corporation.

3. Paragon Electric Co., Inc.

4. Precision Multiple Controls, Inc.

5. SSAC Inc.; ABB USA.

6. TCS/Basys Controls.

7. Theben AG - Lumilite Control Technology, Inc.

8. Time Mark Corporation.

B. Seven-day, programming-switch timer with synchronous-timing motor and seven-day dial; continuously charged, nickel-cadmium-battery-driven, eight-hour, power-failure carryover; multiple-switch trippers; minimum of two and maximum of eight signals per day with two normally open and two normally closed output contacts.

C. Solid-state, programmable time control with four (4) separate programs each with up to 100 on-off operations; 1-second resolution; lithium battery backup; keyboard interface and manual override; individual on-off-auto switches for each program; 365-day calendar with 20 programmable holidays; choice of fail-safe operation for each program; system fault alarm; and communications package allowing networking of time controls and programming from PC.

2.17 ELECTRONIC SENSORS

A. Description: Vibration and corrosion resistant; for wall, immersion, or duct mounting as required.

B. Thermistor Temperature Sensors and Transmitters:

1. Manufacturers:
   a. BEC Controls Corporation.
   b. Ebtron, Inc.
   c. Heat-Timer Corporation.
   d. I.T.M. Instruments Inc.
   e. MAMAC Systems, Inc.
   f. RDF Corporation.

2. Accuracy: Plus or minus 0.5 deg F at calibration point.

3. Wire: Twisted, shielded-pair cable.

4. Insertion Elements in Ducts: Single point, 8 inches long; use where not affected by temperature stratification or where ducts are smaller than 9 sq. ft.

5. Averaging Elements in Ducts: 36 inches long, flexible; use where prone to temperature stratification or where ducts are larger than 10 sq. ft.

6. Insertion Elements for Liquids: Brass or stainless-steel socket with minimum insertion length of 2-1/2 inches.

7. Room Sensor Cover Construction: Manufacturer's standard locking covers.
   a. Set-Point Adjustment: Concealed.
   b. Set-Point Indication: Concealed.
   c. Thermometer: Concealed.
   d. Orientation: Vertical.

8. Outside-Air Sensors: Watertight inlet fitting, shielded from direct sunlight.

9. Room Security Sensors: Stainless-steel cover plate with insulated back and security screws.

C. RTDs and Transmitters:

1. Manufacturers:
   a. BEC Controls Corporation.
   b. MAMAC Systems, Inc.
   c. RDF Corporation.

2. Accuracy: Plus or minus 0.2 percent at calibration point.

3. Wire: Twisted, shielded-pair cable.

4. Insertion Elements in Ducts: Single point, 8 inches long; use where not affected by temperature stratification or where ducts are smaller than 9 sq. ft.

5. Averaging Elements in Ducts: 24 inches long, rigid; use where prone to temperature stratification or where ducts are larger than 9 sq. ft.; length as required.

6. Insertion Elements for Liquids: Brass socket with minimum insertion length of 2-1/2 inches.

7. Room Sensor Cover Construction: Manufacturer's standard locking covers.
   a. Set-Point Adjustment: Concealed.
   b. Set-Point Indication: Concealed.
   c. Thermometer: Concealed.
   d. Orientation: Vertical.

8. Outside-Air Sensors: Watertight inlet fitting, shielded from direct sunlight.

9. Room Security Sensors: Stainless-steel cover plate with insulated back and security screws.

D. Humidity Sensors: Bulk polymer sensor element.

1. Manufacturers:
   a. BEC Controls Corporation.
   b. General Eastern Instruments.
   c. MAMAC Systems, Inc.
   d. ROTRONIC Instrument Corp.
   e. TCS/Basys Controls.
   f. Vaisala.

2. Accuracy: 2 percent full range with linear output.

3. Room Sensor Range: 10 to 90 percent relative humidity.

4. Room Sensor Cover Construction: Manufacturer's standard locking covers.
   a. Set-Point Adjustment: Concealed.
   b. Set-Point Indication: Concealed.
   c. Thermometer: Concealed.
   d. Orientation: Vertical.

5. Duct Sensor: 10 to 90 percent relative humidity range with element guard and mounting plate.

6. Outside-Air Sensor: 10 to 90 percent relative humidity range with mounting enclosure, suitable for operation at outdoor temperatures of minus 22 to plus 185 deg F.

7. Duct and Sensors: With element guard and mounting plate, range of 0 to 100 percent relative humidity.

E. Pressure Transmitters/Transducers:

1. Manufacturers:
   a. BEC Controls Corporation.
   b. General Eastern Instruments.
   c. MAMAC Systems, Inc.
   d. ROTRONIC Instrument Corp.
   e. TCS/Basys Controls.
   f. Vaisala.

2. Static-Pressure Transmitter: Nondirectional sensor with suitable range for expected input, and temperature compensated.
   a. Accuracy: 2 percent of full scale with repeatability of 0.5 percent.
   b. Output: 4 to 20 mA.
   c. Building Static-Pressure Range: 0- to 0.25-inch wg.
   d. Duct Static-Pressure Range: 0- to 5-inch wg.

3. Water Pressure Transducers: Stainless-steel diaphragm construction, suitable for service; minimum 150-psig operating pressure; linear output 4 to 20 mA.

4. Water Differential-Pressure Transducers: Stainless-steel diaphragm construction, suitable for service; minimum 150-psig operating pressure and tested to 300-psig; linear output 4 to 20 mA.

5. Differential-Pressure Switch (Air or Water): Snap acting, with pilot-duty rating and with suitable scale range and differential.

6. Pressure Transmitters: Direct acting for gas, liquid, or steam service; range suitable for system; linear output 4 to 20 mA.

F. Room Sensor Cover Construction: Manufacturer's standard locking covers.

1. Set-Point Adjustment: Concealed.

2. Set-Point Indication: Concealed.

3. Thermometer: Concealed.

4. Orientation: Vertical.

G. Room sensor accessories include the following:

1. Insulating Bases: For sensors located on exterior walls.

2. Guards: Locking; heavy-duty, transparent plastic; mounted on separate base.

3. Adjusting Key: As required for calibration and cover screws.

2.18 STATUS SENSORS

A. Status Inputs for Fans: Differential-pressure switch with pilot-duty rating and with adjustable range of 0- to 5-inch wg.

B. Status Inputs for Pumps: Differential-pressure switch with pilot-duty rating and with adjustable pressure-differential range of 8 to 60 psig, piped across pump.

C. Status Inputs for Electric Motors: Comply with ISA 50.00.01, current-sensing fixed- or split-core transformers with self-powered transmitter, adjustable and suitable for 175 percent of rated motor current.

D. Voltage Transmitter (100- to 600-V ac): Comply with ISA 50.00.01, single-loop, self-powered transmitter, adjustable, with suitable range and 1 percent full-scale accuracy.

E. Power Monitor: 3-phase type with disconnect/shorting switch assembly, listed voltage and current transformers, with pulse kilowatt hour output and 4- to 20-mA kW output, with maximum 2 percent error at 1.0 power factor and 2.5 percent error at 0.5 power factor.

F. Current Switches: Self-powered, solid-state with adjustable trip current, selected to match current and system output requirements.

G. Electronic Valve/Damper Position Indicator: Visual scale indicating percent of travel and 2- to 10-V dc, feedback signal.

H. Water-Flow Switches: Bellows-actuated mercury or snap-acting type with pilot-duty rating, stainless-steel or bronze paddle, with appropriate range and differential adjustment, in NEMA 250, Type 1 enclosure.

1. Manufacturers:
   a. BEC Controls Corporation.
   b. I.T.M. Instruments Inc.

2.19 GAS DETECTION EQUIPMENT

A. Manufacturers:

1. B. W. Technologies.

2. CEA Instruments, Inc.

3. Ebtron, Inc.

4. Gems Sensors Inc.

5. Greystone Energy Systems Inc.

6. Honeywell International Inc.; Home & Building Control.

7. INTEC Controls, Inc.

8. I.T.M. Instruments Inc.

9. MSA Canada Inc.

10. QEL/Quatrosense Environmental Limited.

11. Sauter Controls Corporation.

12. Sensidyne, Inc.

13. TSI Incorporated.

14. Vaisala.

15. Vulcain Inc.

B. Carbon Dioxide Sensor and Transmitter: Single detectors using solid-state infrared sensors; suitable over a temperature range of 23 to 130 deg F and calibrated for 0 to 2 percent, with continuous or averaged reading, 4- to 20-mA output;, for wall mounting.

1. Wall or duct insertion type, 0-2000 ppm range, typical accuracy of +/- 30 ppm or +/- 2% of reading between 60 and 90 degrees F.

C. Occupancy Sensor: Passive infrared, with time delay, daylight sensor lockout, sensitivity control, and 180-degree field of view with vertical sensing adjustment; for flush mounting.

2.20 FLOW MEASURING STATIONS

A. Duct Airflow Station: Combination of air straightener and multiport, self-averaging pitot tube station.

1. Manufacturers:
   a. Air Monitor Corporation.
   b. Wetmaster Co., Ltd.

2. Casing: Galvanized-steel frame.

3. Flow Straightener: Aluminum honeycomb, 3/4-inch parallel cell, 3 inches deep.

4. Sensing Manifold: Copper manifold with bullet-nosed static pressure sensors positioned on equal area basis.

5. Total installed system accuracy: within 3 percent of actual flow.

6. Electronic flow transmitters: Industrial process control type, capable of receiving signals from the airflow measuring device and producing a 4-20 ma DC or 0-5 VDC output signal.

2.21 THERMOSTATS

A. Manufacturers:

1. Erie Controls.

2. Danfoss Inc.; Air-Conditioning and Refrigeration Div.

3. Heat-Timer Corporation.

4. Sauter Controls Corporation.

5. tekmar Control Systems, Inc.

6. Theben AG - Lumilite Control Technology, Inc.

B. Electric, solid-state, microcomputer-based room thermostat with remote sensor.

1. Automatic switching from heating to cooling.

2. Preferential rate control to minimize overshoot and deviation from set point.

3. Set up for four separate temperatures per day.

4. Thermostat to not allow override at the thermostat.

5. Short-cycle protection.

6. Programming based on every day of week.

7. Selection features include degree F or degree C display, 12- or 24-hour clock, keyboard disable, remote sensor, and fan on-auto.

8. Battery replacement without program loss.

9. Thermostat display features include the following:
   a. Time of day.
   b. Actual room temperature.
   c. Day of week.
   d. System mode indications include "heating," "off," "fan auto," and "fan on."

C. Line-Voltage, On-Off Thermostats: Bimetal-actuated, open contact or bellows-actuated, enclosed, snap-switch or equivalent solid-state type, with heat anticipator; listed for electrical rating; with concealed set-point adjustment, 55 to 85 deg F set-point range, and 2 deg F maximum differential.

1. Electric Heating Thermostats: Equip with off position on dial wired to break ungrounded conductors.

2. Selector Switch: Integral, manual on-off-auto.

D. Electric, Low-Limit Duct Thermostat: Snap-acting, single-pole, single-throw, manual-reset switch that trips if temperature sensed across any 12 inches of bulb length is equal to or below set point.

1. Bulb Length: Minimum 20 feet.

2. Quantity: One thermostat for every 20 sq. ft. of coil surface.

E. Electric, High-Limit Duct Thermostat: Snap-acting, single-pole, single-throw, manual-reset switch that trips if temperature sensed across any 12 inches of bulb length is equal to or above set point.

1. Bulb Length: Minimum 20 feet.

2. Quantity: One thermostat for every 20 sq. ft. of coil surface.

2.22 HUMIDISTATS

A. Manufacturers:

1. MAMAC Systems, Inc.

2. ROTRONIC Instrument Corp.

B. Duct-Mounting Humidistats: Electric insertion, 2-position type with adjustable, 2 percent throttling range, 20 to 80 percent operating range, and single- or double-pole contacts.

2.23 ENTHALPY SENSORS

A. Manufacturers:

1. MAMAC Systems, Inc.

2. ROTRONIC Instrument Corp.

B. Shall have a range of 16-40 BTU/lb. dry air.

C. Unit shall be suitable for duct mounting.

2.24 ACTUATORS

A. Electric Motors: Size to operate with sufficient reserve power to provide smooth modulating action or two-position action.

1. Comply with requirements in Section 230513 "Common Motor Requirements for HVAC Equipment."

2. Permanent Split-Capacitor or Shaded-Pole Type: Gear trains completely oil immersed and sealed. Equip spring-return motors with integral spiral-spring mechanism in housings designed for easy removal for service or adjustment of limit switches, auxiliary switches, or feedback potentiometer.

3. Nonspring-Return Motors for Valves Larger Than NPS 2-1/2: Size for running torque of 150 in. x lbf and breakaway torque of 300 in. x lbf.

4. Spring-Return Motors for Valves Larger Than NPS 2-1/2: Size for running and breakaway torque of 150 in. x lbf.

5. Nonspring-Return Motors for Dampers Larger Than 25 Sq. Ft.: Size for running torque of 150 in. x lbf and breakaway torque of 300 in. x lbf.

6. Spring-Return Motors for Dampers Larger Than 25 Sq. Ft.: Size for running and breakaway torque of 150 in. x lbf.

B. Electronic Actuators: Direct-coupled type designed for minimum 60,000 full-stroke cycles at rated torque.

1. Manufacturers:
   a. Belimo Aircontrols (USA), Inc.

2. Valves: Size for torque required for valve close off at maximum pump differential pressure.

3. Dampers: Size for running torque calculated as follows:
   a. Parallel-Blade Damper with Edge Seals: 7 inch-lb/sq. ft. of damper.
   b. Opposed-Blade Damper with Edge Seals: 5 inch-lb/sq. ft. of damper.
   c. Parallel-Blade Damper without Edge Seals: 4 inch-lb/sq. ft of damper.
   d. Opposed-Blade Damper without Edge Seals: 3 inch-lb/sq. ft. of damper.
   e. Dampers with 2- to 3-Inch wg of Pressure Drop or Face Velocities of 1000 to 2500 fpm: Increase running torque by 1.5.
   f. Dampers with 3- to 4-Inch wg of Pressure Drop or Face Velocities of 2500 to 3000 fpm: Increase running torque by 2.0.

4. Coupling: V-bolt and V-shaped, toothed cradle.

5. Overload Protection: Electronic overload or digital rotation-sensing circuitry.

6. Fail-Safe Operation: Mechanical, spring-return mechanism. Provide external, manual gear release on nonspring-return actuators.

7. Power Requirements (Two-Position Spring Return): 24-V ac.

8. Power Requirements (Modulating): Maximum 10 VA at 24-V ac or 8 W at 24-V dc.

9. Proportional Signal: 2- to 10-V dc or 4 to 20 mA, and 2- to 10-V dc position feedback signal.

10. Temperature Rating: Minus 22 to plus 122 deg F.

11. Temperature Rating (Smoke Dampers): Minus 22 to plus 250 deg F.

12. Run Time: 12 seconds open, 5 seconds closed.

2.25 CONTROL VALVES

A. Manufacturers:

1. Danfoss Inc.; Air Conditioning & Refrigeration Div.

2. Erie Controls.

3. Hayward Industrial Products, Inc.

4. Magnatrol Valve Corporation.

5. Neles-Jamesbury.

6. Parker Hannifin Corporation; Skinner Valve Division.

7. Pneuline Controls.

8. Sauter Controls Corporation.

B. Control Valves: Factory fabricated, of type, body material, and pressure class based on maximum pressure and temperature rating of piping system, unless otherwise indicated.

C. Hydronic system globe valves shall have the following characteristics:

1. NPS 2 and Smaller: Class 125 bronze body, bronze trim, rising stem, renewable composition disc, and screwed ends with backseating capacity repackable under pressure.

2. NPS 2-1/2 and Larger: Class 125 iron body, bronze trim, rising stem, plug-type disc, flanged ends, and renewable seat and disc.

3. Internal Construction: Replaceable plugs and stainless-steel or brass seats.
   a. Single-Seated Valves: Cage trim provides seating and guiding surfaces for plug on top and bottom.
   b. Double-Seated Valves: Balanced plug; cage trim provides seating and guiding surfaces for plugs on top and bottom.

4. Sizing: 3-psig maximum pressure drop at design flow rate or the following:
   a. Two Position: Line size.
   b. Two-Way Modulating: Either the value specified above or twice the load pressure drop, whichever is more.
   c. Three-Way Modulating: Twice the load pressure drop, but not more than value specified above.

5. Flow Characteristics: Two-way valves shall have equal percentage characteristics; three-way valves shall have linear characteristics.

6. Close-Off (Differential) Pressure Rating: Combination of actuator and trim shall provide minimum close-off pressure rating of 150 percent of total system (pump) head for two-way valves and 100 percent of pressure differential across valve or 100 percent of total system (pump) head.

D. Butterfly Valves: 200-psig, 150-psig maximum pressure differential, ASTM A 126 cast-iron or ASTM A 536 ductile-iron body and bonnet, extended neck, stainless-steel stem, field-replaceable EPDM or Buna N sleeve and stem seals.

1. Body Style: Wafer.

2. Disc Type: Aluminum bronze.

3. Sizing: 1-psig maximum pressure drop at design flow rate.

E. Terminal Unit Control Valves: Bronze body, bronze trim, two or three ports as indicated, replaceable plugs and seats, and union and threaded ends.

1. Rating: Class 125 for service at 125 psig and 250 deg F operating conditions.

2. Sizing: 3-psig maximum pressure drop at design flow rate, to close against pump shutoff head.

3. Flow Characteristics: Two-way valves shall have equal percentage characteristics; three-way valves shall have linear characteristics.

F. Self-Contained Control Valves: Bronze body, bronze trim, two or three ports as indicated, replaceable plugs and seats, and union and threaded ends.

1. Rating: Class 125 for service at 125 psig and 250 deg F operating conditions.

2. Thermostatic Operator: integral sensor with integral adjustable dial.

2.26 DAMPERS

A. Manufacturers:

1. Air Balance Inc.

2. Don Park Inc.; Autodamp Div.

3. TAMCO (T. A. Morrison & Co. Inc.).

4. United Enertech Corp.

5. Vent Products Company, Inc.

B. Dampers: AMCA-rated, opposed-blade design; 0.108-inch- minimum thick, galvanized-steel or 0.125-inch- minimum thick, extruded-aluminum frames with holes for duct mounting; damper blades shall not be less than 0.064-inch- thick galvanized steel with maximum blade width of 8 inches and length of 48 inches.

1. Operating Temperature Range: From minus 40 to plus 200 deg F.

2. Edge Seals, Standard Pressure Applications: Closed-cell neoprene.

3. Edge Seals, Low-Leakage Applications: Use inflatable blade edging or replaceable rubber blade seals and spring-loaded stainless-steel side seals, rated for leakage at less than 10 cfm per sq. ft. of damper area, at differential pressure of 4-inch wg when damper is held by torque of 50 in. x lbf; when tested according to AMCA 500D.

PART 3 - EXECUTION

3.1 CONSTRUCTION WASTE MANAGEMENT (LEED)

A. The contractor, subcontractors, and their personnel shall follow the procedures and practices for waste separation, collection and transport as defined in the contractor’s “Waste Management Plan” as required by Division 01 Section "Construction Waste Management."

3.2 EXAMINATION

A. Conditioned power is not available on most projects; confirm its availability.

B. Verify that power supply is available to control units and operator workstation.

C. Verify that pneumatic piping and duct-, pipe-, and equipment-mounted devices are installed before proceeding with installation.

3.3 INSTALLATION

A. Install software in control units and operator workstation(s). Implement all features of programs to specified requirements and as appropriate to sequence of operation.

B. Connect and configure equipment and software to achieve sequence of operation specified.

C. Mount compressor and tank unit on elastomeric mounts. Vibration isolators are specified in Section 230548 "Vibration and Seismic Controls for HVAC Piping and Equipment." Isolate air supply with wire-braid-reinforced rubber hose. Secure and anchor according to manufacturer's written instructions and seismic-control requirements.

1. Pipe manual and automatic drains to nearest floor drain.

2. Supply instrument air from compressor units through filter, pressure-reducing valve, and pressure relief valve, with pressure gages and shutoff and bypass valves.

D. Verify location of thermostats, humidistats, and other exposed control sensors with Drawings and room details before installation. Install devices 48 inches above the floor.

1. Install averaging elements in ducts and plenums in crossing or zigzag pattern.

E. Install guards on thermostats in the following locations:

1. Entrances.

2. Public areas.

3. Where indicated.

F. Install automatic dampers according to Section 233300 "Air Duct Accessories."

G. Install damper motors on outside of duct in warm areas, not in locations exposed to outdoor temperatures.

H. Install labels and nameplates to identify control components according to Section 230553 "Identification for HVAC Piping and Equipment."

I. Install hydronic instrument wells, valves, and other accessories according to Section 232113 "Hydronic Piping."

J. Install refrigerant instrument wells, valves, and other accessories according to Section 232300 "Refrigerant Piping."

K. Install duct volume-control dampers according to Section 233113 "Metal Ducts" and Section 233116 "Nonmetal Ducts."

3.4 ELECTRICAL WIRING AND CONNECTION INSTALLATION

A. Install raceways, boxes, and cabinets according to Section 260533 "Conduits."

B. Install building wire and cable according to Section 260519 "Building Wire and Cable."

C. Install signal and communication cable according to Section 270500 "Telecommunications Pathway."

1. Conceal cable, except in mechanical rooms and areas where other conduit and piping are exposed.

2. Install exposed cable in raceway.

3. Install concealed cable in raceway.

4. Bundle and harness multiconductor instrument cable in place of single cables where several cables follow a common path.

5. Fasten flexible conductors, bridging cabinets and doors, along hinge side; protect against abrasion. Tie and support conductors.

6. Number-code or color-code conductors for future identification and service of control system, except local individual room control cables.

7. Install wire and cable with sufficient slack and flexible connections to allow for vibration of piping and equipment.

D. Connect manual-reset limit controls independent of manual-control switch positions. Automatic duct heater resets may be connected in interlock circuit of power controllers.

E. Connect hand-off-auto selector switches to override automatic interlock controls when switch is in hand position.

3.5 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including connections. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports:

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation. Remove and replace malfunctioning units and retest.

2. Test and adjust controls and safeties.

3. Test calibration of electronic controllers by disconnecting input sensors and stimulating operation with compatible signal generator.

4. Test each point through its full operating range to verify that safety and operating control set points are as required.

5. Test each control loop to verify stable mode of operation and compliance with sequence of operation. Adjust PID actions.

6. Test each system for compliance with sequence of operation.

7. Test software and hardware interlocks.

C. DDC Verification:

1. Verify that instruments are installed before calibration, testing, and loop or leak checks.

2. Check instruments for proper location and accessibility.

3. Check instrument installation for direction of flow, elevation, orientation, insertion depth, and other applicable considerations.

4. Check instrument tubing for proper fittings, slope, material, and support.

5. Check installation of air supply for each instrument.

6. Check flow instruments. Inspect tag number and line and bore size, and verify that inlet side is identified and that meters are installed correctly.

7. Check pressure instruments, piping slope, installation of valve manifold, and self-contained pressure regulators.

8. Check temperature instruments and material and length of sensing elements.

9. Check control valves. Verify that they are in correct direction.

10. Check DDC system as follows:
    a. Verify that DDC controller power supply is from emergency power supply, if applicable.
    b. Verify that wires at control panels are tagged with their service designation and approved tagging system.
    c. Verify that spare I/O capacity has been provided.
    d. Verify that DDC controllers are protected from power supply surges.

D. Replace damaged or malfunctioning controls and equipment and repeat testing procedures.

3.5 ADJUSTING

A. Calibrating and Adjusting:

1. Calibrate instruments.

2. Make three-point calibration test for both linearity and accuracy for each analog instrument.

3. Calibrate equipment and procedures using manufacturer's written recommendations and instruction manuals. Use test equipment with accuracy at least double that of instrument being calibrated.

4. Control System Inputs and Outputs:
   a. Check analog inputs at 0, 50, and 100 percent of span.
   b. Check analog outputs using milliampere meter at 0, 50, and 100 percent output.
   c. Check digital inputs using jumper wire.
   d. Check digital outputs using ohmmeter to test for contact making or breaking.
   e. Check resistance temperature inputs at 0, 50, and 100 percent of span using a precision-resistant source.

5. Flow:
   a. Set differential pressure flow transmitters for 0 and 100 percent values with 3-point calibration accomplished at 50, 90, and 100 percent of span.
   b. Manually operate flow switches to verify that they make or break contact.

6. Pressure:
   a. Calibrate pressure transmitters at 0, 50, and 100 percent of span.
   b. Calibrate pressure switches to make or break contacts, with adjustable differential set at minimum.

7. Temperature:
   a. Calibrate resistance temperature transmitters at 0, 50, and 100 percent of span using a precision-resistance source.
   b. Calibrate temperature switches to make or break contacts.

8. Stroke and adjust control valves and dampers without positioners, following the manufacturer's recommended procedure, so that valve or damper is 100 percent open and closed.

9. Stroke and adjust control valves and dampers with positioners, following manufacturer's recommended procedure, so that valve and damper is 0, 50, and 100 percent closed.

10. Provide diagnostic and test instruments for calibration and adjustment of system.

11. Provide written description of procedures and equipment for calibrating each type of instrument. Submit procedures review and approval before initiating startup procedures.

B. Adjust initial temperature and humidity set points.

C. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to three visits to Project during other than normal occupancy hours for this purpose.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain HVAC instrumentation and controls. Refer to Section 017900 "Demonstration and Training."

END OF SECTION 23 09 00

SECTION 23 2113.34 - THERMAL-ENHANCED BENTONITE GROUT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Requirements for furnishing, mixing, and placing thermally-enhanced bentonite grout to seal and backfill each vertical u-bend well bore of the closed-loop ground heat exchangers to insure proper thermal contact with the earth and to ensure the environmental integrity of each vertical bore column. No other backfill material shall be accepted.

1.3 REFERENCES

A. National Ground Water Association - geothermal heat pump manual-Guidelines for the

B. Construction of Vertical Boreholes for Closed Loop Heat Pump Systems

C. Local codes

1.4 SUBMITTALS

A. Manufacturer’s published data sheets including thermal conductivity, permeability, percent solids, grout weight, linear shrinkage potential, maximum particle size and unit yield along with verification of the required listing.

1.5 QUALITY ASSURANCE

A. Grouting compound shall be certified and listed by National Sanitation Foundation International to ANSI/NSF Standard 60, “Drinking Water Treatment Chemicals - Health Effects”.

PART 2 - PRODUCTS

2.1 MANUFACTURER/PRODUCT

A. Grout Products:

1. Aquagard
2. Aquagrout

3. Black Hills Grout
4. Enviroplug
5. Groutwell
6. Puregold
7. Quick Grout
8. Volclay Grout

B. Grouting: Materials to be utilized by the Contractor shall be a minimum of 20% high sodium solids bentonite grout. The bentonite will be a slurry that will be tremie grouted from the bottom of the boring to the surface in accordance with the IGSHPA installation manual. The mechanical contractor will work quickly to assure that there are no air voids forming as a result of the bentonite placing.

C. Grouting material shall be Black Hills Bentonite's Thermal Grout Select as supplied by GeoPro, Inc. or equivalent which is pre-approved by the Owner or Owner's representative.

2.2 THERMAL CONDUCTIVITY

A. The thermal conductivity of the grouting compound must be 1.0 Btu/hr-ft-F or greater.

2.3 PERMEABILITY

A. The grout mixture shall also have a maximum permeability rate of less than 6.9 x 10 -8 cm/s as determined by using the "Falling-Head Method" (defined in the United States Army Corps of Engineers' Civil Engineering Manual No. EM 1110-2-1906, "Laboratory Soils Testing" as recommended by the U.S. Environmental Protection Agency to insure proper sealing. Permeability shall be verified by an independent testing laboratory with a copy of the report being supplied upon request from the Owner or Owner's representative.

2.4 TOTAL SOLIDS AND ENHANCEMENT COMPOUND PERCENTAGE

A. The thermally-enhanced bentonite grout used shall have a minimum manufacturer's recommended mixture of 63.5% solids. The thermal enhancement compound (high-grade silica compound) shall constitute a minimum of 50% by weight of the aqueous slurry.

2.5 PACKAGING

A. Grouting materials shall be pre-manufactured and packaged prior to delivery to the job site.

PART 3 - EXECUTION

3.1 MIXING

A. Thermally-enhanced bentonite grouting material shall be mixed according to manufacturers' written instructions.

B. Mechanical Contractor shall monitor the grouting operation to ensure grout is properly mixed and the viscosity is adequately maintained for pumping.

C. Grout shall be mixed by a paddle type mixing device or by manufactured portable grouting unit specifically designed for the vertical ground heat exchanger industry. Jet mixing and recirculation are not allowed for grout.

3.2 INSTALLATION

A. Grout material shall be pressure pumped through a 1", 1-1/4" or 1-1/2" innside diameter tremie pipe and placed in the bore column from the bottom to the top. Grouting process shall conform to the manufacturer's instructions. Completed grouted surface shall be placed at ground level to ensure complete fill of the bore column.

B. Mechanical Contractor shall maintain a ready supply of spare grout pipes, hoses and fittings on the site.

C. A positive displacement pump shall be used for placing the grout in the borehole. Minimum pump suction and discharge lines shall be 3" and 1-1/2" respectively.

D. Drilling fluids shall be confined to the site and disposed of in accordance with prevailing local environmental regulations.

3.3 INSPECTION

A. Since some settling may occur after initial placement of the grout material, the Mechanical Contractor shall monitor each borehole and continue adding grout as required for a period of no less than 30 minutes and no longer than 2 hours.

B. Grouting manufacturer shall provide testing of site mixed grouting material to verify thermal conductivity. Manufacturer shall provide a minimum of 3 sample analyses for each project.

C. At a minimum, sampling shall be taken at the beginning of the project, at approximately one-third completion, and at approximately two-thirds completion. In the event that the analysis indicates a thermal conductivity value below the minimum specified value, corrective action shall be taken to increase thermal conductivity value back.

END OF SECTION 232113.34

SECTION 23 21 14 - GROUND-LOOP HEAT-PUMP PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes piping for vertical, direct-buried, ground-loop, heat-pump systems that operate between 23 and 104 deg F.

1.3 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure, unless otherwise indicated:

1. Ground-Loop, Heat-Pump Piping: 160 psig.

1.4 ACTION SUBMITTALS

A. Product Data: For the following:

1. Pipe and fittings.
2. Joining method and equipment.
3. Propylene glycol solution.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control test reports.

1.6 QUALITY CONTROL

A. Geothermal Piping Installer Qualifications: The persons performing geothermal work shall be personally certified in polyethylene pipe fusion techniques by IGSHPA or piping manufacturer, personally experienced in doing work of this nature, and shall have been regularly employed by a company performing geothermal work for a minimum of five (5) years. Contractor shall be able to furnish proof of certification for field personnel installing the piping, which shall be submitted with materials submittals.

B. Geothermal Piping Supervisor’s Qualifications: The supervisor overseeing the geothermal piping work shall be personally certified in polyethylene pipe fusion techniques by IGSHPA or

piping manufacturer, personally experienced in geothermal piping work of this nature, and shall have been regularly employed by a company performing work of this nature for a minimum of ten (10) years. Contractor shall be able to furnish proof of certification, which shall be submitted with materials submittals.

C. Factory Testing: Perform routine factory testing of factory fabricated equipment and materials in accordance with the agencies having jurisdiction.

D. Field Testing: Perform field testing of piping systems in accordance with the local authorities having jurisdiction.

1.7 WARRANTY

A. The piping manufacturer shall warrant against defects of material and workmanship for a period of fifty (50) years after the date of final acceptance by the owner for all direct-buried HDPE piping installed under the project scope.

1. Minimum fifty (50) year warranty of all piping, joints, and fittings. Warranty shall include all material and labor to replace defective portions of the system.
2. Manufacturer shall replace, at no cost to the owner, and defective piping or fitting materials, including all labor to install, within the specified warranty period.

PART 2 - PRODUCTS

2.1 PIPING

A. Ground loop heat exchange pipe shall be high-density crosslinked polyethylene manufactured using the high-pressure peroxide method of crosslinking (PEXa). Pipe shall conform to (a) ASTM F876 and (b) CSA B137.5 and (c) CSA C448 or (d) ISO 15875-1:2003, 15875-2:2003 or (e) DIN 16892 and 16893.

B. Pipe shall be rated for continuous operation of 100 psi gauge pressure at 180°F temperature, and 160 psi gauge pressure at 73.4°F temperature.

C. Horizontal Heat Exchanger:

1. The minimum bend radius for cold bending of the pipe shall be no less than five (5) times the outside diameter. Bends tighter than this minimum shall require the use of a bending template, as supplied by the pipe manufacturer, and hot air.

D. Vertical Borehole Heat Exchanger:

1. The vertical borehole heat exchanger tip shall be manufactured of one continuous pipe, with no joints in the borehole or shall be manufactured from coated stainless steel components manufactured to the ASTM F2080 standard.
2. The vertical borehole heat exchanger shall be a double U-bend system, consisting of 2 single U-bend pipes attached together.

3. The vertical borehole heat exchanger tip shall be covered in a GRP resin or a rubber coating.

2.2 FITTINGS

A. All buried fitting shall be of permanent design.

B. Cold-expansion compression-sleeve fittings shall conform and be third-party certified to ASTM F2080, and CSA B137.5.

C. Cold-expansion compression-sleeve fittings shall be manufactured of brass or stainless steel and shall be supplied by the piping manufacturer as part of a proven cataloged system.

D. All electrofusion fittings intended for ground loop heat exchange applications shall conform to ASTM F1055 or EN 1555-3.

2.3 MANIFOLDS

A. Material: Distribution manifolds shall be manufactured of brass or polypropylene and be supplied by the piping manufacturer as a part of a proven cataloged system.

B. Brass manifolds shall be produced from extruded brass round pipe with tapped holes for connections, and be pre-assembled by the manufacturer. 100% of manifolds used shall have been air tested by the manufacturer with no indication of leaks.

C. Polypropylene manifolds shall be produced from extruded polypropylene SDR 11 pipe containing a fiber layer to restrict thermal expansion. Holes shall be tapped for connections. Outlet ports shall be fusion welded onto the body of the manifold, with integrated fittings for connection to the borehole field. Fusion welding shall be done in a factory setting to ensure quality of the manifold. Manifold shall be supplied by the manufacturer with all components pressure tested and with no indication of leaks.

D. Balancing Manifolds:

1. Where required by design, manifolds shall be equipped with supply and return manifold isolation valves, integral thermometer and manometer housings, and air vent/fill ports.
2. Where required by design, each circuit shall be supplied with circuit isolation valves, integral visual flow gauges and brass cold expansion compression-sleeve fittings to connect to IGSHPA-approved PEXa pipe.

2.4 BOREHOLE BACKFILL

A. Bore Seal from bottom to Surface: Bentonite with thermal conductivity greater than 1.0 Btu/h x sq. ft. x deg F.

2.5 ANTIFREEZE SOLUTION

A. Propylene Glycol: Minimum 6 percent propylene glycol with corrosion inhibitors and environmental stabilizer additives to be mixed with water to protect the piping circuit and connected equipment from physical damage from freezing or corrosion.

B. Quantity: Sufficient solution for initial system startup and for preventive maintenance for one year from date of Substantial Completion.

C. Dilution Water: Chloride content shall be less than 25 ppm, sulfate less than 25 ppm, and hardness less than 100 ppm.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavating, trenching, warning tape, and backfilling are specified in Section 312000 "Earth Moving."

3.2 ACCEPTABLE INSTALLERS

A. Installation shall be performed by qualified laborers trained in the procedures of ground loop heat exchange systems and have IGSHPA certification.

3.3 PREPARATION

A. Coordinate with related trades and manufacturer’s recommendations with regard to installation in conjunction with:

1. Drilling
2. Excavation
3. Pipe Fusion
4. Heat Pump Location

3.4 HORIZONTAL PIPING INSTALLATION

A. Separate trenches by 10 feet minimum, unless otherwise indicated. Remove rocks in trenches that could contact pipe.

B. Backfill to 24 inches above pipe with mud developed from excavated rock-free soil or with sand, pea gravel, or fly ash. Backfill from slurry level to grade with excavated soil, compacting as specified for pipe burial in Section 312000 "Earth Moving."

C. Extend pipe from trench onto the bottom of the body of water at an elevation that is at least 12 inches below frost line. Seal membrane or impervious liner under the body of water after installing piping.

D. Install PEXa piping in trenches according to ASTM D 2774 or ASTM F 645.

1. Clean PEXa pipe and fittings and make heat-fusion joints according to ASTM D 2657. Minimize number of joints.

E. Purge, flush, and pressure test piping before backfilling trenches.

F. Install continuous detectable warning tape for underground piping. Locate tape a minimum of 24 inches below finished grade, directly over piping. Underground warning tapes are specified in Section 312000 "Earth Moving."

3.5 VERTICAL PIPING INSTALLATION

A. Install PEXa piping in boreholes according to ASTM D 2774 or ASTM F 645.

1. Clean PEXa pipe and fittings and make heat-fusion joints according to ASTM F1055 or EN 1555-3. Minimize number of joints.

B. Purge, flush, and pressure test piping before backfilling boreholes.

C. After installation of loop pipe in borehole, fill piping loop with water or antifreeze solution, and pump backfill into borehole to discharge at base of borehole.

D. Fill borehole with backfill to a point at least 60 inches below grade and backfill remainder with surface seal material.

E. Extend piping and connect to water-source, ground-loop, heat-pump piping systems at outside face of building wall in locations and pipe sizes indicated.

1. Terminate water-service piping at building wall until building water-source, ground-loop, heat-pump piping systems are installed. Terminate piping with caps. Make connections to building water-source, ground-loop, heat-pump piping systems when those systems are installed.

F. Wall sleeves are specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."

G. Mechanical sleeve seals are specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."

3.6 ANTIFREEZE SOLUTION FILL

A. Fill system with required quantity of propylene glycol and water to provide minus 10 deg F freezing temperature.

B. Test the dilute solution using gas chromatography to verity concentration of propylene glycol, and forward report to Architect.

3.7 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

3.8 GENERAL INSTALLATION

A. Install in accordance with manufacturer's published installation manual and/or published guidelines and final shop drawings.

B. Mount manifolds in the locations previously prepared or in previously installed cabinets, if used. Manifolds shall be mounted as level as possible, with the venting device on the uppermost section.

C. Route piping in an orderly manner, according to layout and spacing shown in final shop drawings.

D. At connections and fittings, use a plastic pipe cutter to ensure square and clean cuts, and join pipes immediately or cap ends of pipe to seal from contaminants. Where compression-sleeve fittings are installed within the ground, they shall be wrapped in a heat-shrink material approved by the manufacturer.

E. Piping that shall pass through expansion joints shall be covered in protective polyethylene convoluted sleeving (flexible conduit) extending 15 inches on each side of the joint. Sleeving shall be secured on pipe to prevent movement during installation of thermal mass.

F. Where piping exits the thermal mass, a protective conduit shall be placed around the pipe, with the conduit extending a minimum of 6 inches into the floor and exiting by a minimum of 6 inches. For penetrations at manifolds, use rigid PVC bend guides secured in place to prevent movement.

G. At the time of installation of each circuit of pipe, connect the pipe to the correct manifold outlet and record pipe length for balancing. If manifold is not installed, cap the end of the pipe and label the pipe's circuit numbers along with S for supply and R for return. Connect pipes to manifold as soon as possible and record circuit lengths. Circuits shall be labeled to indicate circuit length and serviced area.

3.9 FIELD QUALITY CONTROL

A. Piping Tests: Fill piping 24 hours before testing and apply test pressure to stabilize piping. Use potable water only.

B. Hydrostatic Tests: Test at not less than 1-1/2 times the pipe working-pressure rating allowing for static pressure of borehole depth.

1. Increase pressure in 50-psig increments and inspect each joint between increments. Hold at test pressure for 30 minutes. Slowly increase to next test pressure increment and hold for 30 minutes. After testing at maximum test pressure, reduce pressure to 30 psig. Hold for 90 minutes, and measure pressure at 30-minute intervals. Repair leaks and retest until no leaks exist.

C. Prepare reports of testing activity.

END OF SECTION 23 21 14

SECTION 26 09 33 - LIGHTING - PRESET AND DIMMING CONTROL EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Integrated, multi-preset, modular dimming controls.
   a. Media Center Lighting
   b. Dining Area Lighting
   c. Collaborative Stair Lighting

2. Multi-zone lighting control/dimming panels.
   a. All individual classrooms
   b. As required for typical office/work spaces that require multi-level dimming

3. Networked lighting control modules/panels
   a. Corridor lighting
   b. Stair lighting
   c. Exterior building mounted lighting
   d. Exterior parking lot/pedestrian lighting

4. Wallstation controls

B. Related Sections include the following:

1. Division 01 Section “Construction Waste Management”

2. Division 01 Section "LEED Requirements" for additional LEED requirements.

3. Division 26 Section “Wiring Devices and Wall Plates” for sensor requirements.

1.3 SUMMARY

A. Furnish and install a complete system for the control of lighting and other equipment as indicated on the plans, detailed in the manufacturer submittal and as further defined herein. Contractor is solely responsible to verify quantity, installation locations and wiring requirements for this project. Specific catalog numbers when listed in this section are for reference only. It is the responsibility of the contractor to verify with the lighting control manufacturer all catalog information and specific product acceptability.

B. System shall include, but not be limited by the following list: Pre-assembled dimming and switching panels with digital switches and digital time clocks, low-voltage wall stations and/or control interfaces, and solid-state high frequency fluorescent dimming ballasts (where applicable), 0-10V LED dimming control. Additional items may also be required and are described herein and/or shown on the drawings.

C. The lighting control system shall communicate via RS485. The system must be able to communicate with fully digital centralized relay panels, zone control panels, digital switches, modular dimming control systems, other various interfaces and shall include all operational software and hardware necessary for a complete system. Software to be resident within the lighting control system. System shall provide local access to all programming functions at the master LCP and remote access to all programming functions via dial-up modem and through any standard computer workstation running and industry standard internet browser. Lighting control system shall have server built into the master LCP that "serves" HTML pages to any authorized workstation. Desktop computers are not part of this section and will be provided by others. Non-networked, non-digital, non-server capable systems are not acceptable.

D. System software shall provide real time status of each relay, zone or group.

E. The lighting control system shall be able to be monitored by and take commands from a remote PC. At any time, should the remote PC go off-line, all systems programming uploaded to the lighting control system shall continue to operate as intended. System requiring an on-line PC or server for normal operation are not acceptable.

F. All programs, schedules, time of day, etc., shall be held in non-volatile memory for a minimum of 10 years at power failure. At restoration of power, lighting control system shall implement programs required by current time and date.

G. Extent of each type of preset lighting control system is indicated on drawings and by provisions of this section.

H. Work under this section consists of the furnishing of all labor, materials, equipment and services necessary for, and incidental to, the complete and proper installation of preset lighting control systems and related work as shown on the drawings or specified herein, and in accordance with all applicable requirements of the Contract Documents.

I. The material and installation shall conform to the applicable building code requirements of all authorities having jurisdiction.

1.4 QUALITY ASSURANCE

A. Materials and equipment shall conform to all applicable codes, the requirements of authorities having jurisdiction and the latest edition of reference standards published by the organizations listed in Section 260500 applicable to the work of this section.

B. Reference Standards

1. The reference standards applicable to work of this section shall include, but not be limited to, the following:
   a. UL 486A
   b. Wire Connectors and Soldering Lugs for use with Copper Conductors.
   c. ANSI.
   d. IEEE.
   e. NEMA 250
   f. Enclosures for Electrical Equipment (1000 Volts Maximum).
   g. NFPA 70.

C. Manufacturer's Qualifications

D. The Manufacturer shall be a firm regularly engaged in the manufacture of preset lighting control systems whose products have been in satisfactory use in similar application for a period of not less than 5 years.

1.5 SUBMITTALS

A. General:

1. Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.

   Product Data:

B. Include dimensions and data on features, components, and ratings for dimming controls. Include elevation views of front panels of control and indicating devices and control stations. Also include the following:

C. List of ballasts and lamp combinations compatible with dimmer controls, by Manufacturer and catalog number.

D. Sound data, including results of operational tests of dimming controls.

E. Operational documentation for software and firmware.

1. Shop Drawings

2. Including equipment layouts, detailed point-to-point wiring diagrams, and sequence of operations.

3. Dimming load schedule indicating a clear understanding of the actual loads per circuit, which circuits are on their respective control zones, which circuits are on emergency (if applicable), and the corresponding circuit numbers (per the electrical drawings).

4. Interconnection diagram

5. Showing a detail of each control, which zones are on that control, the interconnecting wiring between controls and dimming panel(s), and the dimming panel(s). Provide one diagram per each dimming panel location. Block diagrams involving cross-referencing to catalog spec/app sheets will not be acceptable.

6. Detailed factory and field-test procedures.

7. Manufacturer's certifications and warranties.

8. Operation and Maintenance Manuals

9. Including all customized submittal data above, warranties, troubleshooting guides, spare parts list, name and telephone number of local authorized service representative.

F. Submittals shall be clearly marked to demonstrate compliance with all requirements of the Contract Documents. Any deviations from Contract requirements shall be prominently identified and explained.

G. Submittals shall clearly differentiate between factory and field installed work.

H. Manufacturer shall have their quality system registered to the ISO 9001 Quality Standard, including in-house engineering for all product design activities. Due to the exclusion of the Design Control element, ISO 9002 Registration is not acceptable.

I. Lighting control system shall meet IEC801-2, tested to withstand a l5kV electrostatic discharge without damage or loss of memory.

J. LEED Submittal:

1. Product Data for Credit MR 4.1 and Credit MR 4.2: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
   a. Include statement indicating costs for each product having recycled content.

2. Product Data for Credit MR 5.1 and Credit MR 5.2: For products regionally manufactured materials and regionally extracted and manufactured materials.
   a. Identify each regionally manufactured material, including its source and cost.
   b. Identify each regionally extracted and manufactured material, including its source and cost.

1.6 COORDINATION

A. Coordinate features of devices specified in this Section with systems and components specified in other Sections to form an integrated system of compatible components. Match components and interconnections for optimum performance of specified functions.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver materials and equipment in Manufacturer's original, unopened protective packaging.

B. Store materials in a clean, dry place and protect from weather, dirt, fumes, water, construction debris, and physical damage.

C. Handle materials carefully to prevent damage to finished surfaces. Maintain protective coverings until installation is complete and remove as part of final cleanup. Touch up damaged finishes to match the original finish.

1.8 WARRANTY

A. Retain this Article if a special warranty is required for dimming control equipment.

1.9 GENERAL WARRANTY

A. Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

1.10 SPECIAL WARRANTY

A. Written warranty, executed by Manufacturer agreeing to repair or replace components of dimming controls that fail in materials or workmanship within specified warranty period.

B. Manufacturer shall provide a full 2 year warranty on all equipment supplied inclusive of commissioning by a factory-employed engineer. Warranty shall cover 100 percent of the cost to repair or replace any parts required over the first 2 years, which are directly attributable to the Manufacturer.

1.11 COMMISSIONING

A. The Contractor shall provide the Manufacturer and Engineer with 10 working days notice of the scheduled commissioning date.

B. Upon completion of the installation, the system shall be completely commissioned by a factory-employed engineer. The check-out will be performed after all loads have been tested live for continuity and freedom from defects and that all control wiring has been connected and checked for proper continuity. The factory-employed engineer shall demonstrate and educate the Owner's representative(s) on the system capabilities, operation, and maintenance.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with the requirements of the Contract Documents, provide products by one of the following Manufacturer(s):

1. Lutron Electronics Co., Inc.
   a. Multizone relay-based room controllers: QSN-4T16-S(0-10V).
   b. Modular dimming control systems: GrafikEye 4000 series, GP dimming panels.
   c. Network/lighting control panels:
      1) Quantum light management hub(s) QP2/QP3
      2) XP/LP switching/dimming panels
   d. Wallstation controls: seeTouch QS keypads.
   e. All other modules/interfaces required for a complete and operable system
   f. Software: Qadmin.

2. Acuity Brands (LC&D)

3. Cooper Controls (Eaton)

4. Pre-approved equal.

B. Manufacturers' component numbers utilized in this specification are based on the products of Lutron Electronics Co., Inc. and are intended to establish standards of quality and performance characteristics only.

2.2 MATERIALS

A. Dimming Cabinets:

1. Cabinets shall be wall mounted NEMA-1 grade, constructed of sheet steel plates not less than Number 14 U.S. gauge. Contractor shall reinforce wall as required for wall-mounted panels.

2. Panel shall be completely pre-assembled and factory tested by the Manufacturer. The Contractor shall be required to provide input feed wiring, load wiring, and control wiring. No other wiring or assembly by the Contractor shall be permitted. All input feed, load, and control terminals shall be front accessible without the need to remove dimmer assemblies or other components.

3. Cabinets shall contain input and output circuit breakers to provide primary line side protection and outgoing branch circuit protection for each dimming module. Circuit breakers shall be designed to trip within 9 msec after a 400A surge. Circuit breakers shall contain a visual trip indicator and shall be rated at 10,000 AIC (120V) or 14,000 AIC (277V).

4. Cabinets shall contain current carrying terminals with factory-installed brass or copper jumpers. These jumpers will enable power to completely bypass the dimmer modules for temporary power during installation and any future service work. Bypass jumpers shall be clearly and permanently labeled and shall be re-usable at any time. Low voltage control signal methods of bypass shall not be acceptable. Alternatively, the Contractor may provide a switch panel with a specification grade SPST switch wired in parallel with each dimming module. Provide one switch per module with a capacity equal to the input breaker rating of the dimmer module. Engrave each switch faceplate with the dimming module number, NORMAL in the switch open position, and BYPASS in the switch closed position. Provide details of this switching panel with the dimming system submittals.

5. Cabinets shall be cooled exclusively by means of free convection, unaided by fans, in an ambient temperature range of 0 degrees C (32 degrees Fahrenheit) to 40 degrees Celsius (104 degrees Fahrenheit). To provide the utmost in reliability, cabinets that normally use cooling fans must have their capacity de-rated accordingly and as such may require either larger panels or a greater number of panels than shown on the drawings. Any additional labor and material costs required as a result of the need for additional panels shall be included in the Electrical Contractor’s bid.

6. Panels shall be passively cooled via free-convection, unaided by fans. Fan-dependent or fan-assisted systems, or those that recommend regularly scheduled maintenance for air filtration components are not acceptable.

7. Panels requiring the neutral feeder to be sized larger than any individual phase feeder shall not be acceptable.

8. Activation of a circuit protection device shall affect only the single dimmer it is wired to protect.

9. Panel shall provide capability to electronically assign each circuit to any zone in the dimming system. Panels using mechanical switches, rewiring, or EPROMS shall not be acceptable. All circuits shall be capable of being operated (dimmed or switched where appropriate) from the panel.

10. Where indicated on the drawings, dimming and switching panel(s) shall be capable of operating under 2 optically isolated control systems. Panel shall be capable of auto-detecting between Manufacturer's control protocol and DMX512 protocol for each control system. Panel response to control changes shall take no more than 25 milliseconds. Panel shall be capable of assigning each dimmer to either control system on a circuit-by-circuit basis. Panel shall also be capable of conditionally changing assignment from one system to the other.

B. Dimming Modules:

1. Silicon thyristors shall be used to control the power furnished to the loads. The complete load current shall be carried by these devices. They shall be capable of withstanding surges, without impairment to performance, of 6000V/3000A as specified in IEEE std. 587-1980. In addition, under fully loaded operating conditions, all devices shall operate at a minimum 20 degrees Celsius safety margin below the component temperature rating.

2. A positive air gap relay shall be employed with each dimmer to ensure that the load circuits are open when the "off" function is selected at a control station. Use of semi-conductors to accomplish this result shall not be acceptable. These relays need not be integral to the dimming module, but must be integral to the dimming cabinet. Dimming Manufacturer shall provide and warrant both the relays and the necessary control interface(s) as part of the dimming system.

C. System Power-Failure Memory Feature:

1. Retain programming for a minimum of 90 days after power failure. When power is restored, return intensities of dimmed lights for each scene to levels set before failure.

2. Each dimmer shall incorporate an electronic "soft-start" default at initial turn-on that smoothly ramps the lights up to the appropriate levels within 0.5 seconds.

3. All dimming modules shall be voltage regulated so that plus or minus 10 percent change in line voltage shall cause no more than plus or minus 3 percent change in output voltage.

4. All dimming modules shall provide a smooth and continuous Square Law dimming curve throughout the entire dimming range.

5. All dimmers designed for use with inductive loads shall include the following additional features:

6. The maximum allowable asymmetry in the load waveform shall be plus or minus 1 VDC.

7. The dimmer shall incorporate circuitry to prevent the lights from momentarily "flashing" when the dimmer is turned on or off.

8. Quantities and sizes of each dimming module shall be provided to control each type of load shown on the load schedule and/or the drawings.

D. Low Voltage – Electronic Transformer:

1. Dimming performance shall not adversely affect sound rating of electronic transformers. In addition, no flicker or interaction shall occur at any point in the dimming range.

2. Modules shall provide a dimming range from 100-0 percent (blackout). Minimum light levels shall be user adjustable in order to compensate for different loading of each dimmer module.

E. Fluorescent (Hi-Lume) Solid-State Dimming Ballast

1. Fluorescent modules shall be rated to control 430 MA rapid start (3 feet, 4 feet), 800 MA high output (3 feet, 4 feet, 8 feet), or 265 MA T-8 (3-, 4-, 5-foot) lamps at 120V or 277V AC. All lamps on the same circuit must have the same current rating (i.e. 800 MA), but may be different lengths. Ballasts for fluorescent fixtures required to be dimmed must be Lutron Hi-Lume "OSPCU" series. See fixture schedule in specification section 16510. The dimming performance shall be as follows:

2. Dimming range from 100-1 percent light output.

3. 1- and 2-lamp ballasts shall track evenly, with no perceptible difference in light levels for the same type lamps.

4. Different lamp lengths on the same circuit track evenly, with no perceptible difference in light levels for the same type lamps.

5. Ballasts shall be inaudible with no apparent humming or buzzing at any point in the dimming range.

6. No electrical noise shall be generated which could interfere with any other properly installed electrical equipment.

7. Minimum light levels shall be user-adjustable in order to compensate for different loading of each dimmer module. A zero percent control input from any control station shall turn the respective dimmer "off" completely.

F. Non-Dim Relay-Switched Loads:

1. The non-dim relay module shall be rated to switch either tungsten or inductive loads. Relays shall be of the positive air-gap type, and shall be rated to carry at least twice the actual connected load.

2. When used with a preset control system, the modules shall turn off and on positively at the start of the light level transition period.

G. Dimming Control Stations:

1. Control shall be low voltage type as specified here and as listed below and/or shown on the drawings. Controls shall use low voltage Class II wiring, electrically isolated from power wiring by means of a UL listed Class II transformer. A separate set of terminals shall be provided for each control station termination at the dimming panel and/or interface panels.

2. Faceplates shall be machined from a single piece of 1/8 inch thick metal base (minimum). Painted controls shall be painted by Manufacturer to exactly match Architect's sample.

3. Faceplates shall attach to the wall box using no visible means of attachment. To prevent unauthorized faceplate removal, setscrews through the faceplate edge shall securely hold the faceplate to the switchbox. Alternately, control shall be mounted in an enclosure with a locking translucent cover. Paint enclosure per Architect's sample.

4. Controls shall be engraved with appropriate zone and/or scene descriptions, furnished to the Manufacturer prior to fabrication. Size and style of engraving type shall be determined by the Architect. Any silk-screened borders, logos, graduations, etc. shall use a graphic process that chemically bonds the graphics to the metal faceplate, resisting removal by scratching, cleaning, etc.

5. All control stations shall provide power-failure memory. Should power be interrupted to the control station and subsequently returned, the lights will come back on to the same levels set prior to the power interruption. Restoration to some other default level is not acceptable, unless specifically noted elsewhere.

H. Scene based (GrafikEye) Control Systems

1. Each flush-mount unit shall consist of four touch-buttons to provide scene selection, LEDs to indicate lighting levels of each zone, and electronic face between each scene. Fade rate for all zones shall be adjusted from 0 to 60 seconds by one adjustment at the control. The fifth touch-button shall switch off the system. The entire present section shall be concealed behind a smoked translucent flush-mounted window, which shall appear black except for the illuminated potentiometers in the active scene. Unit shall be capable of add-on interface to external equipment, providing electrical isolation, without modification of the back box unit, or mounting of an addition panel.

2. Provide remote preset activator control containing only the same four-scene activating buttons with LEDs and “off” button as specified above, as shown on the drawings.

3. RS232 interface: Provide required modules for interface to A/V system.

I. Controls:

1. Definitions:
   a. A "scene" or "preset" is a specific look or mood created by different lighting zones set at different intensities. A "zone" is one or more lighting circuits, which are controlled together as a group.

2. Control shall provide power failure memory. Should power be interrupted and subsequently returned, the lights will come back on to the same levels set prior to the power interruption without requiring any actions on the part of the user. Restoration to some other default level is not acceptable, unless specifically noted elsewhere.

3. Wiring from dimming and switching panel(s) to preset control unit(s) and wall stations shall be low voltage type Class 2 wiring.

4. Faceplate shall attach using no visible means of attachment.

5. Controls shall be engraved with appropriate zone and/or scene descriptions, furnished to the Manufacturer prior to fabrication. Size and style of engraving type shall be determined by the Architect. Any silk-screened borders, logos, graduations, etc., shall use a graphic process that chemically bonds the graphics to the metal faceplate, resisting removal by scratching, cleaning, etc.

6. Manufacturer shall ensure the following items regarding product color:
   a. Product color matches NEMA standard WDI, Section 2, and the maximum color deviation from this standard shall not exceed Δ E=1, CIE L*a*b color space units. For non-NEMA colors, color match coordination shall be provided on request.
   b. Color variation of any control in the same product family shall not exceed Δ E=1, CIE L*a*b color units.
   c. Visible parts shall exhibit ultraviolet color stability when tested with multiple actinic light sources as defined in ASTM D4674-89. Manufacturer to submit proof of testing upon request.

7. Controls shall provide an immediate, local LED response upon button activation to indicate that a system command action has been requested. LED will remain lit contingent upon receiving system confirmation of the successful completion of the command.

J. Preset Control Stations:

1. Control shall mount individually in standard 2-, 3-, or 4-gang U.S. wall boxes.

2. Control shall provide 4 preset lighting scenes and “off” for up to 24 control zones. Control shall be capable of storing an additional 12 preset lighting scenes, which can be accessed via wall stations and/or control interfaces. Up to 64 zones may be tied together in one system. Preset shall be set via easy-to-use raise/lower switches, one raise and lower switch per zone. The intensity for each zone shall be indicated via an illuminated bar graph, one bar graph per zone. More than one zone may be proportionately raised or lowered at the same time. Programming of preset scenes shall be accomplished without the use of an 'enter' or 'store' button. Additionally, one or more zones may be temporarily overridden without altering the scene values that are stored in memory.

3. Lighting levels shall fade smoothly between scenes at time intervals of 0-59 seconds or 1-60 minutes. The fade time shall be separately selectable for each scene and shall be indicated by a digital display for the current scene. Pressing a scene select button will illuminate the corresponding scene LED and simultaneously begin changing the bar graph levels to reflect the currently selected scene. In the event that a preset scene with a fade time greater than 5 seconds is initially selected from an “off” condition, the programmed fade time shall be temporarily overridden, unless otherwise noted, and the lights shall fade up to that scene over a 5-second time span.

4. Control shall provide tamperproof protection of scenes using a minimum of 4 levels of electronic “lockout” which prevent alterations of scene values stored in memory. Highest level of “lockout” shall be capable of disabling manual control at the preset control unit.

5. Where indicated, control shall be capable of complete setup of all parameters locally, or when used with the appropriate programmer interface, via an IBM-compatible PC. Parameters shall include scenes (including both light levels in 1 percent increments and fade times), load types, low-end trim, tamperproof protection of scenes, and communication between control units (if applicable). Permanent installation of the PC shall not be required unless indicated on the drawings.

6. Scene Selection Control(s):

7. Four Scene Selection Control(s):
   a. Control shall be capable of recalling preset light levels for four scenes, each providing green LED status feedback. Control shall be capable of recalling one of four different banks of scenes, which can be configured in the field through DIP switches.

K. Multi-zone lighting control/dimming panels.

1. Provide lighting control modules as indicated or as required to control the loads as indicated.

2. General Requirements.
   a. Listed to UL 508 as industrial control equipment.
   b. Delivered and installed as a listed factory-assembled panel.
   c. Passively cooled via free-convection, unaided by fans or other means.
   d. Mounting: Surface.
   e. Connection without interface to wired:
      1) Occupancy sensors.
      2) Daylight sensors
   f. LED status indicators confirm communication with occupancy sensors, daylight sensors, and IR receivers.
   g. Contact Closure Input
      1) Directly accept contact closure input from a dry contact closure or sold-state output without interface to:
      2) Activate scenes.
         a) Scene activation from momentary or maintained closure.
      3) Enable or disable after hours.
         a) Automatic sweep to user-specified level after user-specified time has elapsed.
         b) System will provide occupants a visual warning prior to sweeping lights to user-specified level
         c) Occupant can reset timeout by interacting with the lighting system.
      4) Activate or deactivate demand response (load shed).
         a) Load shed event will reduce lighting load by user-specified amount.
   h. Emergency Contact Closure Input:
      1) Turn all zones to full output during emergency state via direct contact closure input from UL 924 listed emergency lighting interface, security.
   i. Supplies power for control link for keypads and control interfaces.
   j. Distributes sensor data among multiple lighting control modules.
   k. Capable of being controlled via wireless sensors and controls.

3. 0-10V Lighting Control Modules.
   a. Coordination Between Low Voltage Dimming Module and Line Voltage Relay: Capable of being electronically linked to single zone.
   b. Single low voltage dimming module; capable of controlling following light sources
      1) 0-10V analog voltage signal.
         a) Provide Class 2 isolated 0-10 V output signal conforming to IEC 60929.
         b) Sink current per IEC 60929.
   c. Switching:
      1) Rated Life of Relay: Typical of 1,000,000 cycles at fully rated 16 A for all lighting loads.
      2) Load switched in manner that prevents arcing at mechanical contacts when power is applied to and removed from load circuits.
      3) Fully rated output continuous duty for inductive, capacitive, and resistive loads.
      4) Module to integrate up to four individually controlled zone
      5) Utilize air gap off, activated when user selects "off" at any control to disconnect the load from line supply.

L. Wallstations

1. Provide control stations with configuration as indicated or as required to control the loads as indicated.

2. Wired Control Stations:
   a. General Requirements:
      1) Power: Class 2 (low voltage).
      2) UL listed.
      3) Provide faceplates with concealed mounting hardware. Borders, logos, and graduations to use laser engraving or silk-screened graphic process that chemically bonds graphics to faceplate, resistant to removal by scratching and cleaning.

3. Multi-Scene Wired Control:
   a. General Requirements:
      1) Communications: Utilize RS485 wiring for low-voltage communication.
      2) Engrave keypads with button, zone, and scene descriptions. Provide sample engraving in shop drawing submission.

4. Software Configuration:
   a. Customizable control station device button functionality:
      1) Buttons can be programmed to perform single defined action.
      2) Buttons can be programmed to perform defined action on press and defined action on release.
      3) Buttons can be programmed using conditional logic off of a state variable such as time of day or partition status.
      4) Buttons can be programmed to perform automatic sequence of defined actions.
      5) Capable of deactivating select keypads to prevent accidental changes to light levels.
      6) Buttons can be programmed for raise/lower of defined loads.
      7) Buttons can be programmed to toggle defined set of loads on/off.

5. Status LEDs:
   a. Upon button press, LEDs to immediately illuminate.
   b. LEDs to reflect the true system status. LEDs to remain illuminated if the button press was properly processed or LEDs to turn off if the button press was not processed.
   c. Support logic that defines when LED is illuminated:
      1) Scene logic (logic is true when all zones are at defined levels).
      2) Room logic (logic is true when at least one zone is on).
      3) Pathway logic (logic is true when at least one zone is on).
      4) Last scene (logic is true when spaces are in defined scenes).

M. LIGHTING CONTROL PANELS

1. Relay Performance Requirements
   a. A component operated at 10°C above the rated temperature will have 1/2 the life expectancy. A component operated at 20°C above the rated temperature will have 1/4 the life expectancy.

b. Electrolytic capacitors to operate at least 20°C below the component manufacturer's maximum temperature rating when device is under fully-loaded conditions in 40°C (104°F) ambient temperature.

c. Capable of withstanding repetitive inrush current of 50 times operating current without impacting lifetime of dimmer/relay.

d. Design and test relays to withstand line-side surges without impairment to performance.

1) Panels: Withstand surges without impairment of performance when subjected to surges of 6,000 volts, 3,000 amps per ANSI/IEEE C62.41B.

e. Utilize air gap off, activated when user selects “off” at any control to disconnect the load from line supply.

f. Possess power failure memory such that if power is interrupted and subsequently returned, lights will automatically return to same levels (on or off) prior to power interruption within 3 seconds.

g. Non-dim circuits to meet the following requirements:

1) Rated life of relay: Minimum 1,000,000 cycles.
2) Load switched in manner that prevents arcing at mechanical contacts when power is applied to load circuits.
3) Fully rated output continuous duty for inductive, capacitive and resistive loads.

h. UL Listed 30 Amp, Latching, 18,000 SCCR, 277VAC Ballast and HID and 20 Amp Tungsten at 120 Vac.

i. Relays shall be individually replaceable. Relay terminal blocks shall be capable of accepting 2 #8AWG wires on both the line and the load side. Systems that do not allow for individual relay replacement or additions are not acceptable.

j. Relays to be rated for 250,000 operations minimum at a full 30a lighting load, default to closed at normal power loss, Normally Closed Latching (NCL). All incandescent circuits shall be energized by use of a Normally Closed SoftStart™ (NCSS) relay rated at 100,000 operations at full 20a load. No exceptions.

k. Optional relay types available shall include: Normally Open Latching (NOL) relay rated for 250,000 operations, a 600v 2-pole NO and NC and a Single Pole, Double Throw (SPDT) relay.

l. A component operated at 10°C above the rated temperature will have 1/2 the life expectancy. A component operated at 20°C above the rated temperature will have 1/4 the life expectancy.

2. Electrolytic capacitors to operate at least 20°C below the component manufacturer's maximum temperature rating when device is under fully-loaded conditions in 40°C (104°F) ambient temperature.

3. Load Handling Thyristors (SCRs and triacs), Field Effect Transistors (FETs), and Isolated Gate Bipolar Transistors (IGBTs): The component’s maximum current rating to be at least 2 times the dimmer’s/relay’s rated operating current.

4. Capable of withstanding repetitive inrush current of 50 times operating current without impacting lifetime of dimmer/relay.

5. Design and test dimmers/relays to withstand line-side surges without impairment to performance.
   a. Panels: Withstand surges without impairment of performance when subjected to surges of 6,000 volts, 3,000 amps per ANSI/IEEE C62.41 and per IEC 61000-4-5 surge requirements.
   b. Other power handling devices: Withstand surges without impairment of performance when subjected to surges of 6,000 volts, 200 amps per ANSI/IEEE C62.41.

6. Utilize air gap off to disconnect the load from line supply.

7. Designed and tested to withstand discharges without impairment of performance when subjected to discharges of 15,000 volts per IEC 801-2.

8. Mechanical:
   a. Listed to UL 508 (United States) as industrial control equipment, approved as applicable.
   b. Delivered and installed as a UL listed factory assembled panel.
   c. Field wiring accessible from front of panel without need to remove dimmer assemblies or other components.
   d. Panels passively cooled via free-convection, unaided by fans or other means.
   e. Ship panels with each dimmer in mechanical bypass position by means of jumper bar inserted between input and load terminals. Jumpers to carry full rated load current and be reusable at any time. Mechanical bypass device to allow for switching operation of connected load with dimmer removed by means of circuit breaker.
   f. NEMA 1 rated enclosure with hinged door.
   g. 16 AWG steel barrier shall separate the high voltage and low voltage compartments of the panel and separate 120v and 277v.
   h. LCP input power shall be capable of accepting 120v or 277v without rewiring

9. LCD Panel Processor
   a. System to be password protected.
   b. Language selection: English.
   c. Integral contact closure inputs.
   d. Programming and system operation:

      1) Control stations, control interfaces and contact closure inputs

         a) Assign functionality of each control station button.

         b) Select patterns.

         c) Select customized pattern.
         d) Enable/Disable time clock.
         e) Initiate delay to off.
         f) Toggle one, some or all zones

      2) RS232 interface or Ethernet interface.
      3) Contact closure output: Momentary or maintained.

e. Time clock

1) Integral astronomical time clock

a) Geographic location (city or latitude/longitude).
b) Adjustable date and time format.
c) Adjustable starting and ending of daylight savings time.
d) Review and modify time clock schedule to add, copy, modify and delete events.

f. Overrides:

1) Set circuit status.
2) Select pattern.
3) Time clock override.
4) Control station overrides.
5) After-hours override.

10. Diagnostics and Service:
    a. Replacing relay does not require re-programming of system or processor.
    b. Relays: Include diagnostic LED's to verify proper operation and assist in system troubleshooting.
    c. Relay panels: Include tiered control scheme for dealing with component failure that minimizes loss of control for occupant.

        1) If lighting control system fails, lights to remain at current level. Panel processor provides local control of lights until system is repaired.
        2) If panel processor fails, lights to remain at current level. Circuit breakers can be used to turn lights off or to full light output, allowing non-dim control of lights until panel processor is repaired.
        3) If relay fails, factory-installed mechanical bypass jumpers to allow each relay to be mechanically bypassed. Mechanical bypass device to allow for switching operation of connected load with relay removed by means of circuit breaker.

11. LCP Manufacturers:
    a. Lutron
    b. Acuity - LC&D
    c. Cooper Controls

PART 3 - EXECUTION

3.1 CONSTRUCTION WASTE MANAGEMENT (LEED)

A. The contractor, subcontractors, and their personnel shall follow the procedures and practices for waste separation, collection and transport as defined in the contractor's "Waste Management Plan" as required by Division 01 Section "Construction Waste Management."

3.2 INSTALLATION

A. Equipment shall be installed utilizing Manufacturer's catalogue cut sheets and installation instructions and in accordance with these specifications.

B. Contractor shall furnish all equipment, labor, system setup, and other services necessary for the proper installation of the products/system as indicated on the drawings and specified herein. System setup shall include defining each dimmer's load type, assigning each load to a zone, and setting the control functions.

C. Install equipment level and plumb and according to Manufacturer's written instructions.

D. Mount control equipment according to Manufacturer's written instructions and requirements in Division 16 Section "Basic Electrical Materials and Methods."

E. Mounting heights indicated are to bottom of unit for suspended items and to center of unit for wall-mounting items.

3.3 CONTROL WIRING INSTALLATION

A. Install wiring as specified in Division 26 Section "Building Wire and Cable" for low-voltage connections.

B. Wiring Method:

1. Install all wiring in raceway as specified in Division 26 Section "Conduit" and “Boxes”, where exposed and subject to damage.

2. Plenum rated cabling may be used where concealed by building construction.

C. Bundle, train, and support wiring in enclosures.

D. Ground equipment.

E. Connections:

1. Tighten electrical connectors and terminals according to Manufacturer's published torque-tightening values. If Manufacturer's torque values are not indicated, use those specified in UL 486A.

3.4 IDENTIFICATION

A. Identify components and power and control wiring according to Division 26 Section "General Requirements for Electrical Work."

B. Identify components and power and control wiring according to Division 26 Section "Electrical Identification."

C. Label each system control module and each remote dimmer bank with a unique designation. Make designations on elevated components readable from floor.

3.5 FIELD QUALITY CONTROL

A. Manufacturer's Field Services:

1. Engage a factory-authorized service representative to test, adjust, and program dimming controls.

B. Schedule visual and mechanical inspections and electrical tests with at least ten business days' advance notice to the Manufacturer and Engineer.

C. The Manufacturer shall inspect control components for defects and physical damage, testing laboratory labeling, and nameplate compliance with the Contract Documents.

D. The Contractor or Manufacturer shall check tightness of electrical connections with torque wrench calibrated within previous six months. Use the Manufacturer's recommended torque values.

E. The Contractor or Manufacturer shall verify settings of photoelectric devices with photometer calibrated within previous six months.

F. Electrical Tests:

1. Use particular caution when testing devices containing solid-state components. Perform the following according to Manufacturer's written instructions:
   a. Continuity tests of circuits.

2. Operational Tests:
   a. Set and operate controls to demonstrate their functions and capabilities in a methodical sequence that cues and reproduces actual operating functions.
   b. Include testing of dimming control equipment under conditions that simulate actual operational conditions. Record control settings, operations, cues, and functional observations.

G. Correct deficiencies, make necessary adjustments, and retest. Verify that specified requirements are met.

H. Test Labeling:

1. After satisfactory completion of tests and inspections, apply a label to tested components indicating test results, date, and responsible agency and representative.

I. Reports:

1. Written reports of tests and observations. Record defective materials and workmanship and unsatisfactory test results. Record repairs and adjustments.

3.6 CLEANING

A. Cleaning:

1. Clean equipment and devices internally and externally using methods and materials recommended by Manufacturers, and repair damaged finishes.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel as specified below:

1. Train Owner's maintenance personnel on troubleshooting, servicing, adjusting, and maintaining equipment and schedules. Provide a minimum of for training. Use both classroom training and hands-on exercises.

2. Training Aid:

Use the approved final version of maintenance manuals as a training aid.

3. Schedule training with Owner, through Architect, with at least 14 days' advance notice.

4. Video Training:
   a. Provide 2 DVD optical storage media copies of an instructional videotape covering features, capabilities, operation, and maintenance of installed lighting control system. Illustrate actual equipment and related functions. Show cause-and-effect sequences during operation. Cross-reference instruction manuals throughout. Follow same order of presentations as instruction manual.

3.8 ON-SITE ASSISTANCE

A. Occupancy Adjustments:

1. Within 1 year of date of Substantial Completion, provide up to 3 project site visits, when requested, to adjust light levels, make preset scene changes, and adjust controls to suit actual conditions.

B. Manufacturer shall provide toll-free technical support hotline 24 hours per day, 7 days per week.

C. Manufacturer shall be capable of providing on-site service support within 24 hours anywhere in the continental U.S.A.

D. Manufacturer shall offer a renewable Service Contract on a year-to-year basis that will include parts and factory labor as well as annual training visits.

END OF SECTION 26 09 33

SECTION 26 51 00 - LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Interior and exterior luminaires and accessories.

2. Ballasts/drivers.

3. Lamps.

4. Poles.

B. Related Sections include the following:

1. Division 01 Section “Construction Waste Management”

2. Division 01 Section "LEED Requirements" for additional LEED requirements.

1.3 DEFINITIONS

A. BF:

1. Ballast factor. Ratio of light output of a given lamp(s) operated by the subject ballast to the light output of the same lamp(s) when operated on an ANSI reference circuit.

B. CRI:

1. Color rendering index. Scale used to measure the effect of a light source on the color appearance of objects in conscious or subconscious comparison with their color appearance under another (reference) light source.

C. CCT:

1. Correlated color temperature. Scale used to measure the color appearance of a light source. The CCT is the absolute temperature of a black body whose chromaticity most nearly resembles that of the light source.

D. CU:

1. Coefficient of utilization. Factor that represents the ratio between the lumens reaching the workplane and the total lamp lumens.

E. LER:

1. Luminaire efficiency rating, which is calculated according to NEMA LE 5. This value can be estimated from photometric data using the following formula:

2. LER is equal to the product of total rated lamp lumens times BF times luminaire efficiency, divided by input watts.

F. RCR:

1. Room cavity ratio. Factor that represents the relationship between the mounting height of a luminaire, area of the room, and proportions of the room, for the space between the luminaire plane and the workplane.

G. Custom Finish:

1. All metal finishes including brass, aluminum, copper, stainless steel, etc., with a surface texture of brushed, polished, satin, etched, or other style. Excludes precious metals such as gold, silver, and platinum unless specifically listed as an option by the specified Manufacturer. This option also allows for a custom-painted color to be selected.

H. Standard Finish:

1. Includes all metal finishes offered by the specified Manufacturer for the specified product.

I. Custom-Painted Color:

1. Any painted color as selected by the Professional. May be provided by paint Manufacturer catalog number or color chip sample. This could include textured or faux finishes if applicable.

J. Optional color:

1. Painted color chosen from the Manufacturer’s standard or optional color list.

K. Standard Color:

1. Painted color chosen from the specified Manufacturer’s standard list.

1.4 SUBMITTALS

A. Submit under provisions of Section 260500.

B. LEED Submittals

1. Product Data for Credit MR 4.1 and Credit MR 4.2: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
   a. Include statement indicating costs for each product having recycled content.

2. Product Data for Credit MR 5.1 and Credit MR 5.2: For products regionally manufactured materials and regionally extracted and manufactured materials.
   a. Identify each regionally manufactured material, including its source and cost.
   b. Identify each regionally extracted and manufactured material, including its source and cost.

3. See Sections 013515 and 013516 for LEED requirements for MR and EQ credits.

4. Lamp information for every fixture type must be submitted in a separate "Lamp Submittal" package and must include mercury content in milligrams and Picograms per lumen hour, initial and maintained lamp lumen values, CRI, CCT, and wattage. Lamps shall be considered non-hazardous waste by passing the EPA's Toxicity Characteristic Leaching Procedure (TCLP) at the end of life.

5. Ballast and driver submittals must clearly state that they do not contain Polychlorinated Biphenyl (PCB).

C. Substitutions

1. Under provisions of Section 260500.

2. The Engineer will review a substitution a maximum of three (3) times. After the substitution has been rejected two (2) times, the Contractor shall supply the product, as specified, in the third submittal.

3. The Contractor must submit any substitution request within 30 days of receiving the Notice to Proceed. Any substitution requests received after this period will be returned as "not reviewed." Substitution requests received within this time frame will be reviewed only for general conformity; approval to bid the substitution in no way waives the requirement for complete submittals after the contract is awarded. The onus remains on the Contractor to provide an equal fixture submittal to the specified product.

4. A substitution request that is submitted in the first 30 days, but returned as "rejected" or "revise and resubmit" must be resubmitted within 30 days of the returned submittal date for reconsideration.

5. No substitution requests will be accepted after the dates listed above. Substitution requests received outside of the listed timeframes will be returned as "not reviewed" and the contractor will be responsible for supplying submittals of the as specified product / basis of design. The Contractor will be fully responsible for any and all additional costs associated with project delays if the specified product is not available to meet the construction schedule.

D. Shop Drawings:

1. Every submittal must include the estimated lead time for delivery indicated on the submittal sheet. Failure to indicate lead time may result in the submittal's rejection.

2. Submittal must provide a physical description of the product, including: an image of the product, dimensions, components, ratings, and performance data for each luminaire. If the finish/color is not indicated on the fixture schedule, a complete finish/color palette shall be submitted.
   a. Performance data shall include photometric data and adjustment factors based on laboratory tests, complying with IESNA Lighting Measurement Testing and Calculation Guides, of each lighting fixture type. The adjustment factors shall be for lamps, ballasts, and accessories identical to those indicated for the lighting fixture as applied in this project.
   b. Testing Agency Certified Data: For indicated fixtures, photometric data shall be verified by a qualified independent testing agency. Photometric data for remaining fixtures may be certified by the Manufacturer's laboratory pending the laboratory carries a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.
   c. All LED fixture submittals must include test data for LM-79 and LM-80. A Lighting Facts label by the US Department of Energy may be submitted in place of the LM-80 test data. TM-21 test data shall be submitted if available.

3. Indicate wattage, bulb shape, voltage, dimensions, base type, burn orientation, CCT, CRI, beam angle, lumen output, efficacy, rated life, and frosting or coating information as applicable for each lamp type.

4. Indicate ANSI type, ballast factor, ballast efficacy factor, input watts, voltage, current, sound rating, and casing for each ballast & LED driver type.
   a. Dimming ballast & LED drivers must also indicate dimming range, starting characteristics, and provide written verification of compatibility with dimming devices and lamps.

5. Show details of nonstandard, modified, or custom fixtures.
   a. Include plans, elevations, sections, details, and attachments.
   b. Detail equipment assemblies, indicate dimensions, weights, loads, required clearances, methods of field assembly, components, features, accessories, installation procedures, relamping methods, and the location and size of field connections.
   c. Wiring diagrams for power, signal, and control wiring must be provided.
   d. Sample materials may be required for final selection and approval.
   e. Photographs of the custom or modified fixture may be required throughout the manufacturing process as a continuous quality assurance procedure.

6. Any submittal that adversely affects the energy efficiency by utilizing an increased power consumption will be rejected unless the submittal includes complete ComCheck verification for the project. The revised ComCheck submission must be approved by the Authority Having Jurisdiction prior to final approval of the substitution. The Contractor may choose to pay the Engineer to verify the product's code compliance through a revision of the project's original ComCheck submission.

7. The Engineer reserves the right to request a sample of any substitution in the submittal package. The sample must be shipped directly to the Engineer's office for review.

E. Manufacturer's Recommendations:

1. Indicate application conditions and limitations of use stipulated by the manufacturer or product testing agency specified under Regulatory Requirements.

F. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation, and installation of product.

G. Samples for Verification:

1. For lighting fixtures designated for sample submission in the Lighting Fixture Schedule or during the submittal review process.

2. Lamps:
   a. Specified units installed.
   b. Ballast/driver:
      1) 120V models of specified ballast/driver types.
   c. Accessories:
      1) Cords and plugs.
      2) All specified accessories and optional features
      3) Pendant or wall mount support system, as applicable.

H. Operation and Maintenance Data Manuals must be provided prior to project closeout including:

1. All data required in the original shop drawing submittal.

2. One copy of the original installation and operation data that was included with the installed fixture, lamp, ballast, driver, transformer, or accessory.

3. Lamp data must include the general ANSI codes for replacement.

1.5 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 260500.

B. Accurately record actual locations of each luminaire and control device.

1.6 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories:

1. Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

C. NFPA Compliance:

1. Fixtures for hazardous locations shall be listed and labeled for indicated class and division of hazard by NFPA.

D. NFPA 101 Compliance:

1. Comply with visibility and luminance requirements for exit signs.

E. Listing and Labeling: Provide fixtures that are listed and labeled for their indicated use on the Project.

1. The terms "Listed" and "Labeled" shall be as defined in the National Electrical Code, Article 100.
2. The Listing and Labeling Agency shall be a "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

1.7 COORDINATION OF TRADES

A. Contractor shall coordinate layout and installation of light fixtures with other construction trades including but not limited to HVAC, plumbing, fire suppression and warning, telecommunications, and security. This coordination shall ensure the ability to install light fixtures with proper mounting and clearances. The Contractor shall bring all conflicts to the Engineer’s attention as soon as possible before installation of either the lighting or the conflicting trade.

1.8 WARRANTY

A. Special Warranty for Emergency Lighting Unit Batteries:

1. Manufacturer’s standard form in which Manufacturer of battery-powered emergency lighting unit agrees to repair or replace components of rechargeable batteries that fail in materials or workmanship within specified warranty period.

2. Warranty Period:
   a. Five (5) years from date of Substantial Completion. Full warranty shall apply for first year, and pro-rated warranty for the remaining four (4) years.

B. LED Fixture Manufacturer’s Warranty

1. Manufacturer shall provide a standard warranty form or other written notification on company letterhead addressed to the project owner agreeing to replace lamps, drivers, and/or fixtures that fail in the following areas within specified warranty period indicated below:
   a. Produce light meeting 70% of the initial rated light out as published on the shop drawing submittal.
   b. Color shift in excess of ±200 Kelvin in a perceptible manner.

2. Warranty Period:
   a. Five (5) years from date of Substantial Completion.

1.9 EXTRA MATERIALS

A. Provide spare quantities for each different type of material as follows:

1. LED lamps/modules/circuit boards:
   a. Ten (10) percent of the total quantity installed, but not less than two (2) of each type. This quantity not to exceed a combined total of 35 LED lamps/modules/circuit boards of each type specified.

2. Glass and plastic globes, lenses, covers, **interchangeable reflectors,** and other optical assemblies:
   a. One (1) of each for every 25 shall be furnished to a maximum of ten (10) extra items of each type.

3. Ballasts, transformers, and LED drivers **and power supplies**:
   a. Five (5) percent of the total quantity installed but not less than one (1) of each type and not more than 15 of each type.

4. For any fixture types that do not have field replaceable components, provide complete fixtures for attic stock; ten (10) percent of the total quantity installed, but not less than two (2) of each type.

B. Deliver replacement stock as directed by Owner to Owner's storage space.

PART 2 - PRODUCTS

2.1 ACCESSORIES

A. Contractor shall provide the Owner with two (2) of each special tool required for replacing lighting fixture or any components, including lamps. The tools shall be new and shall be turned over to the Owner when the project is completed.

2.2 LUMINAIRES

A. Furnish products as specified in schedule.

B. The fixture Manufacturers' catalog numbers scheduled on the drawings in the fixture schedule may not include all the required accessories or hardware that is necessary for a complete installation.

C. Furnish luminaires with all associated appurtenances including, but not necessarily limited to, lamps, ballasts, reflectors, lenses and/or louvers, sockets, holders, suspension accessories,

pendants, canopies, recessing boxes, plaster frames, and similar items completely wired, assembled, installed, and tested as specified and in the manner indicated.

D. All troffer-type lighting fixtures shall be designed to completely eliminate light leakage between the fixture body and doorframe and shall be provided with positive acting, hinge and latch flush doorframes.

E. All recessed lighting fixtures shall be provided with an integral, automatic resetting, thermal cutout.

F. All exterior fixtures shall be weatherproof, gasketed, and shall be installed with non-ferrous metal screws finished to match the fixture.

G. All Alzak-type of reflector cones and louvers used in downlights (or other fixture types where the reflector is visible) shall be specially anodized in order to eliminate iridescence.

H. Every lighting outlet shall have a lighting fixture unless otherwise directed. In instances where a specific type of fixture has not been assigned to an outlet, provide a complete fixture of the type and wattage designated for outlets of similar function and/or as directed by the Architect.

I. All lighting fixtures shall be UL listed or assembled from UL components.

2.3 FIXTURE TYPE IDENTIFICATION

A. Fixture types are indicated on the drawings and reflect the type of mounting, specific type or group of fixture, the total lamp wattage of the fixture.

B. Examples:

1. RA-120, SB-64, TC-50.

2. The first letter indicates the Type of Mounting. R=Recessed; S=Surface; P=Pendant; W=Wall; O=Outside or Exterior; T=Track.

3. The second letter indicates the specific type or group of fixture as hereinafter specified.

4. The number following the specific type indicates the total lamp wattage of the fixture under normal operation.

2.4 BALLASTS, TRANSFORMERS, AND DRIVERS

A. This section generally covers all ballast/transformer/driver types that may be used on this project. Any equipment specified in the fixture schedule with specific performance characteristics shall take precedence over the following specification section. If no other performance specifications are listed in the fixture schedule, all ballasts/transformers/drivers shall conform with the following section. Any specification below that does not apply to this project shall be disregarded.

B. All ballasts, transformers, and drivers shall be submitted to controls and lamp manufacturers to assure compatibility. Written verification of compatibility must be submitted with the lamp, ballast, and controls submittals respectively.

C. Low Voltage Transformers

1. Acceptable manufacturers:
   a. Q-tran
   b. Semper-fi

2. Performance Characteristics
   a. 5-year warranty minimum
   b. Provides five (5) different voltages simultaneously. Compensates for voltage drop due to long secondary wire runs.
   c. Powers 12 volt and 24 volt lighting.
   d. Fully loadable at any tap, or combination of taps with no de-rating required.
   e. Quiet operation even when dimming.
   f. Facilitates full-range dimming (0-100% light output).
   g. Provides equal light output to multiple loads at varying distances.
   h. Sizes ranging from 50 watts to 1400 watts with the ability to house multiple transformers in a single enclosure.

D. LED Drivers

1. Shall be UL listed and comply with ANSI C62.41 Category A for transient protection.

2. Shall be available in ratings to meet required application needs, including but not limited to: indoor, plenum, recessed, outdoor, wet location.

3. Shall have a Total Harmonic Distortion (THD) of less than 20%.

4. Shall have a power factor greater than 90%.

5. Shall have end of life detection and shut down.

6. Shall be class A sound rated.

7. Shall tolerate sustained open circuit and short circuit output conditions without damage and without the need for external fuses or trip devices.

8. Shall not contain Polychlorinated Biphenyl (PCB).

9. Shall have poke-in wire trap connectors or integral leads color coded per ANSI C82.11

10. Shall meet Federal Communications Commission (FCC) rules and regulations, Title 47 CFR Part 15, non-consumer (Class A) for EMI/RFI.

2.5 LAMPS

A. This section generally covers all lamp types that may be used on this project. Any lamp specified in the fixture schedule with specific performance characteristics shall take precedence over the following specification section. If no other performance specifications are listed in the fixture schedule, all lamps shall conform with the following section. Any specification below that does not apply to this project shall be disregarded.

B. Light-emitting diodes (LEDs):

1. Red LEDs utilized in exit and other signage must maintain at least 70% of their initial lumen output after 50,000 hours of operation.

2. LED's excluding exit sign
   a. Any substitutions must meet or exceed the performance characteristics of the LEDs utilized in the specified manufacturer's product.
   b. Shall be tested and be in compliance with the current edition of the Illuminating Engineering Society (IES) document LM-80, "Approved Method: Measuring Lumen Maintenance of LED Light Sources."
      1) LED light source life may not be predicted from LM-80 data. LED life must be calculated in accordance with the current edition of the IES document TM-21.
   c. Light fixtures utilizing integral LEDs shall be tested and be in compliance with the current edition of the IES document LM-79, "Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products."
   d. All parts, including luminaire, driver, driver enclosure, dimming interface (where applicable), LEDs, and other products shall be covered by the luminaire fixture manufacturer's warranty.
   e. Luminaires utilizing white LED arrays or blue LEDs with remote phosphor to produce white light shall produce white light with a CCT of 4000K.
   f. CRI for all LED sources shall be greater than or equal to 80 for interior luminaires and greater than or equal to 70 for exterior luminaires.
   g. Color consistency among individual fixtures within each fixture type must remain within 3 MacAdam ellipses of each other, throughout the duration of the warranty period.

2.6 EMERGENCY LIGHTING UNITS

A. Unless otherwise specified, emergency lighting units shall meet the following requirements.

B. Manufacturers:

1. Basis of Design – Lithonia "Indura" series
   a. INDX1236 (blank) LP05VS ULT.

2. Dual-Lite "Dynamo DYN" series

3. Mule Lighting "Patriot – NEMA 4X" series

4. Substitutions:
   a. Under provisions of Section 260500.

C. Description:

1. Self-contained emergency lighting unit.

D. Battery:

1. 12 volt, high-temperature nickel-cadmium or lithium iron phosphate type, with 1.5 hour capacity, fully warranted for 3 years minimum and pro-rated for 5 years.

E. Battery charger:

1. Dual-rate type, with sufficient capacity to recharge discharged battery to full charge within 12 hours.

2. Current limiting charger.

3. Unit shall have thermal protection to prevent overheating and charger failure.

F. Lamps:

1. Two (2) LED lamps, 5-6 watts (max.) per lamp.

G. Remote lamps:

1. Match lamps on unit.

H. Housing:

1. Heavy duty polycarbonate with color molded through or heavy duty die-cast aluminum with painted finish.

2. Finish color shall be gray.

I. Lens:

1. Impact-resistant, corrosion-resistant, clear, polycarbonate lens.

2. Gasketed and sealed to housing.

J. Hardware:

1. Stainless steel, tamper-resistant screws.

K. Indicators:

1. Provide lamps to indicate AC ON and RECHARGING. Provide voltmeter and audible feature.

L. Provide TEST switch to transfer unit from external power supply to integral battery supply.

M. Provide self-diagnostics and time delay features.

N. Provide heater, thermostat, and/or battery blanket for cold temperature operation. Unit shall be rated for temperatures down to -22°F (-30°C) or lower; and unit shall be rated for temperatures up to 104°F (40°C) or higher.

O. Electrical connection:

1. Conduit connection.

P. Voltage:

1. Dual voltage input (120/277).

Q. Unit shall have the following listings:

1. Wet location

2. UL 924

3. NEMA 4X

4. IP66 or greater

PART 3 - EXECUTION

3.1 CONSTRUCTION WASTE MANAGEMENT (LEED)

A. The contractor, subcontractors, and their personnel shall follow the procedures and practices for waste separation, collection, and transport as defined in the contractor's "Waste Management Plan" as required by Division 01 Section "Construction Waste Management."

3.2 EXAMINATION

A. Examine substrate and supporting grids for luminaires.

B. Examine each luminaire to determine suitability for lamps specified.

3.3 INSTALLATION

A. Install in accordance with Manufacturer's instructions.

B. Install suspended luminaires using aircraft cable, unless otherwise specified in the fixture schedule. Provide length required to suspend luminaire at indicated height.

C. Support luminaires larger than 2 foot by 4 foot size independently of ceiling framing. Electrical Contractor shall furnish all necessary additional auxiliary supporting steel for fixtures not mounted on building framework, and where necessary, to span the ceiling channels

of hung ceiling construction. Fixtures supported by ceiling framing members shall be securely attached to the framing members in a manner approved by the National Electrical Code.

D. Fixtures and/or fixture outlet boxes shall be provided with hangers to adequately support the complete weight of the fixture. Design of hangers and method of fastening other than herein specified shall be submitted to the Architect for approval. Fixtures mounted on outlet boxes shall be rigidly secured to a fixture stud in the outlet box. Hickies or extension pieces shall be installed where required to facilitate proper installation. Fixtures that weigh more than 50 pounds shall be supported independently of the outlet box.

E. Provide aligner hangers for stem-suspended fixtures so that fixtures hang level with vertical stems.

F. All fixtures of the same type and within the same visible area shall be installed so that the lamps in all the fixtures are parallel and aligned with the building lines and with each other.

G. All fixtures with Alzak reflectors (i.e., downlights, etc.) shall be installed such that there is no permanent damage caused by fingerprints or other body oils.

H. Unless otherwise noted, locate surface, pendant, and recessed ceiling luminaires as indicated on reflected ceiling plan; in all other areas refer to lighting plan. Coordinate with other disciplines.

I. Install surface mounted luminaires and exit signs plumb and adjust to align with building lines and with each other. Secure to prohibit movement.

J. Exposed Grid Ceilings:

1. Fasten surface mounted luminaires to ceiling tee using bolts, screws, rivets, or suitable clips.

K. Install recessed luminaires to permit component removal from below.

L. Install recessed luminaires using accessories and firestopping materials to meet regulatory requirements for fire rating. Refer to architectural finish schedules for locations where this occurs.

M. Install clips to secure recessed grid-supported luminaires in place.

N. Install wall mounted luminaires and exit signs at height as indicated on drawings or in schedule.

O. Unless otherwise indicated, luminaire mounting heights are to bottom of unit for suspended items and to center of unit for wall-mounted items.

P. Install accessories furnished with each luminaire.

Q. Connect luminaires and exit signs to branch circuit outlets provided under Section 260534.

R. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.

S. Bond products and metal accessories to branch circuit equipment grounding conductor.

T. Install specified lamps in each luminaire.

U. All recessed wallslot wall washing type systems shall be furnished with lens luminance deflector directly beneath light source for visual shielding when specified, and all extensions, corners, caps, and similar accessories, in order to provide a complete system continuous to within 6 inches wall to wall. Actual illuminated length shall be centered in entire fixture length with equal extensions at each end.

V. All lighting contained within architectural details (i.e., cove, slots, valances, etc.) shall be continuous with fixtures tightly butted up against each other to reduce socket shadows. Actual illuminated length shall be centered in overall detail with equal spacing at each end. All concealed lighting of this nature shall be closely coordinated with architectural details where indicated in fixture schedule.

W. The Electrical Contractor shall consult the Room Finish Schedule as to the type of ceiling construction and shall be responsible for ordering the proper fixtures and hardware required for installation in or on a specific room surface.

X. Fixtures shall be installed so that no labels will be visible under normal operating conditions of the fixture.

1. Recessed fixtures shall be designed to fit the make and type of ceiling to be installed, and shall include plaster frames where installed in plaster or gypsum board ceilings.

2. Recessed fixtures shall be removable from below to allow access to an outlet box in the ceiling, as required by the NEC.

Y. All luminaires with louvers, blades, or baffles shall be installed so that the louvers, blades, or baffles are aligned with the building lines and with each other.

3.4 FIELD QUALITY CONTROL

A. Inspect each installed fixture for damage. Replace damaged fixtures and components.

B. Tests and Observations:

1. Verify normal operation of lighting units after installing luminaires and energizing circuits with normal power source. Inspect for proper connection, operation, lamp type, and ballast/driver type.

2. Verify emergency operation of lighting units after installing luminaires and energizing emergency power circuits. Inspect for proper connection, operation, lamp type, ballast/driver type, and battery type, where applicable.

3.5 ADJUSTING

A. Unless otherwise indicated, aim and adjust all downlight / wash lights and adjustable accents to aim flat against nearest adjacent walls.

B. Adjust exit sign directional arrows as indicated.

C. Re-lamp luminaires at Owner's final acceptance of project for the following reasons:

1. Failed lamps.

2. LEDS that have been used 3,000 hours or more for temporary or construction lighting.

3.6 EMERGENCY FIXTURE IDENTIFICATION

A. All emergency-only lighting fixtures shall be identified by providing a red plastic stick-on dot ½-inch in diameter on the exposed fixture corner flange or the adjacent ceiling support member. Fixtures shall be marked at the same location for uniformity.

3.7 CLEANING

A. Clean electrical parts to remove conductive and deleterious materials.

B. Remove dirt and debris from enclosure.

C. Clean photometric control surfaces as recommended by Manufacturer.

D. Clean finishes and touch up damage as directed by Architect or Owner.

3.8 DISPOSAL

A. All ballasts containing PCB’s and batteries shall be treated as hazardous waste and disposed of as regulated by the Environmental Protection Agency’s Universal Waste Rule. Any state regulations more stringent shall take precedence.

B. All fluorescent and HID lamps shall be treated as hazardous waste and recycled as regulated by the Environmental Protection Agency’s Universal Waste Rule. Any state regulations more stringent shall take precedence.

1. Lamps recognized as having reduced mercury content and passing the Toxicity Characteristic Leaching Procedure (TCLP) shall be excluded.

END OF SECTION 26 51 00

SECTION 26 55 61 – THEATRICAL LIGHTING AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes equipment for a small theater / TV studio lighting system, including fixtures, lamps, dimmers, controls, and distribution components.

1.3 SUBMITTALS

A. Product Data: For fixtures, lamps, distribution components, and control systems, including dimensions and data on features and components. Include data on ratings and features of devices.

B. Shop Drawings: Detail dimmer equipment showing arrangements, characteristics, and circuit assignments of various modules. Include elevation views of front panels indicating devices and controls. Include illustrations and dimensioned drawings.

1. Wiring Diagrams: Detail wiring for power and control systems and differentiate between manufacturer-installed and field-installed wiring.

C. Manufacturer Certificates: Signed by the manufacturer certifying that they comply with requirements. Include evidence of manufacturing experience.

D. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

E. Maintenance Data: For fixtures, distribution equipment, software operating manuals, instructional videotapes, and controls are to be included in maintenance manuals specified in Division 1.

F. Record Data: Show connections and circuit and channel assignments.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has installed systems of similar scope and function as the units required for this project.

B. Manufacturer Qualifications: A firm experienced in manufacturing equipment similar to that indicated for this project that maintains technical support service available by toll-free telephone number. Service capability to provide the user with training, parts, and emergency maintenance and repairs support within 48 hours maximum response time.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to Authorities Having Jurisdiction.

D. Comply with NFPA 70.

1.5 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Lamps: 1 for every 10 of each ANSI code, type, and rating installed. Furnish at least one of each type.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include the following:

1. Basis of Design: Lehigh Electric Products Company.

2. Electronic Theatre Controls, Inc. (ETC)

3. Strand Lighting, Inc.

B. Other manufacturers wishing to be considered for prior approval must submit the following items a minimum of 10 days prior to the bid date. Approval to bid does not waive the requirement to comply with the equipment specifications listed in this section.

1. A complete bill of material listing all proposed equipment.
2. Catalog sheets detailing the products proposed in 1 above,
3. Description listing any deviations the proposed substitution has as compared with the specified system.
4. Detail additional costs associated with using the alternate system in lieu of the specified system.

2.2 FIXTURES AND DISTRIBUTION EQUIPMENT, GENERAL

A. Metal Parts: Free from burrs and sharp corners and edges.

B. Sheet Metal Components: Steel, unless otherwise indicated. Form and support sheet metal to prevent warping and sagging.

C. Fixture Doors and Other Internal Access: Smooth operating, free from light leakage under operating conditions, and arranged to permit relamping without the use of tools. Arrange doors, lenses, diffusers, and other pieces to prevent accidental falling during relamping and when secured in operating position.

D. Pigtail: Factory wired 36-inch (900 mm) long, 3-wire cord and plug connector assembly with cord encased in woven fiberglass or silicone tubing.

E. Plug Connectors: Two-pole, 3-wire, 20-A parallel blade type.

F. Pipe Clamps: Malleable iron and designed for clamping fixtures to 3/4- to 2-inch OD pipe and equipped with a T-bolt to lock alignment. Arrange fixture clamps for horizontal rotation of yoke for aiming.

G. Safety Cables: Heavy duty, flexible steel, 30-inch (760) nominal length, with spring clip at one end and steel ring at other.

H. Fixture Ventilation Openings: Baffled against light leaks.

I. Fixture Operating Controls and Handles: Thermally insulated.

J. Lenses: Borosilicate glass in silicone mountings.

K. Color Filter Frame Holder: Attached to front of fixture.

L. Fixture Yoke: Rigid metal arranged for vertical aiming of unit and equipped with T-bolt or hand screw to lock alignment.

2.3 FIXTURES

A. General: Listed under UL 1573.

B. Standard Features: Equip each fixture with pigtail, yoke with pipe clamp, and safety cable for batten mounting, and filter holder.

C. Cyclorama Floodlights: Multicolor, RGBA, LED fixture with 8 or 16 bit DMX control of intensity and color. Fixture shall be designed to provide a color wash of cyclorama curtains.

1. Lightweight aluminum housing. Fixture weight to be approximately 11 pounds.
2. Asymmetrical, specular aluminum reflector providing even asymmetrical distribution of light.

3. Integral multi-voltage power supply, 100-240VAC. 10A push button circuit breaker.
4. 6’ power cable with molded Edison plug. Feed thru power connectors for up to 6 units.
5. Convection cooled operation with no fans for operation within a 1°C to 400°C range. IP-20 rating for dry location use.
6. Compatible with DMX and RDM protocols. Feed thru 5 pin XLR connectors. Field angles: Approximately 82° horizontal and 37° vertical.
7. Preprogrammed modes for fixed colors and color mixes, timed color changes, and strobes.
8. Three adjustable feet for floor mounting or pipe mounting with optional yoke and c-clamp.
9. 100 Watts maximum output at full RGBA using 3 Watt Red, Green, Blue, and Amber LEDs. LEDs to have a 50,000 hour nominal life rating.
10. Fixture to include a local control keypad for configuration settings of DMX-512A address, fixture personality, and stand alone operation.
11. Fixture to be complete with 6’ power cord, 10’ DMX cable, safety cable, yoke and c-clamp.
12. Provide:
    a. Four (4) – Spectra Cyc 100.

D. PAR Spotlight – LED: Eight inch 100 watt rated. Provide c-clamp, Edison style parallel plug, and safety cable as described above.

1. Aluminum die-cast construction.
2. Four lens kit to include NSP, SP, MFL, and WFL 8” hi-temp glass lenses.
3. Luxeon Rebel LED’s – 100 watt Max at full RGBA output.
4. Compatible with DMX and RDM protocols.
5. Supplied with 3 meter DMX in and out cables with DMX connector.
6. User selectable for 8 and 16 bit personalities for smooth dimming.
7. PowerCon in and out connectors.
8. Supply with power and DMX cables as required for installation as shown on the plans
9. Provide:
    a. Ten (10) – LSPP-RGBA-LED.
    b. Six (6) – 8”, 4 door, 8 leaf barn-door assemblies

E. Ellipsoidal Spotlights - LED: Multicolor, RGBA, 250W LED fixture with 8 or 16 bit DMX control of intensity and color.

1. Housing: Die-cast aluminum and sheet metal housing construction. Tool-free interchangeable barrels. 360-degree rotating barrel.
2. Yoke: Rigid flat steel with dual locking dog tilt handles, two mounting positions, indexed tilt angle markings.
3. Light Engine: RGBA, 50,000 hour LED Life. Quiet fan cooling for 250W.
4. Lenses: Color coded crown glass (white plate) lenses provided with anti-reflective coating. Molded front lens made out of polymeric plastic for 5 and 10 degree units only.
5. Body Color**:** Black.

6. Rating: 100-240volt 50/60Hz Universal Power Input.
7. Electrical & Data: PowerCON® in and out connections. 5-pin DMX in and out. Requires power from non-dim source.
8. Shutters: Four .037" stainless steel, fully adjustable and lockable. Constructed with oversized heat resistant handles.
9. Completely enclosed accessory holder.
10. Provide:
    a. Six (6) – LE6P-LED-250-36

F. TV Studio Accessories

1. Cables:

    a. Provide: Six (6) – LECPBG/10' and six (6) – LECPBG/5'

    b. Provide: Four (4) – Twofers

    c. Provide: Six (6) – 10' ProCon to ProCon

    d. Provide: Twenty-four (24) – 10' **DMX**

2. Castered stand with 5' to 9' extension.

    a. Provide: three (3)

G. Pipe Grid: Size and type as indicated in architectural documents.

1. Rigidly fasten the top row of pipes on 4' centers to the building structure. Mount the SlimDim strips to these pipes.
2. The bottom layer of pipes is to be fastened perpendicular to upper pipes with double pipe fittings at each cross point.
3. Anchor both layers of pipes to a side wall with wall flanges or similar fasteners. Connect the grid assembly at each pipe intersection to the building structure.

2.5 LIGHTING CONTROL SYSTEM

A. Description: Microprocessor-based, digitally controlled, distributed dimming system controlled by a remote control console. System to be SlimDim series with prewired dimmer assemblies mounted in a sheet metal enclosure with a black powder-coat finish and silk-screened legends.

B. SlimDim – Pipe Mounted

1. Mounting: Furnished with a pipe clamp, safety cable, and integral safety cable brackets.
2. Dimensions: 4.25" high, 2.5" deep, and 60" long.
3. Power input: 10' SO cord for 120/208V, 3 phase (20 amp) power feed with a NEMA L21-20 (4 pole, 5 wire grounding) locking connector and mating power receptacle in a screw cover electrical box.
4. Convenience outlet. 20 amp duplex receptacle for constant power.

5. Available in dimmer or non-dim models with any combination of dimmer or non-dim modules. Three modules per SD6 unit:
   a. Dimmer modules:
      1. Two independent dimmers.
      2. Dimmer output: One flush mounted stage pin output receptacle per dimmer.
   b. Non-dims modules:
      1. Non-dims: Two independent non-dim relays
      2. Relay output: One flush mounted parallel blade outlet per relay
6. Isolated DMX512A output connectors with each non-dim pair.
7. UL and cUL listed under Industrial Control Equipment.
8. Wireless DMX option provides wireless DMX transmission from the console to the SlimDim. Units with wireless DMX option shall include a wireless DMX antenna and receiver integral to the dimmer housing and one DMX out receptacle.
   Operation limits:
   a. Temperature range: Convection cooled (0° to 40° C ambient temperature) with thermal overload protection. Fans are not acceptable.
   b. Line voltage range: 90 to 140 volts.
9. Provide:
   a. 3 – ~~SD6-3-3D-0ND-XXGP-CC/SC/PC10/PR/WD~~ **SD6-3-0D-3ND-XXGP-CC/SC/PC10/PR/WD** [Pipe mounted SlimDim complete with 6 ~~(1200W) dimmers~~ **non-dim relays**, pigtail receptacles (type to match theatrical light fixture plugs), c-clamps, safety cables, 10’ power cord with connector, wireless DMX receiver, and mating power receptacle].

E. SlimDim – Wall Mounted

1. Mounting: Furnished with wall mounting brackets.
2. Dimensions: 8.5” high, 2.5” deep, and 16” long.
3. Power input: Terminal blocks suitable for a 120V, 1 phase, 3 wire (20 amp) power feed.
4. Available in dimmer or non-dim models:
   a. Dimmers:
      1. Two independent dimmers with 10 amp fully magnetic circuit breaker for each dimmer and 350 micro-second (10%-90%) toroidal chokes.
      2. Dimmer output: One flush mounted stage pin output receptacle per dimmer.
   b. Non-dims:
      1. Non-dims: Two independent 10A continuous duty relays with 10 amp fully magnetic circuit breaker for each relay.
      2. Relay output: One flush mounted parallel blade outlet per relay
5. UL and cUL listed under Industrial Control Equipment.
6. Wireless DMX option shall provide wireless DMX transmission from the console to the SlimDim. Units with wireless DMX option shall include a wireless DMX antenna and receiver integral to the dimmer housing and one DMX out receptacle.
7. Operation limits:
   a. Temperature range: Convection cooled (0° to 40° C ambient temperature) with thermal overload protection. Fans are not acceptable.
   b. Line voltage range: 90 to 140 volts.

8. Provide:
   a. 3 – ~~SD2-1-D-XXGF-WB/WD~~ **SD2-1-ND-XXGF-WB/WD** [Wall mounted SlimDim complete with 2 ~~(1200W) dimmers~~ **non-dim relays**, flush receptacles (type to match theatrical light fixture plugs), wall mounting brackets, and wireless DMX receiver].

9. Dimmer Performance:

   a. Temperature range: Convection cooled (0° to 40° C ambient temperature) with thermal overload protection. Fans are not acceptable.
   b. Line voltage range: 90 to 140 volts.

F. Electronics:

1. Digital, dimmer control circuitry.
2. Digital receiver module with programming keys, dimmer LEDs, and LED display:

   a. Accepts DMX512A control protocol with an optically isolated input per BSR E1.11 and is RDM ready.
   b. Programmable dimmer to channel patch for up to 512 DMX channels.
   c. Assign each dimmer's control mode to incandescent/low-voltage, fluorescent (2-wire dimmable phase control ballasts), or non-dim operation.
   d. LEDs indicate dimmer active status.

3. Test and operation modes:

   a. Ramp test: Sequentially turns each dimmer on then off at a programmable output level.
   b. Focus check: Operate a selected dimmer at an output level.

4. DMX, overtemp, and power LED indicators.
5. Programmable min and max output levels for each dimmer.

G. Control Console: Console to be a digital, 32-bit microprocessor controller with user selectable two scene manual or 250 cue memory control. Console to meet or exceed the Lehigh Wave Series as specified below:

1. General:

   a. Manual 2-scene control with 30 control channels per scene.
   b. Manual single-scene control with 2 pages of 60 control channels (120 total) per scene.
   c. Two pages of 60 submasters (120 total).
   d. 5 independent control channels.
   e. Up to 250 cues per show.
   f. Live or blind recording of cues, submasters, and effects.
   g. 4 x 20 Backlit LCD display to display channel levels, cues, submaster, patch and other control information with alphanumeric labeling of cues, submasters, and shows.
   h. Output/input interfaces:

1) DMX-512 input and output receptacles.
2) USB port A for flash drive interface to record show files and input software upgrades.
3) USB port B for PC interface.
4) Ethernet port.

i. Grandmaster with Blackout.
j. Dimmer rack overtemp warning indicator LED.
k. Dimensions: 35”W X 4”H X 13.25”D

2. LCD display functions:

a. Preview/edit channel levels, cues, submasters, and effects.
b. Playing back the cue stack.
c. Preview/edit patch.
d. Show storage and retrieval.
e. Context sensitive help function.

3. Channels

a. Two rows of 30 channel controllers with bump buttons in a two scene format.
b. 60 channel single scene mode with two pages for 120 control channels.
c. All single and two scene channels to have normal and solo bump control function plus bump master level controller.
d. 5 independent control channels.
e. Focus check function.

4. Cues:

a. Cues to be recorded live or blind.
b. 250 cues per show with alphanumeric labeling.
c. A cue can be an effect with effects programmable to any cue. Activating the cue activates the associated effect.
d. Any cue, submaster, effect step, or combination look can be copied and pasted or inserted to any cue, submaster, or effects list.

5. Faders:

a. A and B fader pairs with Go and Hold. Separate up and down fade time controls.
b. Timed fades may be stopped, changed to manual, held, or modified at anytime during the fade.
c. LCD displays the cue fade time.
d. Cues can be stepped through quickly without fade times.

6. Submasters:

a. 60 pile-on submaster controllers with normal and solo bump button control.
b. Two submaster memory pages for a total of 120 submasters.
c. Submasters recorded live or blind.

d. A submaster is activated by a submaster controller or bump button when in the submaster mode and will pile-on to any active control settings.
e. Effects programmable to any submaster. Activating the submaster activates the associated effect. Multiple effects and submasters may run simultaneously.

7. Effects:

a. Assignable to any cue or submaster.
b. Up to 50 steps per effect.
c. Adjustable step speed.
d. One-shot mode or run continuously in forward, reverse, bounce, or random directions.
e. Step fade options for down-up, build, or snap.

8. Patch:

a. Program a dimmer to channel patch for up to 512 dimmers on 120 channels.
b. One-to-one patch or channel selectable.
c. Programmable dim or non-dim function.

9. DMX Backup:

a. A full 512 channel DMX universe can be input and stored as a cue or submaster which allows the console to serve as a backup with stored cues from another console.
b. Master level controller for DMX input.
c. DMX backup cues are stored as 512 channels. Patched input DMX channels are mixed HTP with active console channels.

10. Operating Modes

a. 2-scene: 2-scene preset manual operation with timed crossfades and pile-on submasters and effects.
b. 1-scene: Single scene preset manual operation with timed crossfades and pile-on submasters and effects.
c. Program: Recording of cues, submasters, and effects.
d. Playback: Playback of cues, submasters, and effects.
e. Setup: Patching and loading/saving show files.

11. Console receptacle stations for remote console operation. Provide in locations as shown on the drawings.
12. Provide: One (1) – Wave 120 console with a wireless DMX transmitter.

F. FINISHES
a. Manufacturers' standard, unless otherwise indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install equipment according to the manufacturer's written instructions. Set permanently mounted items plumb and level and square with ceilings and walls.

B. Mounting of Equipment: Conform to manufacturer's instructions and Division 26 Section "Supporting Devices." Mounting heights indicated are to bottom of unit for suspended items and to center of unit for wall-mounted ones.

3.2 CONTROL WIRING INSTALLATION

A. Install wiring between control devices as specified in Division 26 Section "Wires and Cables" for hard-wired connections. Install wiring in raceway except cable and plug connections.

B. Wiring in Enclosures: Bundle, train, and support.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Services: Arrange and pay for the service of a factory-authorized service representative to test, adjust, and program the lighting control system.

B. Schedule visual and mechanical inspections and electrical tests with at least 21-days advanced notification.

C. Electrical Tests: Perform according to manufacturer's instructions. Exercise caution when testing devices containing solid-state components.

3.4 CLEANING AND ADJUSTING

A. Remove paint splatters and other spots, dirt, and debris. Repair scratches and mars of finish to match original finish. Clean fixtures, devices, and equipment internally and externally using methods and materials as recommended by manufacturers.

3.5 DEMONSTRATION

A. Demonstrate the system to prove compliance with requirements.

B. Direct Training: Arrange and pay for the services of a factory-authorized service representative to demonstrate the lighting control system and train the Owner's personnel.

1. Conduct a minimum of 1 day of training in operation and maintenance as specified under "Instructions to Owner's Employees" in Division 1 Section

"Project Closeout." The training is to include system operation and maintenance procedures.

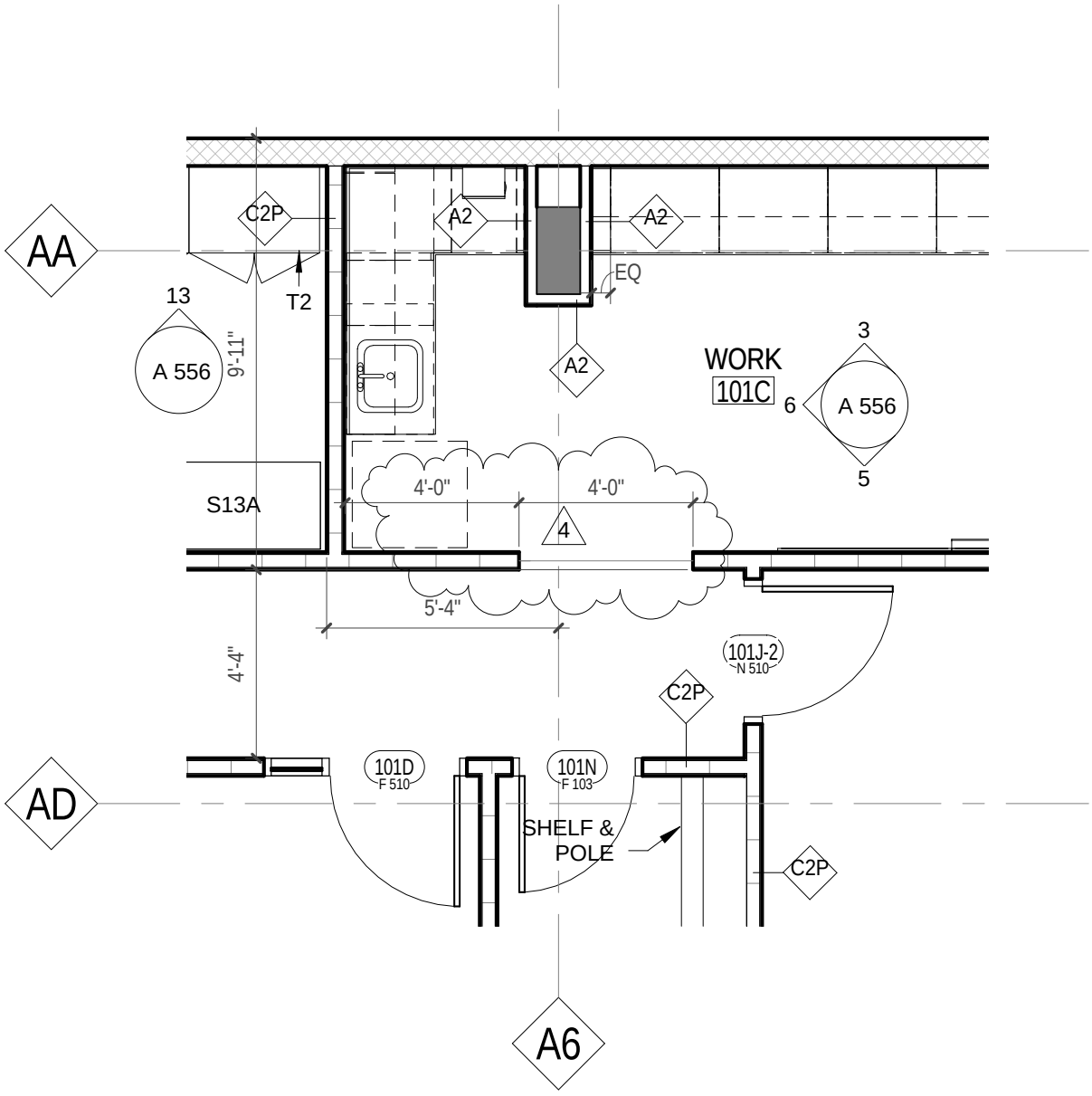
2. Schedule training with at least a 21-day advance notification.

3.6 COMMISSIONING

A. Operational Tests: Energize lighting controls systems, program controls, and check controlled outlets for light levels.

B. Correct deficiencies and retest deficient items. Verify by the system tests that specified requirements are met.

END OF SECTION 26 55 61



1 AAD 5.01

L1B - WORKROOM - ADD 5

SCALE: 1/4" = 1'-0"

JRS ARCHITECTS
2010 Clipper Park Rd.
Suite 101
Baltimore, MD 21211
410.235.7256

Workroom Entrance

Baltimore City Public Schools

Additions & Renovations at Robert Poole Building #056

1300 W 36TH ST., BALTIMORE, MD 21211

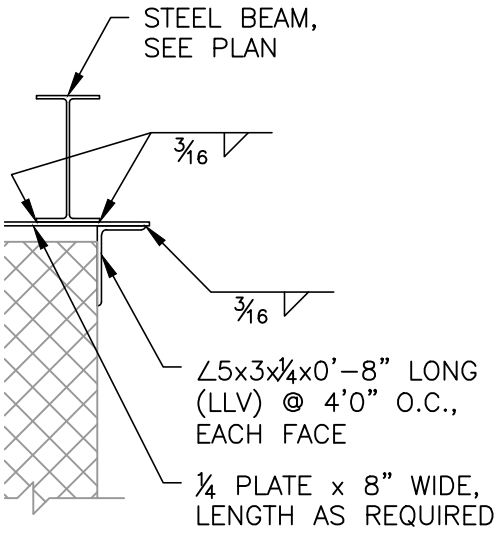
DATE: 05/05/16

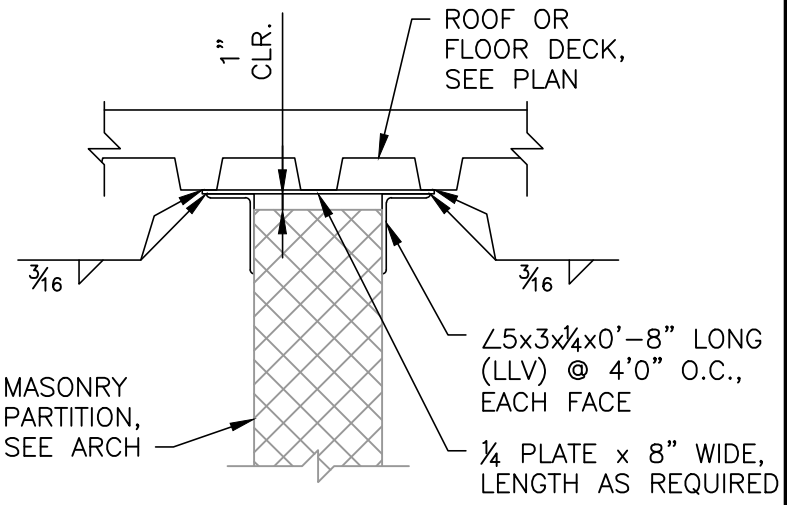
CHANGE TO DRAWING: | REV: 4

DRAWING NO.:

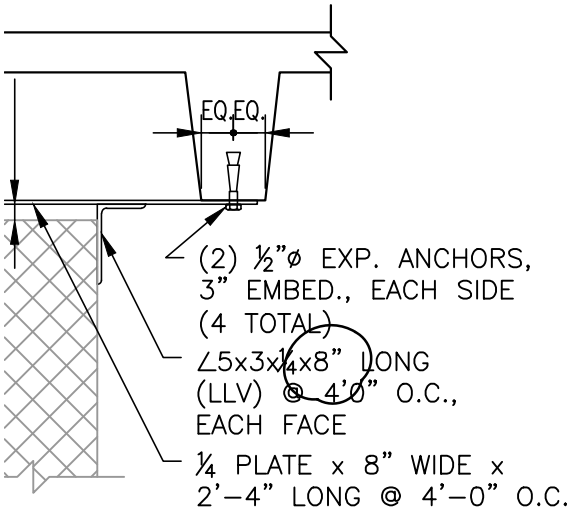
AAD 5.01

SCALE: 1/4" = 1'-0"



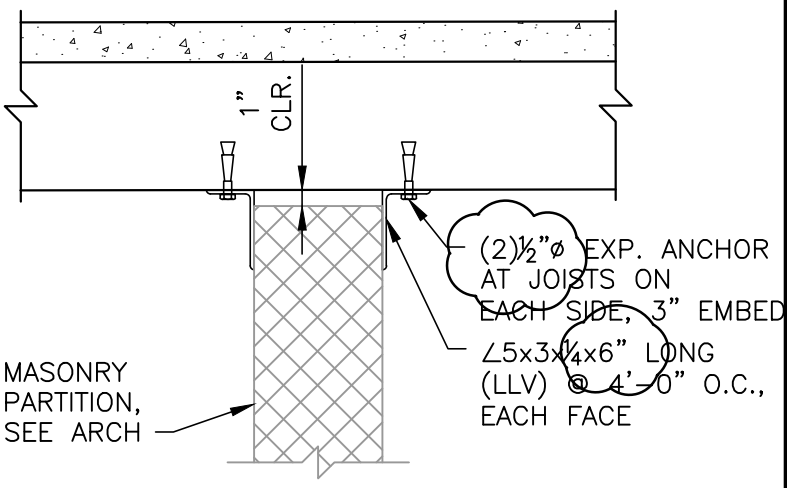


TEEL BEAM



EXIST. CONC. JOISTS

AT STEEL DECK



PERPENDICULAR TO EXIST. CONC. JOISTS

TYPICAL MASONRY PARTITION BRACING

1 / S-004

SCALE: 1"=1'-0"

ALBRECHT ENGINEERING INC
3500 BOSTON STREET
SUITE 329
BALTIMORE, MD 21224
410-522-5870

Baltimore Cit□Pu□lic Sc□ools

Additions & Renovations at Robert Poole Building #056

1300 W 36TH ST., BALTIMORE, MD 21211

DATE: 05/06/16

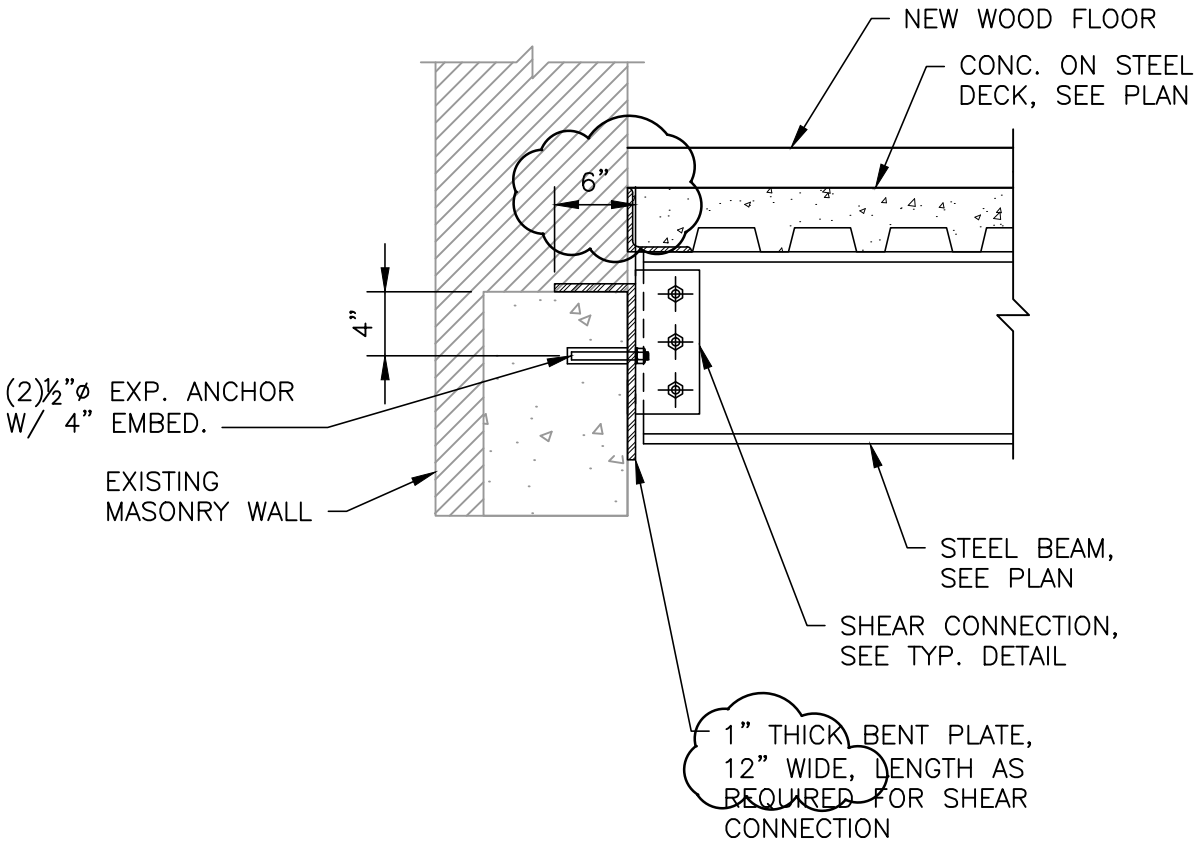
CHANGE TO DRAWING:	REV:
S-004	5

DRAWING NO.:

ADD S5.01

SCALE: 1" = 1'-0"

TYPICAL MASONRY PARTITION DETAIL



11 / S-501 WALL PLATE WP-1
SCALE: 1"=1'-0"

ALBRECHT ENGINEERING INC
3500 BOSTON STREET
SUITE 329
BALTIMORE, MD 21224
410-522-5870

WALL PLATE WP-1 DETAIL

Baltimore Cit□ Pu□lic Sc□ools

Additions & Renovations at Robert Poole Building #056

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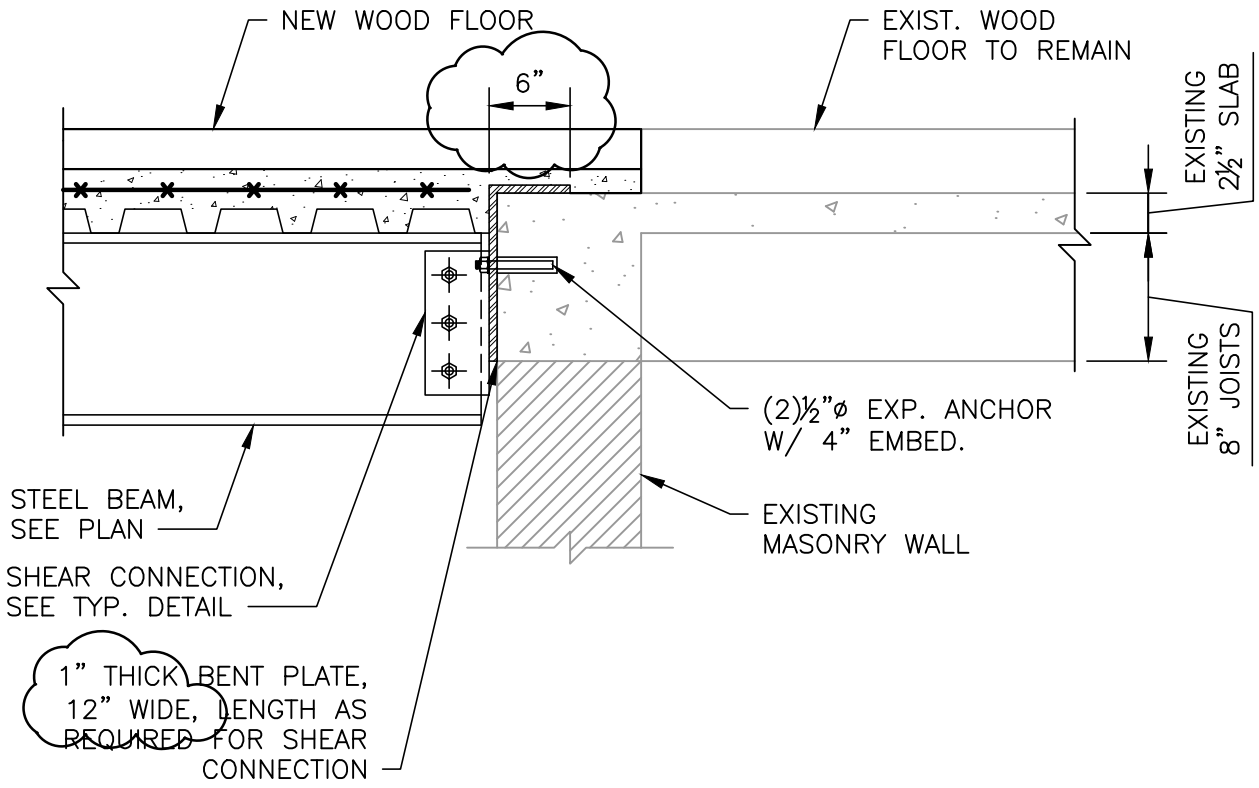
DATE: 05/06/16

CHANGE TO DRAWING:	REV:
S-501	5

DRAWING NO.:

ADD S5.02

SCALE: 1" = 1'-0"



12
S-501

WALL PLATE WP-2

SCALE: 1"=1'-0"

ALBRECHT ENGINEERING INC
3500 BOSTON STREET
SUITE 329
BALTIMORE, MD 21224
410-522-5870

WALL PLATE WP-2 DETAIL

Baltimore Cit□Pu□lic Sc□ools

Additions & Renovations at Robert Poole Building #056

1300 W 36TH ST., BALTIMORE, MD 21211

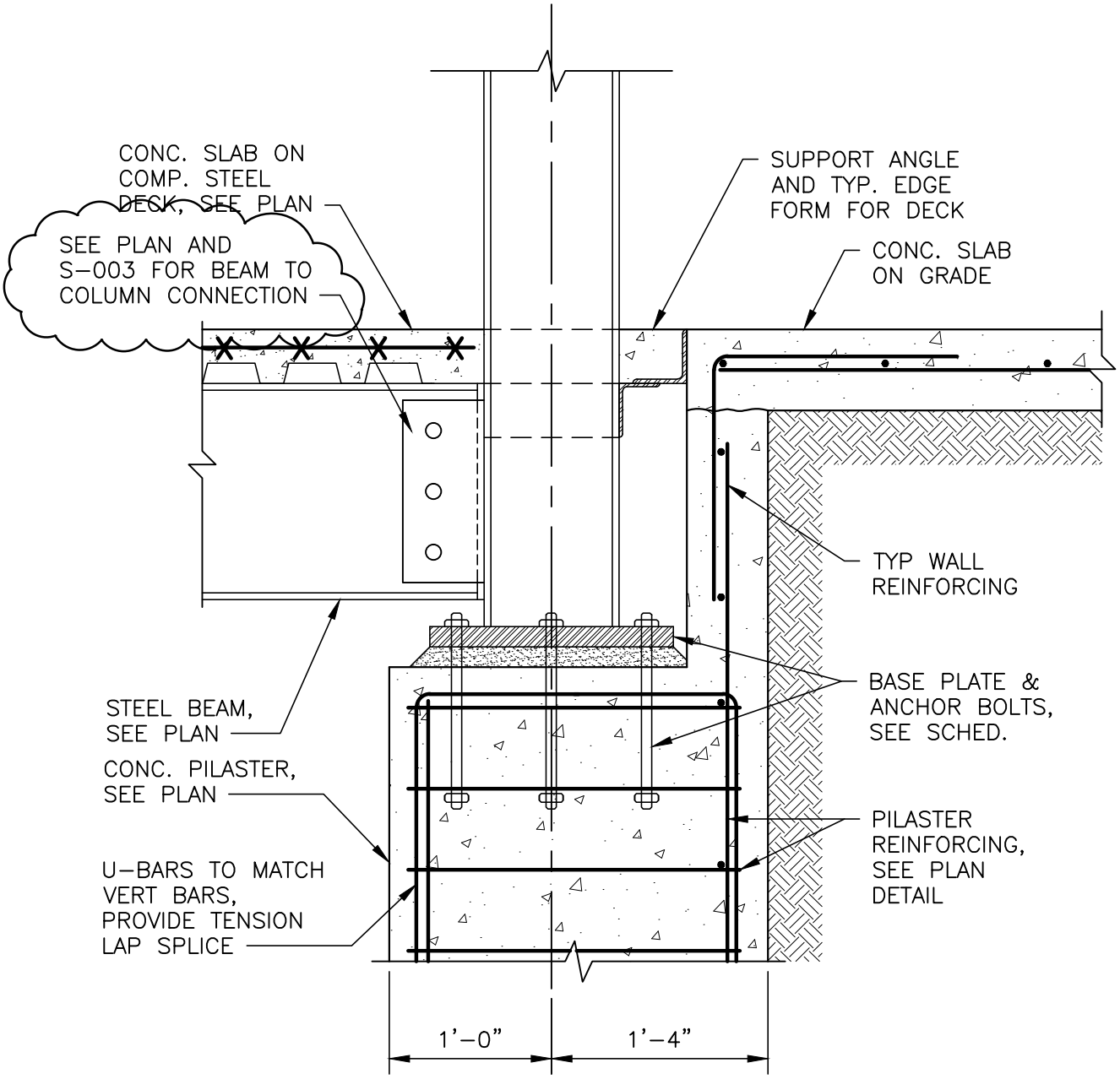
DATE: 05/06/16

CHANGE TO DRAWING:	REV:
S-501	5

DRAWING NO.:

ADD S5.03

SCALE: 1" = 1'-0"



COLUMN POCKET IN CONC. WALL

1 / S-402

SCALE: NONE

ALBRECHT ENGINEERING INC
3500 BOSTON STREET
SUITE 329
BALTIMORE, MD 21224
410-522-5870

COLUMN POCKET IN CONCRETE WALL

Baltimore Cit□ Pu□lic Sc□ools

Additions & Renovations at Robert Poole Building #056

1300 W 36TH ST., BALTIMORE, MD 21211

DATE: 05/06/16

CHANGE TO DRAWING:	REV:
S-402	5

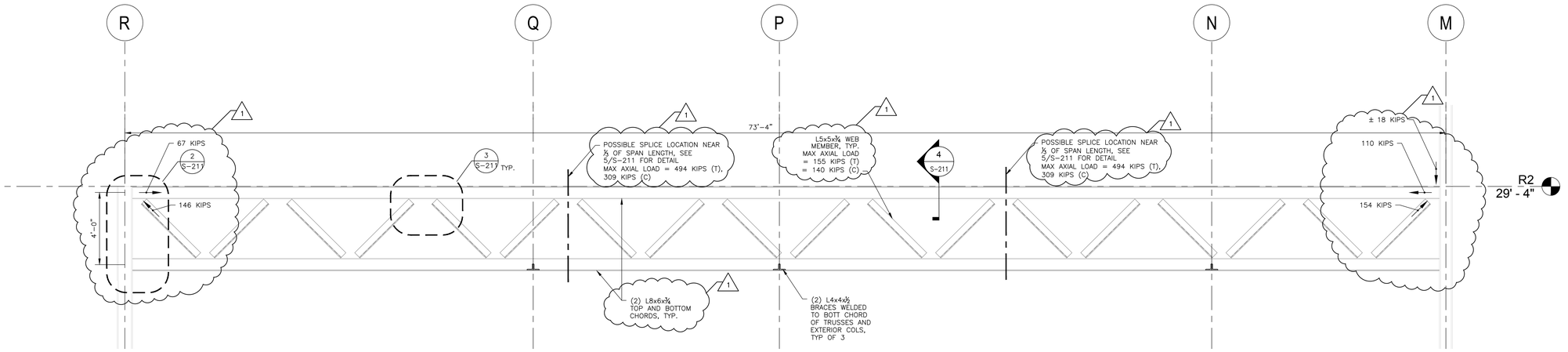
DRAWING NO.:

ADD S5.04

SCALE: 1" = 1'-0"

DOOR SCHEDULE

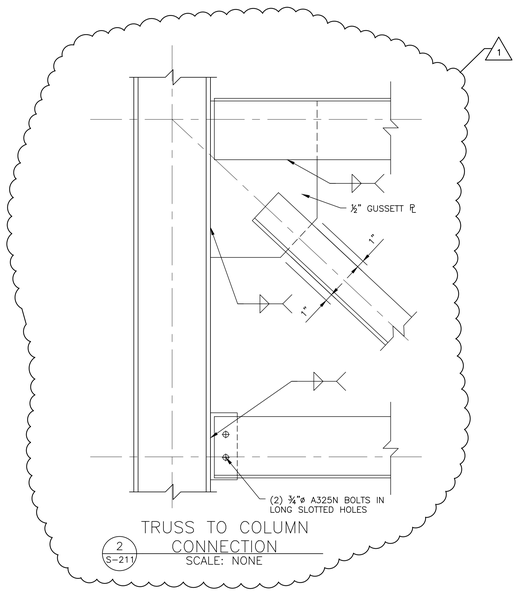
NO.	TO:	TO:	WTH	HT	DOOR MTL	DOOR TYPE	FRAME MTL	FRAME TYPE	WALL THK	DETAILS HEAD	DETAILS JAMB	DETAILS SILL	DOOR RATING	HDW SET	COMMENTS
001A	001A	ENTRY	6' - 0"	8' - 0"	AL	FG	AL	-						442	
001B-1	001B	CORRIDOR	6' - 0"	7' - 0"	WD	HG	HM	F4B	7 5/8"	H2	J2		90 MIN	444	
001D	001D	CORRIDOR	3' - 0"	7' - 0"	WD	F	HM	F1	1' - 0"	H3	J3			817	
001H	001H	PASSAGE	3' - 8"	7' - 0"	HM	F	HM	F1	7 5/8"	H2	J2		1.5 HR	102	
002-1	002	OFFICE / RECEP	3' - 0"	7' - 0"	WD	HG	HM	F4A	7 5/8"	H2	J2			510	
002-2	002	OFFICE / RECEP	3' - 0"	7' - 0"	WD	HG	HM	F4B	7 5/8"	H2	J2			510	
002A	002A	ADMIN ASST	3' - 0"	7' - 0"	WD	F	HM	F3A	4 7/8"	H1	J1			510	
002B	002B	PRINCIPAL	3' - 0"	7' - 0"	WD	F	HM	F3A	4 7/8"	H1	J1			510	
002C	002C	FLEX OFF	3' - 0"	7' - 0"	WD	F	HM	F3A	4 7/8"	H1	J1			510	
002D	002D	CLOS	3' - 0"	7' - 0"	WD	F	HM	F1	4 7/8"	H1	J1			103	
003	003	MULTIPURP CLASSRM	3' - 0"	7' - 0"	WD	HG	HM	F4B	7 5/8"	H2	J2			713	
003-1	003	MULTIPURP CLASSRM	3' - 0"	8' - 0"	AL	FG	AL	-						326	
004	004	CLASSRM (Type 6)	3' - 0"	7' - 0"	WD	HG	HM	F4B	7 5/8"	H2	J2			713	
004C	104C	ELEC	3' - 0"	7' - 0"	WD	F	HM	F1	4 7/8"	H1	J1			811	
005-1	005	PLANNING	3' - 0"	7' - 0"	WD	HG	HM	F4A	5 5/8"	H2	J2			510	
005-2	005	PLANNING	3' - 0"	7' - 0"	WD	HG	HM	F4A	5 5/8"	H2	J2			510	
006	006	RESOURCE	3' - 0"	7' - 0"	WD	HG	HM	F4B	7 5/8"	H2	J2			713	
008	008	JC	3' - 0"	7' - 0"	WD	F	HM	F1	7 5/8"	H2	J2			817	
009	009	MEN	3' - 0"	7' - 0"	WD	F	HM	F1	7 5/8"	H2	J2			210	
010	010	WOMEN	3' - 0"	7' - 0"	WD	F	HM	F1	7 5/8"	H2	J2			210	
012	012	CLASSRM (Type 1A)	3' - 0"	7' - 0"	WD	HG	HM	F4B	7 5/8"	H2	J2			713	
013	013	CLASSRM (Type 7)	3' - 0"	7' - 0"	WD	HG	HM	F4B	7 5/8"	H2	J2			713	
014	014	CLASSRM (Type 1B)	3' - 0"	7' - 0"	WD	HG	HM	F4B	7 5/8"	H2	J2			713	
015	015	FACULTY	3' - 0"	7' - 0"	WD	HG	HM	F4B	7 5/8"	H2	J2			510	
016	016	TLT	3' - 0"	7' - 0"	WD	F	HM	F1	7 5/8"	H2	J2			913	
017	017	TRANSFORMER	3' - 0"	7' - 0"	WD	F	HM	F1	1' - 0"	H3	J3			811	
018	018	CLASSRM (Type 1A)	3' - 0"	7' - 0"	WD	HG	HM	F4B	7 5/8"	H2	J2			713	
019	019	MECH	6' - 0"	7' - 0"	WD	F	HM	F1	7 5/8"	H2	J2			813	
019A	019A	ELEC	3' - 0"	7' - 0"	WD	F	HM	F1	7 5/8"	H2	J2			811	
019B	019B	MDF	3' - 8"	7' - 0"	HM	F	HM	F1	7 5/8"	H2	J2			811	
020	020	CLASSRM (Type 4)	3' - 0"	7' - 0"	WD	HG	HM	F4B	7 5/8"	H2	J2			713	
021	021	FIRE PUMP	3' - 0"	7' - 0"	WD	F	HM	F1	7 5/8"	H2	J2		1.5 HR	817	
022	022	STG-CENTRAL	3' - 8"	7' - 0"	HM	F	HM	F1	7 5/8"	H2	J2		1.5 HR	817	
022A1	022A	EMR	3' - 8"	7' - 0"	HM	F	HM	F1	7 5/8"	H2	J2		1.5 HR	817	
022A2	022A	EMR	3' - 8"	7' - 0"	HM	F	HM	F1	7 5/8"	H2	J2		1.5 HR	817	
023	023	LKR	3' - 0"	7' - 0"	WD	F	HM	F1	5 5/8"	H2	J2			913	
024	024	TLT/SHR	3' - 0"	7' - 0"	WD	F	HM	F1	7 5/8"	H2	J2			913	
025	025	ELEC	3' - 8"	7' - 0"	HM	F	HM	F1	7 5/8"	H2	J2			812	
026-1	026	MAIN ELEC	3' - 8"	7' - 0"	HM	F	HM	F1	1' - 4"	H4	J4			321A	
026-2	026	MAIN ELEC	3' - 8"	7' - 0"	HM	F	HM	F1	5 5/8"	H2	J2			811	
027	027	RECYCLE	3' - 8"	7' - 0"	HM	F	HM	F1	7 5/8"	H2	J2			817	
028-1	028	CAN WASH	3' - 8"	7' - 0"	HM	F	HM	F1	1' - 4"	H4	J4			321A	
028-2	028	CAN WASH	3' - 0"	7' - 0"	HM	F	HM	F1	7 5/8"	H2	J2			817	
029	029	STG	3' - 8"	7' - 0"	HM	F	HM	F1	1' - 4"	H4	J4			321A	
030	030	OFFICE	3' - 0"	7' - 0"	HM	FG	HM	F1	7 5/8"	H2	J2		1.5 HR	510	
031-1	031	RCVG	6' - 0"	7' - 0"	4 HM	F	HM	F1	1' - 4"	H4	J4			621	
031-2	031	RCVG	6' - 0"	7' - 0"	WD	F	HM	F1	7 5/8"	H2	J2		1.5 HR	822	
040	040	VP OFFICE	3' - 0"	7' - 0"	WD	F	HM	F3A	9"	H3	J3			510	
041	041	CONF	3' - 0"	7' - 0"	WD	HG	HM	F4C	7 5/8"	H2	J2			510	
042	042	STG-ADMIN	3' - 0"	7' - 0"	WD	F	HM	F1	7 5/8"	H2	J2			817	
043	043	PREP	3' - 0"	7' - 0"	WD	F	HM	F1	7 5/8"	H2	J2			510	
044-1	044	ENV SCIENCE	3' - 0"	7' - 0"	WD	HG	HM	F4B	7 5/8"	H2	J2			713	
044-2	044	ENV SCIENCE	3' - 0"	7' - 0"	WD	HG	HM	F4B	1' - 1"	H3	J3			713	
045	045	STG-SCI	3' - 0"	7' - 0"	WD	F	HM	F1	7 5/8"	H2	J2			817	
046-1	046	ART STUDIO	3' - 0"	7' - 0"	WD	HG	HM	F4A	7 5/8"	H2	J2			713	
046-2	046	ART STUDIO	3' - 0"	7' - 0"	WD	HG	HM	F4B	7 5/8"	H2	J2			713	
047	047	STG-ART	3' - 0"	7' - 0"	WD	F	HM	F1	7 5/8"	H2	J2			817	
048	048	ELEC	3' - 0"	7' - 0"	WD	F	HM	F1	7 5/8"	H2	J2			811	
049	049	STG-COLLAB	3' - 0"	7' - 0"	WD	F	HM	F1	9"	H3	J3			817	
049A	049A	IDF	3' - 0"	7' - 0"	WD	F	HM	F1	7 5/8"	H2	J2			811	
050	050	MEN	3' - 0"	7' - 0"	WD	F	HM	F1	9"	H3	J3			210	
051	051	JC	3' - 0"	7' - 0"	WD	F	HM	F1	9"	H3	J3			817	
052	052	WOMEN	3' - 0"	7' - 0"	WD	F	HM	F1	9"	H3	J3			210	
061	061	GREENHOUSE 1	6' - 0"	7' - 0"	AL	FG	AL	-						321B	
100A	100A	VEST	6' - 0"	7' - 0"		FG								442	
100B	100B	LOBBY	6' - 0"	7' - 0"	AL	FG	AL	-						446	
100C	100C	CORRIDOR	6' - 8"	8' - 6"	WD	F	HM	F1	7 5/8"	H2	J2		90 MIN	320	
100D-1	100D	CORRIDOR	6' - 8"	8' - 6"	WD	F	HM	F1	7 5/8"	H2	J2		90 MIN	320	
100D-2	100D	CORRIDOR	6' - 0"	8' - 8"	WD	F	HM	F1	7 5/8"	H2	J2			320	
100D-3	100D	CORRIDOR	3' - 4"	8' - 8"	WD	N	HM	F1	7 5/8"	H2	J2			320A	
100F-2	100F	CORRIDOR	3' - 0"	8' - 0"	AL	FG	AL	-						441A	
100G	100G	CORRIDOR	6' - 0"	7' - 0"	WD	F	HM	F1	5 5/8"	H2	J2			320B	
100H-1	100H	CORRIDOR	6' - 6"	8' - 0"	AL	FG	AL	-						440	
100H-2	100H	CORRIDOR	6' - 6"	8' - 0"	AL	FG	AL	-						442	
100J	100J	CORRIDOR	6' - 0"	7' - 0"	WD	F	HM	F1	5 5/8"	H2	J2			320	
101A-1	101A	MAIN OFF RECEP	3' - 0"	7' - 0"	AL	FG	AL	-						513	
101A-2	101A	MAIN OFF RECEP	3' - 0"	7' - 0"	AL	FG	AL	-						510	
101B-1	101B	SECURITY	3' - 0"	7' - 0"	WD	N	HM	F1	4 7/8"	H1	J1			510	
101C-1	101C	WORK	3' - 0"	7' - 0"	WD	N	HM	F1	4 7/8"	H1	J1			510	
101D	101D	AD ASST	3' - 0"	7' - 0"	WD	F	HM	F3A	4 7/8"	H1	J1			510	
101E	101E	FLEX OFF	3' - 0"	7' - 0"	WD	F	HM	F3A	4 7/8"	H1	J1			510	
101F	101F	STG	3' - 0"	7' - 0"	WD	F	HM	F1	4 7/8"	H1	J1			915	
101G	101G	PRINCIPAL	3' - 0"	7' - 0"	WD	F	HM	F3A	4 7/8"	H1	J1			510	
101H	101H	CONF	3' - 0"	7' - 0"	WD	F	HM	F3A	4 7/8"	H1	J1			510	
101J-1	101J	PASSAGE	3' - 0"	7' - 0"	HM	F	HM	F1	7 5/8"	H2	J2			510	
101J-2	101J	PASSAGE	3' - 0"	7' - 0"	WD	N	HM	F1	4 7/8"	H1	J1			510	
101K	101K	TLT	3' - 0"	7' - 0"	WD	F	HM	F1	4 7/8"	H1	J1			913	
101L	101L	ATTEN	3' - 0"	7' - 0"	WD	F	HM	F3A	4 7/8"	H1	J1			510	
101M	101M	STOR-SEC	3' - 0"	7' - 0"	WD	F	HM	F1	4 7/8"	H1	J1			915	
101N	101N	CLOS	2' - 8"	7' - 0"	WD	F	HM	F1	4 7/8"	H1	J1			103	
102A	102A	GUID RECEP	3' - 0"	7' - 0"	WD	HG	HM	F4C	5 5/8"	H2	J2			510	
102B	102B	STG	3' - 0"	7' - 0"	WD	F	HM	F1	4 7/8"	H1	J1			915	
102C	102C	CAREER	3' - 0"	7' - 0"	HM	FG	HM	F1	4 7/8"	H1	J1			510	
102D	102D	OFF	3' - 0"	7' - 0"	WD	F	HM	F3A	4 7/8"	H1	J1			510	
102E	102E	OFF	3' - 0"	7' - 0"	WD	F	HM	F3A	4 7/8"	H1	J1			510	
102F	102F	OFF	3' - 0"	7' - 0"	WD	F	HM	F3A	4 7/8"	H1	J1			510	
102G	102G	TEST	3' - 0"	7' - 0"	WD	F	HM	F3B	4 7/8"	H1	J1			510	
102H	102H	CONF	3' - 0"	7' - 0"	HM	FG	HM	F1	4 7/8"	H1	J1			510	
102J-1	102J	PASSAGE	3' - 0"	7' - 0"	HM	FG	HM	F1	5 5/8"	H2	J2			510	
102J-2	102J	PASSAGE	3' - 0"	7' - 0"	WD	N	HM	F1	4 7/8"	H1	J1			510	
102L	102L	IDF	3' - 0"	7' - 0"	WD	F	HM	F1	5 5/8"	H2	J2			811	
103A	103A	WAIT	3' - 0"	7' - 0"	WD	HG	HM	F4B	7 5/8"	H2	J2			510	
103B	103B	NURSE	3' - 0"	7' - 0"	WD	F	HM	F3B	4 7/8"	H1	J1			510	
103F	103F	EXAM	3' - 0"	7' - 0"	WD	F	HM	F1	4 7/8"	H1	J1			510	
103G	103G	TLT	3' - 0"	7' - 0"	WD	F	HM	F1	4 7/8"	H1	J1			914	
103H	103H	EXAM	3' - 0"	7' - 0"	WD	F	HM	F1	4 7/8"	H1	J1			510	
103J	103J	STG	3' - 0"	7' - 0"	WD	F	HM	F1	4 7/8"	H1	J1			817	
103K	103K	TLT	3' - 0"	7' - 0"	WD	F	HM	F1	4 7/8"	H1	J1			913	
103L	103L	PASSAGE	3' - 0"	7' - 0"	WD	HG	HM	F1	4 7/8"	H1	J1			510	
104	104	PASSAGE	3' - 0"	7' - 0"	WD	HG	HM	F1	7 5/8"	H2	J2			510	
104A	104A	SP ED OFF	3' - 0"	7' - 0"	WD	F	HM	F3A	4 7/8"	H1	J1			510	
104B	104B	TLT	3' - 0"	7' - 0"	WD	F	HM	F1	4 7/8"	H1	J1			913	
104D	104D	STG-SP ED	3' - 0"	7' - 0"	WD	F	HM	F1	4 7/8"	H1	J1			915	
104E	104E	FACULTY	3' - 0"	7' - 0"	WD	F	HM	F3A	4 7/8"	H1	J1			510	
104F	104F	FLEX OFF	3' - 0"	7' - 0"	WD	F	HM	F3A	4 7/8"	H1	J1			510	
104G	104G	CLOS	3' - 0"	7' - 0"	WD	F	HM	F1	4 7/8"	H1	J1			915	
105A	105A	MEDIA CENTER	6' - 0"	7' - 0"	AL		AL	-						725	
105B-1	105B	PASSAGE	3' - 0"	7' - 0"	WD	F	HM	F3A	7 5/8"	H2	J2			510	
105B-2	105B	PASSAGE	3' - 0"	7' - 0"	WD	HG	HM	F1	4 7/8"	H1	J1			104	
105C	105C	PROJECT	3' - 0"	7' - 0"	WD	F	HM	F1	4 7/8"	H1	J1			510	
105D	105D	STG	3' - 0"	7' - 0"	WD	F	HM	F1	4 7/8"	H1	J1			817	
106-1	106	FLEX SPACE	3' - 0"	7' - 0"	AL	FG	AL	-						314	
106-2	106B	CAREER READINESS	3' - 0"	7' - 0"	WD	F	HM	F1	4 7/8"	H1	J1			104	
106A			3' - 0"	7' - 0"	AL	FG	AL	-						441A	
106B	106B	CAREER READINESS	3' - 0"	7' - 0"	WD	N	HM	F1	7 5/8"	H2	J2		1.5 HR	104	
107	107	PASSAGE	3' - 0"	7' - 0"	WD	F	HM	F3A	7 5/8"	H2	J2			510	
107A	107A	FLEX OFF	3' - 0"	7' - 0"	WD	F	HM	F3A	4 7/8"	H1	J1			510	
107B	107B	PSY OFF	3' - 0"	7' - 0"	WD	F	HM	F3A	4 7/8"	H1	J1			510	
107C	107C	SW OFF	3' - 0"	7' - 0"	WD	F	HM	F3A	4 7/8"	H1	J1			510	
107D	107D	PSY OFF	3' - 0"	7' - 0"	WD	F	HM	F3A	4 7/8"	H1	J1			510	
107E	107E	SW OFF	3' - 0"	7' - 0"	WD	F	HM	F3A	4 7/8"	H1	J1			510	
107F	107F	FLEX OFF	3' - 0"	7' - 0"	WD	F	HM	F3A	4 7/8"	H1	J1			510	
107G	107G	FLEX OFF	3' - 0"	7' - 0"	WD	F	HM	F3A	4 7/8"	H1	J1			510	
107H	107H	STG	3' - 0"	7' - 0"	WD	F	HM	F1	4 7/8"	H1	J1			817	
107J	107J	STG	3' - 0"	7' - 0"	WD	F	HM	F1	4 7/8"	H1	J1			817	
108	108	JC	3' - 0"	7' - 0"	WD	F	HM	F1	7 5/8"	H2	J2			817	
109-1	109	SCH STORE	3' - 0"	7' - 0"	WD	F	HM	F1	7 5/8"	H2	J2			510	
109-2	109	SCH STORE	4' - 0"	3' - 10"										101	OVERHEAD COILING DOOR
109A	109A	STG	3' - 0"	7' - 0"	WD	F	HM	F1	4 7/8"	H1	J1			817	
109B	109B	SGA OFF	3' - 0"	7' - 0"	WD	F	HM	F3A	7 5/8"	H2	J2			510	
109C	109C	TLT	3' - 0"	7' - 0"	WD	F	HM	F1	5 5/8"	H2	J2			913	
110-1			3' - 4"	7' - 0"	WD	F	HM	F1	4 1/4"	H1	J1			510	
110-2	110	PASSAGE	3' - 0"	7' - 0"	WD	N	HM	F1	7 5/8"	H2	J2		1.5 HR	510	
112	112	ELEC	3' - 0"	7' - 0"	WD	F	HM	F1	4 7/8"	H1	J1			811	
113	113	PANTRY	3' - 0"	7' - 0"	WD	F	HM	F1	4 7/8"	H1	J1			817	
114	114	IDF	3' - 0"	7' - 0"	WD	F	HM	F1	4 7/8"	H1	J1			811	
115A	115A	LAUN	3' - 0"	7' - 0"	WD	F	HM	F1	4 7/8"	H1	J1			817	
115B	115B	CARE	3' - 0"	7' - 0"	WD	F	HM	F1	4 7/8"	H1	J1			817	
116	116	TISH	3' - 0"	7' - 0"	WD	F	HM	F1	4 7/8"	H1	J1			914	
120-1	120	CORRIDOR	6' - 0"	8' - 8"	WD	F	HM	F1	2' - 1"					320	
121A	121A	CTE VEST	3' - 4"	7' - 0"	AL	HL	AL	-						713	
121B	121B	STG - COLLAB	3' - 0"	7' - 0"	WD	F	HM	F1	4 7/8"	H1	J1			817	
122-1	122	CISCO LAB	3' - 0"	7' - 8"	WD	FG	HM	-		H1	J1			713	
122-2	122	CISCO LAB	3' - 0"	7' - 8"	WD	FG	HM	-		H1	J1			713	
122A	122A	STG - CISCO	3' - 0"	7' - 0"	WD	F	HM	F1	4 7/8"	H1	J1			817	
123-1	123	GATEWAY CR	3' - 0"	7' - 8"	WD	FG	HM	-		H1	J1			713	
123-2	123	GATEWAY CR	3' - 0"	7' - 8"	WD	FG	HM	-		H1	J1			713	
123-3	123	GATEWAY CR	2' - 4"	7' - 0"	WD	F	HM	F1	4 7/8"	H1	J1			817	ACCESS DOOR
123A	123A	STG-GTW	3' - 0"	7' - 0"	WD	F	HM	F1	4 7/8"	H1	J1			817	
124	124	PLTW CR	3' - 0"	7' - 8"	WD	FG	HM	-		H1	J1			713	
124A	124A	STG-PLTW	3' - 0"	7' - 0"	WD	F	HM	F1	7 5/8"	H2	J2			817	
125	125	MEN	3' - 0"	7' - 0"	WD	F	HM	F1	7 5/8"	H2	J2			210	
126	126	WOMEN	3' - 0"	7' - 0"	WD	F	HM	F1	7 5/8"	H2	J2			210	
140	140	STG-FURN	3' - 6"	7' - 0"	WD	F	HM	F1	4 1/4"	H1	J1			817	
141-1	141	DINING	6' - 4"	7' - 0"	AL	FG	AL	-						445	
141-2	141	DINING	6' - 0"	7' - 0"	WD	F	HM	F1	7 5/8"	H2	J2			445	
141-3			25' - 0"	10' - 0"										101	SIDE FOLDING DOOR
141-4			25' - 0"	10' - 0"										101	SIDE FOLDING DOOR
142	142	RCVG	3' - 0"	7' - 0"	WD	F	HM	F1	7 5/8"	H2	J2			512	
142A	142A	LKR	3' - 0"	7' - 0"	WD	CD	HM	F1	7 5/8"					210	
142B	142B	TLT	3' - 0"	7' - 0"	WD	F	HM	F1	7 5/8"	H2	J2			913	
142C	142C	OFF	3' - 0"	7' - 0"	WD	HG	HM	F1	7 5/8"	H2	J2			510	
142D	142D	JC/SOAP	3' - 0"	7' - 0"	WD	F	HM	F1	7 5/8"	H2	J2			817	
142E	142E	DRY STOR	3' - 0"	7' - 0"	WD	F	HM	F1	5 5/8"	H2	J2			817	
143	143	WOMEN	3' - 0"	7' - 0"	WD	F	HM	F1	7 5/8"	H2	J2			210	
144	144	MEN	3' - 0"	7' - 0"	WD	F	HM	F1	7 5/8"	H2	J2			210	
145	145	JC	3' - 0"	7' - 0"	WD	F	HM	F1	7 5/8"	H2	J2			817	
146-1	146	TICKETS	3' - 0"	7' - 0"	WD	F	HM	F1	7 5/8"	H2	J2			510	
146-2	146	TICKETS	4' - 0"	3' - 10"										101	OVERHEAD COILING DOOR
147	147	IDF	3' - 0"	7' - 0"	WD	F	HM	F1	7 5/8"	H2	J2			811	
148-1	148	STG-PE	3' - 6"	7' - 0"	WD	F	HM	F1	7 5/8"	H2	J2			817	
148-2	148	STG-PE	6' - 0"	7' - 0"	2 HM	F	HM	F1	1' - 4"	H4	J4			321	
149	149	ATHL DIR	3' - 0"	7' - 0"	WD	F	HM	F3A	7 5/8"	H2	J2			510	
150	150	REF LKR	3' - 0"	7' - 0"	WD	F	HM	F1	5 5/8"	H2	J2			510	
151	151	REF LKR	3' - 0"	7' - 0"	WD	F	HM	F1	5 5/8"	H2	J2			510	
152	152	LAUNDRY	3' - 0"	7' - 0"	WD	F	HM	F1	5 5/8"	H2	J2			817	
153A	153A	LKRS - WOMEN'S	3' - 0"	7' - 0"	WD	F	HM	F1	5 5/8"	H2	J2			211	
153B-1	153B	OFFICE	3' - 0"	7' - 0"	WD	F	HM	F3A	5 5/8"	H2	J2			510	
153B-2	153B	OFFICE	3' - 0"	7' - 0"	WD	F	HM	F3A	5 5/8"	H2	J2			510	
153C	153C	LKR/TLT	3' - 0"	7' - 0"	WD	F	HM	F1	5 5/8"	H2	J2			913	
153D	153D	TEAM - WOMEN'S	3' - 0"	7' - 0"	WD	N	HM	F1	5 5/8"	H2	J2			211	
154A	154A	LKRS - MEN'S	3' - 0"	7' - 0"	WD	F	HM	F1	5 5/8"	H2	J2			211	
154B-1	154B	OFFICE	3' - 0"	7' - 0"	WD	F	HM	F3A	5 5/8"	H2	J2			510	
154B-2	154B	OFFICE	3' - 0"	7' - 0"	WD	F	HM	F3A	5 5/8"	H2	J2			510	
154C	154C	LKR/TLT	3' - 0"	7' - 0"	WD	F	HM	F1	5 5/8"	H2	J2			913	
154D	154D	TEAM - MEN'S	3' - 0"	7' - 0"	WD	N	HM	F1	5 5/8"	H2	J2			211	
155-1	155	GYMNASIUM	6' - 0"	7' - 0"	WD	F	HM	F1	7 5/8"	H2	J2			325	
155-2	155	GYMNASIUM	6' - 0"	7' - 0"	WD	F	HM	F1	7 5/8"	H2	J2			325	
155-3	155	GYMNASIUM	6' - 0"	7' - 0"	WD	F	HM	F1	7 5/8"	H2	J2			325	
155-4	155	GYMNASIUM	3' - 10"	7' - 4"	AL	FG	AL							323A	
155-5	155	GYMNASIUM	3' - 10"	7' - 4"	AL	FG	AL	-						323A	
156-1	156	AUXILIARY GYM	6' - 0"	7' - 0"	WD	F	HM	F1	7 5/8"	H2	J2			325	
156-2	156	AUXILIARY GYM	6' - 0"	7' - 0"	4 HM	F	HM	F1	1' - 6"	H4	H4	S4		323	
3 160	001I	GREENHOUSE 2	6' - 0"	7' - 0"	AL	FG	AL	-						321B	
201A-1	200A	CORRIDOR	3' - 0"	7' - 0"	WD	HG	HM	F4B	5 5/8"	H2	J2			713	
201A-2	200A	CORRIDOR	3' - 0"	7' - 0"	WD	HG	HM	F4B	5 5/8"	H2	J2			713	
201A-3	201A	CHEMISTRY	3' - 0"	7' - 0"	WD	F	HM	F1	4 7/8"	H1	J1			713	
201A-4	324	RESOURCE	3' - 0"	7' - 0"	WD	HG	HM	F4B	7 5/8"	H2	J2			713	
201B-1	201B	STG-CHEM	3' - 0"	7' - 0"	WD	N	HM	F1	4 7/8"	H1	J1			817	
201B-2	201B	STG-CHEM	3' - 0"	7' - 0"	WD	F	HM	F1	4 7/8"	H1	J1			817	
201C-1	201C	PREP	3' - 0"	7' - 0"	WD	HG	HM	F1	4 7/8"	H1	J1			713	
201C-2	201C	PREP	3' - 0"	7' - 0"	WD	HG	HM	F1	4 7/8"	H1	J1			713	
202B-1	202B	STG-BIO	3' - 0"	7' - 0"	WD	N	HM	F1	4 7/8"	H1	J1			817	
202B-2	202B	STG-BIO	3' - 0"	7' - 0"	WD	F	HM	F1	4 7/8"	H1	J1			817	
202C	202C	STG-COLLAB	3' - 0"	7' - 0"	WD	N	HM	F1	5 5/8"	H2	J2			915	
203	203	CLASSRM (Type 1B)	3' - 0"	7' - 0"	WD	HG	HM	F4B	7 5/8"	H2	J2			713	
204A	204A	CLASSRM (Type 2)	3' - 0"	7' - 0"	WD	HG	HM	F4B	7 5/8"	H2	J2			713	
204B	204B	CLASSRM (Type 3)	3' - 0"	7' - 0"	WD	HG	HM	F4B	7 5/8"	H2	J2			713	
205	205	CLASSRM (Type 1C)	3' - 0"	7' - 0"	WD	HG	HM	F4B	7 5/8"	H2	J2			713	
206	206	CLASSRM (Type 8)	3' - 0"	7' - 0"	WD	HG	HM	F4B	7 5/8"	H2	J2			713	
207	207	FOT LAB	3' - 0"	7' - 0"	WD	HG	HM	F4A	7 5/8"	H2	J2			713	
207A	207A	STG-FOT	3' - 0"	7' - 0"	WD	HG	HM	F1	4 7/8"	H1	J1			817	
208	208	CLASSRM (Type 5)	3' - 0"	7' - 0"	WD	HG	HM	F4A	7 5/8"	H2	J2			713	
209	209A	CORRIDOR	3' - 0"	7' - 0"	WD	HG	HM	F4B	7 5/8"	H2	J2			713	
209A-1	209A	SE OFF	3' - 0"	7' - 0"	HM		HM	F1	7 5/8"	H2	J2			510	
209A-2	209A	SE OFF	3' - 0"	7' - 0"	WD	F	HM	F1	7 5/8"	H2	J2			510	
209A-3	209A	SE OFF	3' - 0"	7' - 0"	WD	F	HM	F1	7 5/8"	H2	J2			510	
210	210	CLASSRM (Type 1B)	3' - 0"	7' - 0"	WD	HG	HM	F4B	7 5/8"	H2	J2			713	
211-1	211	CLASSRM (Type 3)	3' - 0"	7' - 0"	WD	HG	HM	F4B	7 5/8"	H2	J2			713	
211-2	211	CLASSRM (Type 3)	3' - 0"	7' - 0"	WD	F	HM	F1	4 7/8"	H1	J1			713	
212	212	CLASSRM (Type 1C)	3' - 0"	7' - 0"	WD	HG	HM	F4B	7 5/8"	H2	J2			713	
213	213	CLASSRM (Type 2)	3' - 0"	7' - 0"	WD	HG	HM	F4B	7 5/8"	H2	J2			713	
213-2	213	CLASSRM (Type 2)	3' - 0"	7' - 0"	WD	F	HM	F1	4 7/8"	H1	J1		



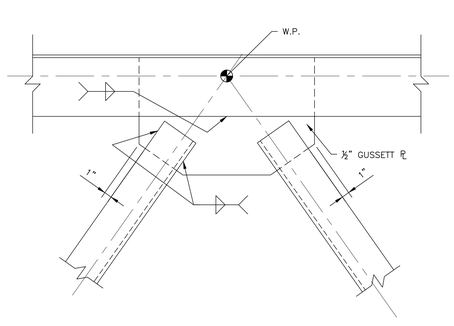
1 S-211 TRUSS ELEVATION
SCALE: 3/8"=1'-0"

NOTE:

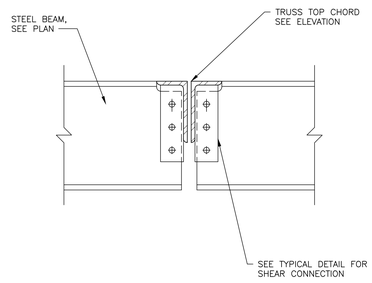
1. ALL TRUSS CONNECTIONS SHALL BE DESIGNED BY A LICENSED ENGINEER WORKING FOR THE STEEL FABRICATOR WHO SHALL SUBMIT CALCULATIONS FOR APPROVAL PRIOR TO FABRICATION. CONNECTIONS SHOWN HERE ARE SUGGESTED DETAILS AND ALTERNATE DETAILS MAY BE USED AT THE DISCRETION OF THE ENGINEER RESPONSIBLE FOR THE CONNECTION DESIGN.



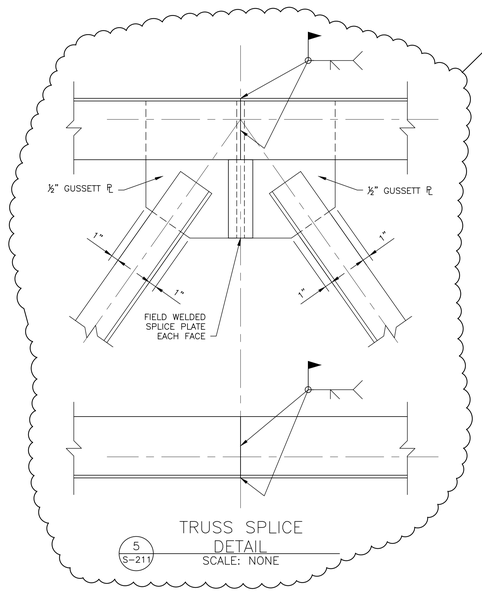
2 S-211 TRUSS TO COLUMN CONNECTION
SCALE: NONE



3 S-211 TYP TRUSS WEB CONNECTION
SCALE: NONE



4 S-211 BEAM TO TRUSS CONNECTION
SCALE: NONE



5 S-211 TRUSS SPLICE DETAIL
SCALE: NONE

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EDUCATIONAL SYSTEMS PLANNING
49 OLD SOLOMONS ISLAND RD, SUITE 301
ANNAPOLIS, MD 21401

Baltimore City Public Schools
Additions & Renovations at Robert Poole Building #056
1300 W 36TH ST, BALTIMORE, MD 21211

I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND.
LICENSE NO.: 23393
EXPIRATION DATE: 8/25/2016

No.	DATE	DESCRIPTION
1	05/06/16	ADDENDUM #5

BID ISSUE

PROJECT No.: 2015-013
DATE: 3/31/16
SCALE: As Indicated
DRAWING NAME

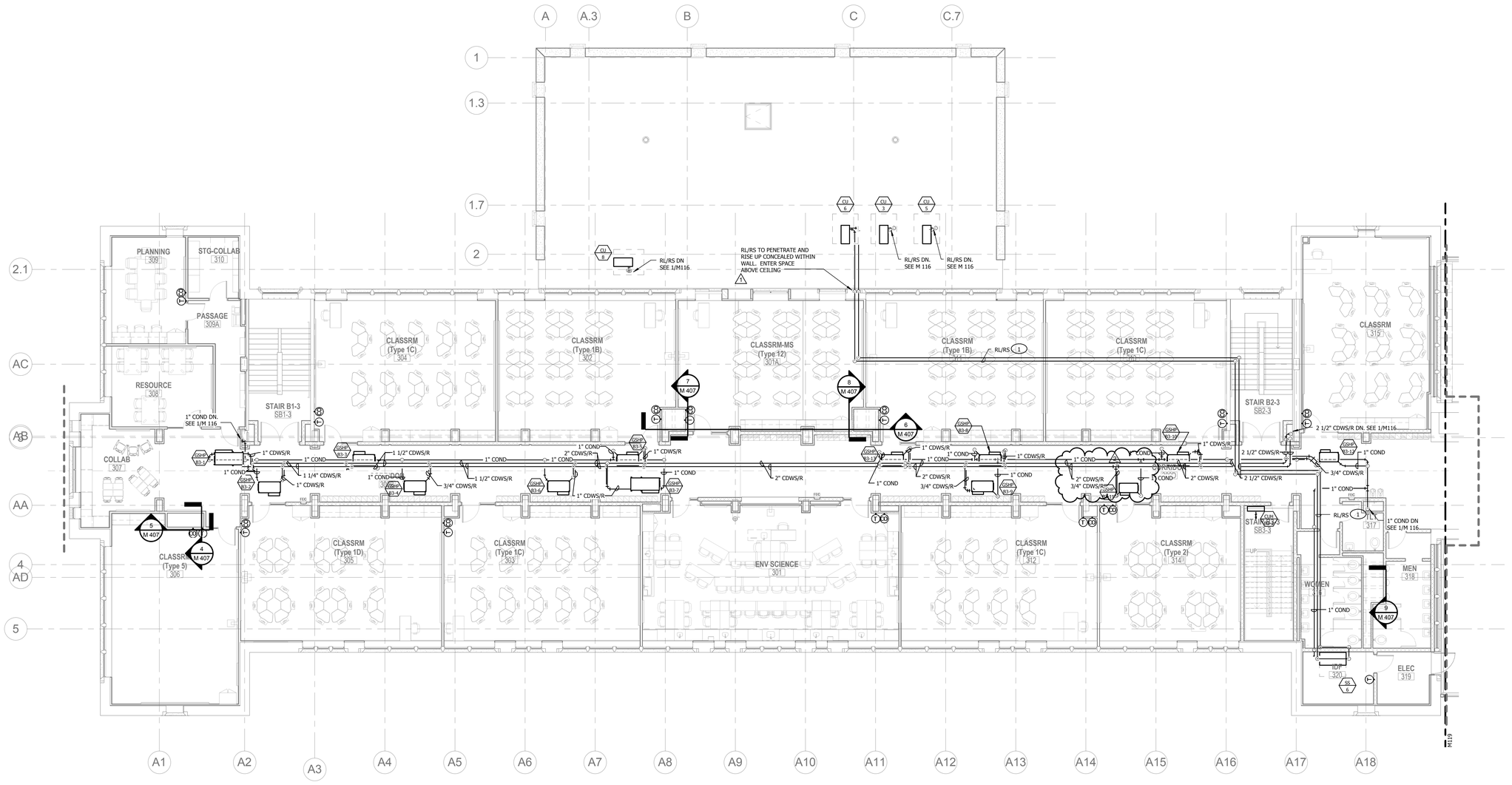
TRUSS ELEVATION AND DETAILS

S-211

3/18/2016 5:47 PM

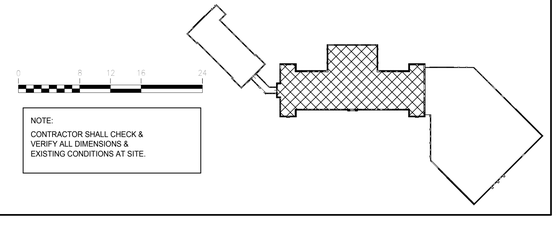
KEYED NOTES:

1. REFRIGERANT LINES SIZED PER MANUFACTURER'S STANDARDS.



1 M 118 NEW WORK THIRD FLOOR PLAN B - MECHANICAL PIPING

1/8" = 1'-0"



NOTE:
CONTRACTOR SHALL CHECK & VERIFY ALL DIMENSIONS & EXISTING CONDITIONS AT SITE.

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I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND.
LICENSE NO.: 18294
EXPIRATION DATE: 12/14/2016

No.	DATE	DESCRIPTION
1	04/22/16	ADDENDUM #2
2	05/06/16	ADDENDUM #5

BID ISSUE

PROJECT No.: 152-01

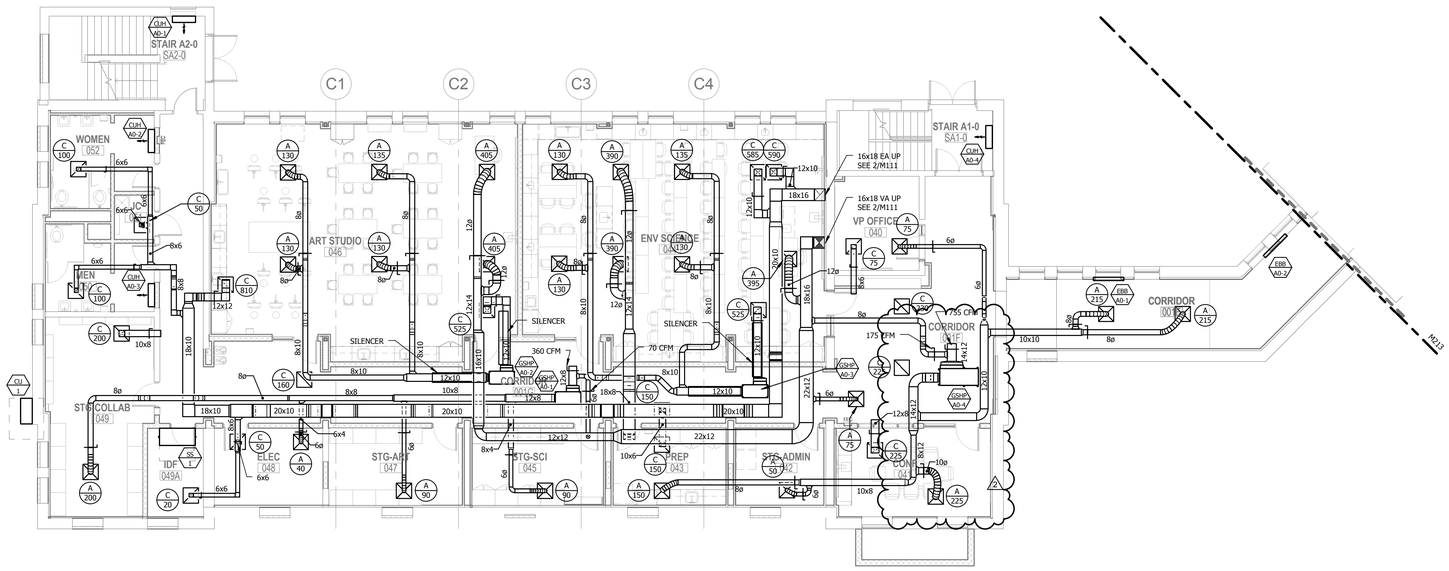
DATE: 03/31/16

SCALE: AS NOTED

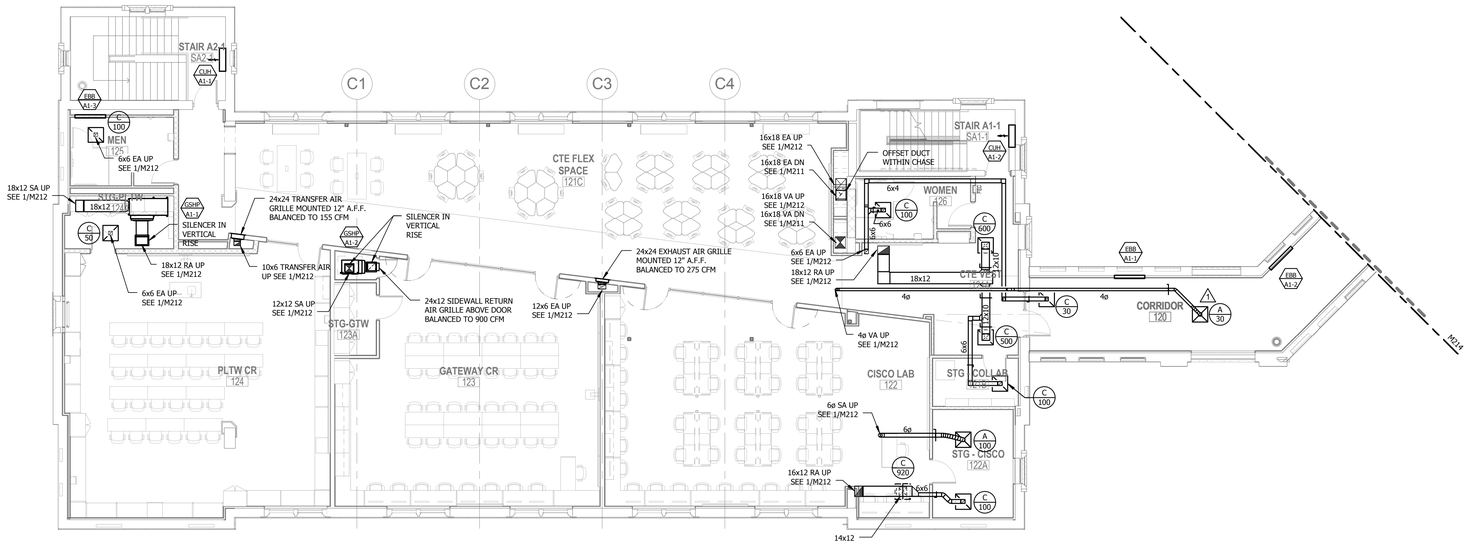
DRAWING NAME
NEW WORK THIRD FLOOR PLAN B - MECHANICAL PIPING

M 118

5/6/2016 2:31:43 PM



1 / M 211 NEW WORK BASEMENT FLOOR PLAN A - DUCTWORK
1/8" = 1'-0"



2 / M 211 NEW WORK FIRST FLOOR PLAN A - DUCTWORK
1/8" = 1'-0"

NOTE:
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I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY REGISTERED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND.
LICENSE NO.: 16294
EXPIRATION DATE: 12/14/2016

No.	DATE	DESCRIPTION
1	04/22/16	ADDENDUM #2
2	05/06/16	ADDENDUM #5

BID ISSUE

PROJECT No.: 152-01

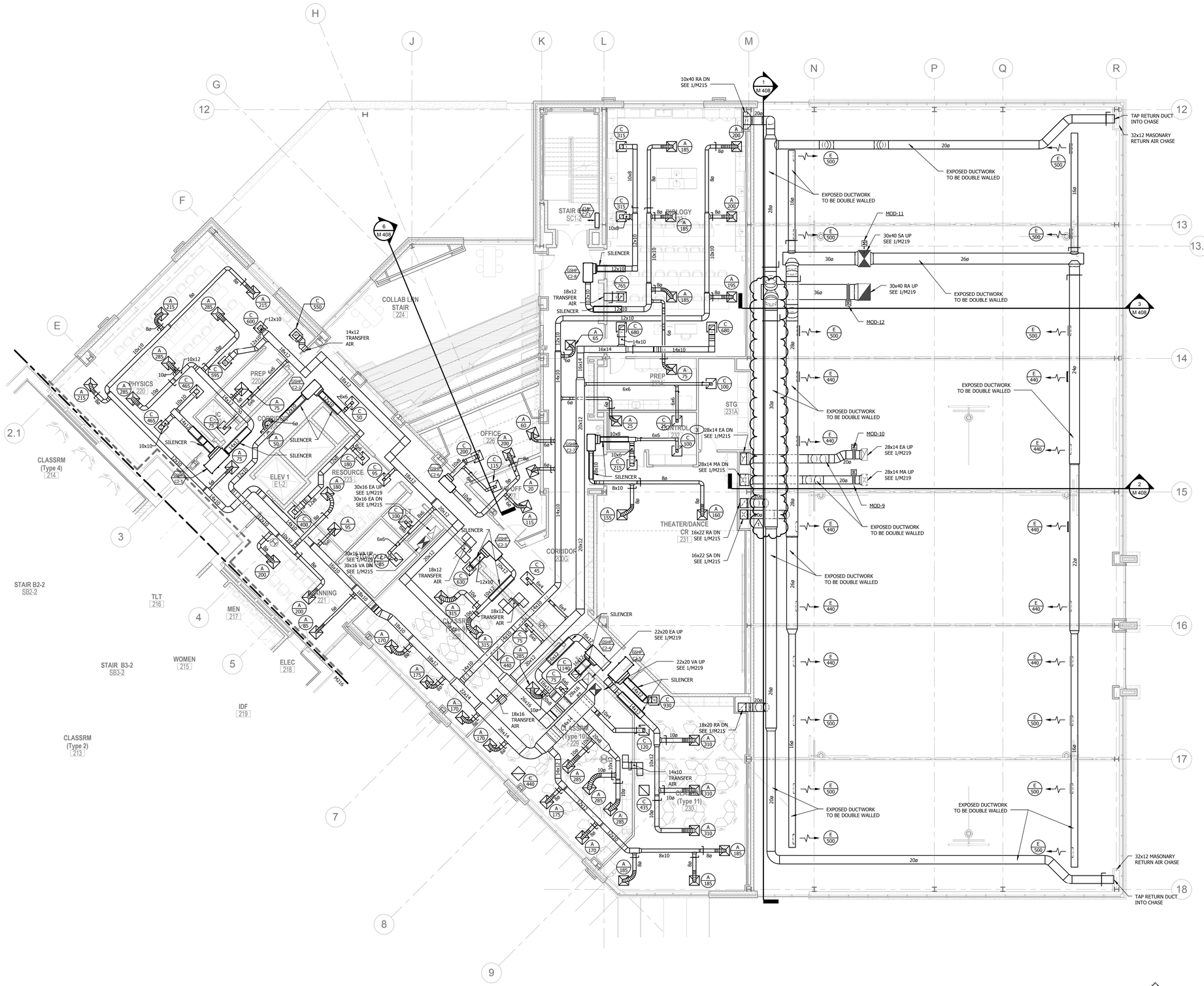
DATE: 03/31/16

SCALE: AS NOTED

DRAWING NAME
NEW WORK BASEMENT & FIRST FLOOR PLAN A - DUCTWORK

M 211

5/6/2016 2:33:43 PM



KEYED NOTES:

1. EXHAUST DUCT TO BE STEEL WITH MINIMUM THICKNESS OF 0.0575 IN(NO. 16 GAGE)

1 M 217 NEW WORK SECOND FLOOR PLAN C - DUCTWORK
1/8" = 1'-0"

0 8 12 16 24

NOTE:
CONTRACTOR SHALL CHECK & VERIFY ALL DIMENSIONS & EXISTING CONDITIONS AT SITE.

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LICENSE NO.: 1029A
EXPIRATION DATE: 12/14/2016

No.	DATE	DESCRIPTION
1	05/06/16	ADDENDUM #5

BID ISSUE

PROJECT No.: 152-01

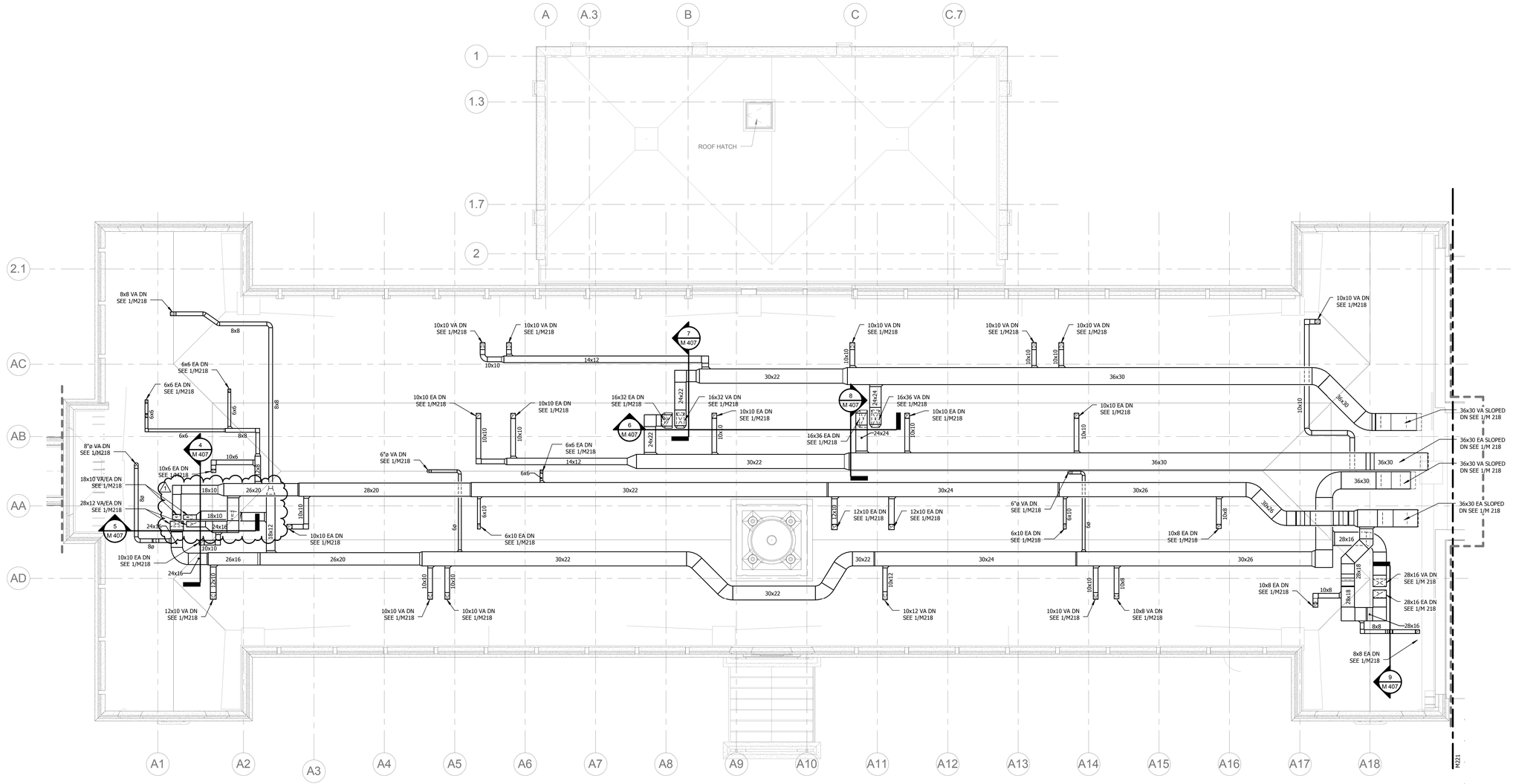
DATE: 03/31/16

SCALE: AS NOTED

DRAWING NAME
NEW WORK SECOND FLOOR PLAN C - DUCTWORK

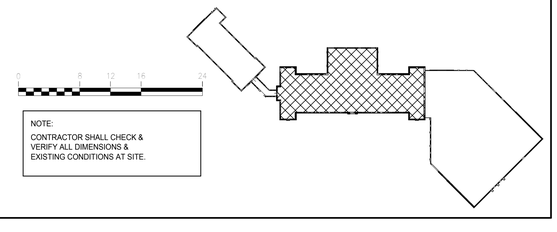
M 217

5/6/2016 2:39:38 PM



1 M 220 NEW WORK ROOF PLAN B - DUCTWORK

1/8" = 1'-0"



NOTE:
CONTRACTOR SHALL CHECK & VERIFY ALL DIMENSIONS & EXISTING CONDITIONS AT SITE.

5/6/2016 2:46:02 PM

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LICENSE NO.: 19294
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No.	DATE	DESCRIPTION
1	05/06/16	ADDENDUM #5

BID ISSUE

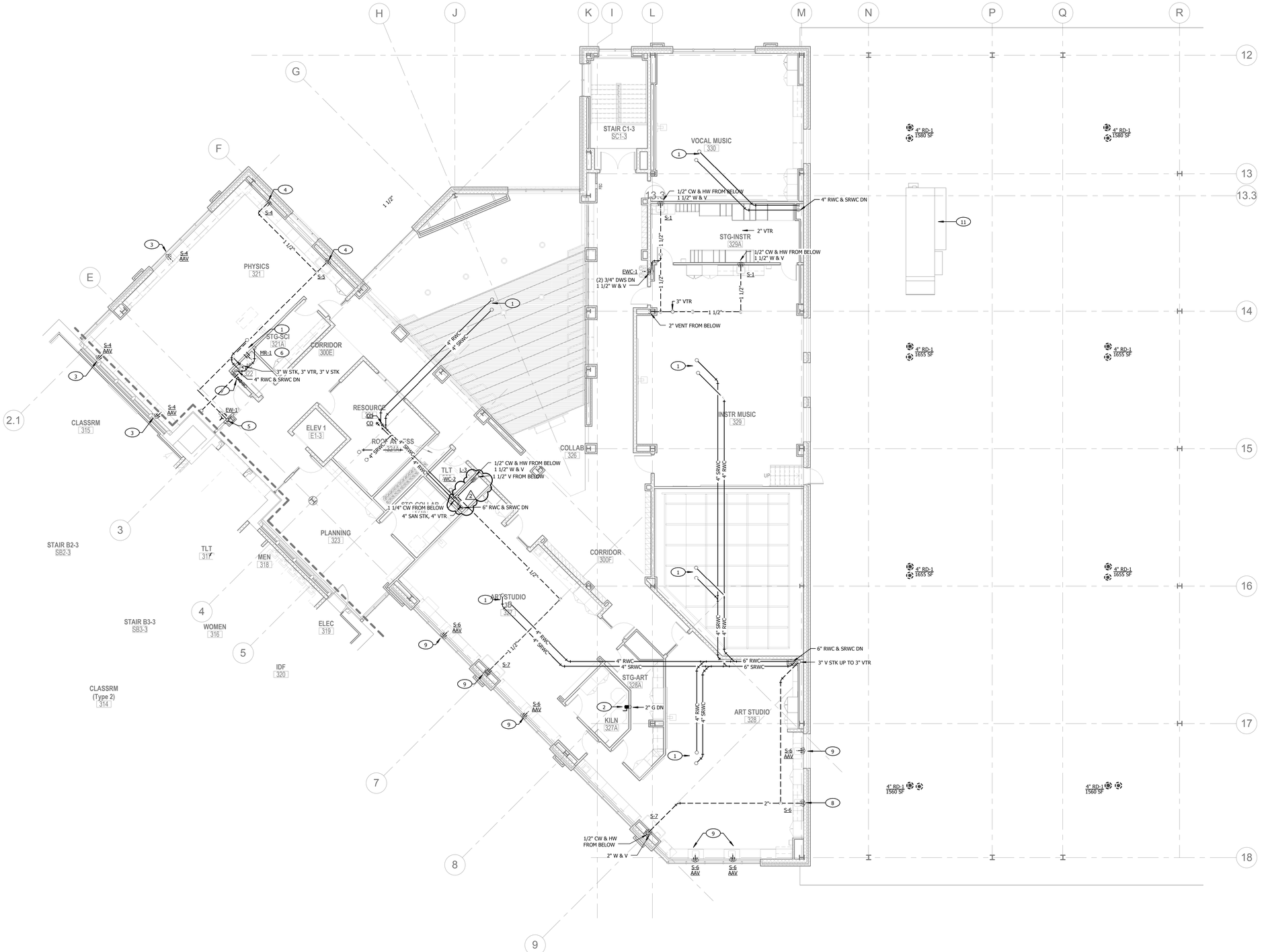
PROJECT No.: 152-01

DATE: 03/31/16

SCALE: AS NOTED

DRAWING NAME
NEW WORK ROOF PLAN B - DUCTWORK

M 220



1 P 119 NEW WORK THIRD FLOOR PLAN C - PLUMBING
1/8" = 1'-0"

KEYED NOTES:

1. 4" PRIMARY AND SECONDARY RAINWATER CONDUCTOR UP TO RD-1.
2. 2" GAS TO KILN. PROVIDE SHUTOFF AND CONNECT WITH FLEXIBLE APPLIANCE CONNECTOR.
3. 1/2" COLD WATER FROM BELOW TO SINK. 1 1/2" WASTE DOWN WITH AUTOMATIC AIR VENT BELOW SINK.
4. 1/2" COLD FROM BELOW. 1 1/2" AND VENT.
5. 1/2" TEPID WATER FROM BELOW, 1 1/2" WASTE AND VENT FOR EYEWASH.
6. 1/2" COLD AND HOT WATER FROM BELOW.
7. EMERGENCY SHUT OFF VALVES FROM 3/4" COLD, 1/2" HOT WATER AND 1/2" GAS FOR PHYSICS 321.
8. 1/2" COLD AND HOT WATER FROM BELOW. 1 1/2" WASTE AND VENT.
9. 1/2" COLD AND HOT WATER FROM BELOW. 1 1/2" WASTE DOWN WITH AUTOMATIC AIR VENT.
10. 1/2" COLD AND HOT WATER FROM BELOW. 2" WASTE AND 1 1/2" VENT.
11. 2" GAS FROM BELOW ROOF TO MAKEUP AIR UNIT. CONNECT TO UNIT PER MANUFACTURER'S LITERATURE AND DETAIL 9/P 700. FLASH ROOF PENETRATION.

⚠ REVISED PLUMBING

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BID ISSUE

PROJECT No.: 152-01

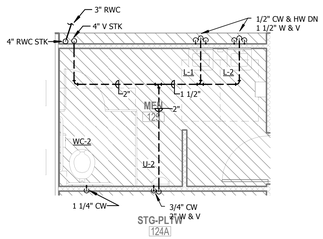
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SCALE: AS NOTED

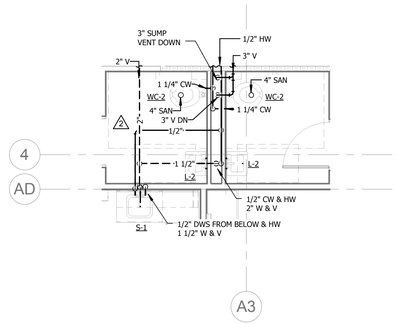
DRAWING NAME
NEW WORK THIRD FLOOR PLAN C - PLUMBING

P 119

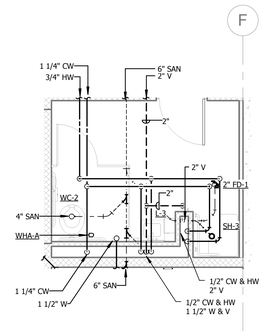
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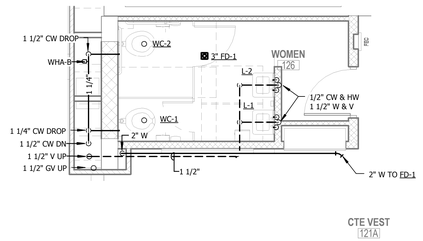
1 P 400 ENLARGED MEN 125
1/4" = 1'-0"



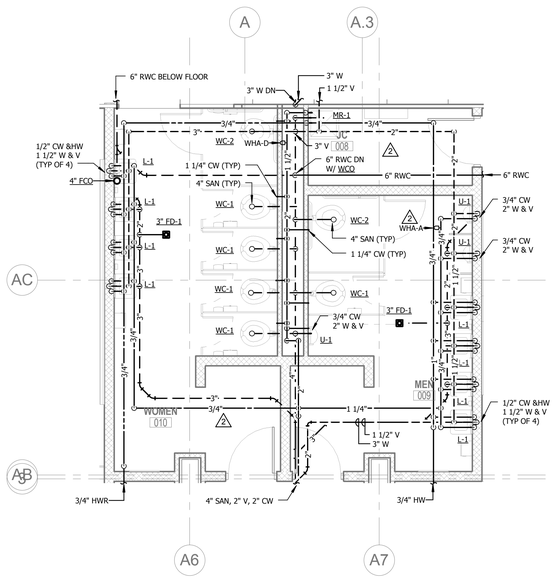
2 P 400 ENLARGED TOILET 103G
1/4" = 1'-0"



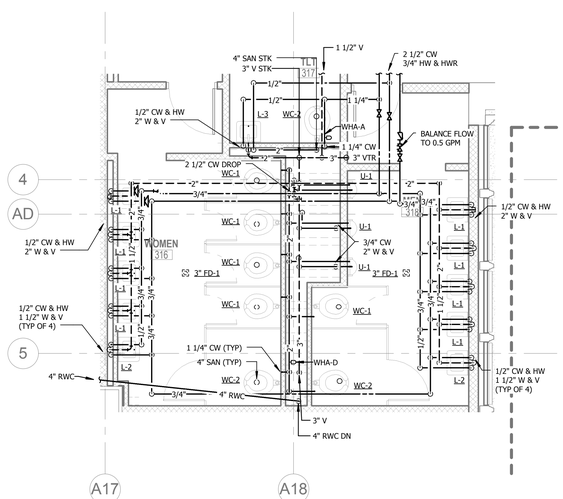
3 P 400 ENLARGED TOILET/SHOWER 042
1/4" = 1'-0"



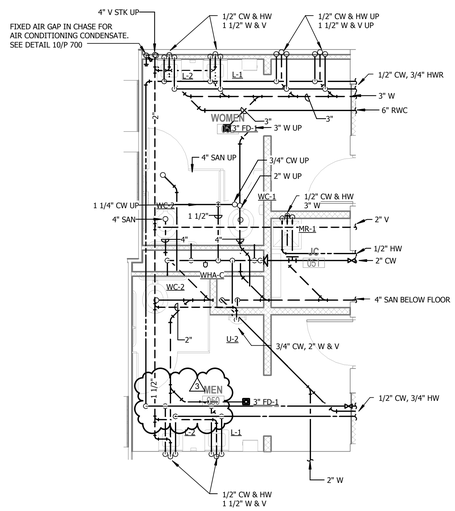
5 P 400 ENLARGED WOMEN 126
1/4" = 1'-0"



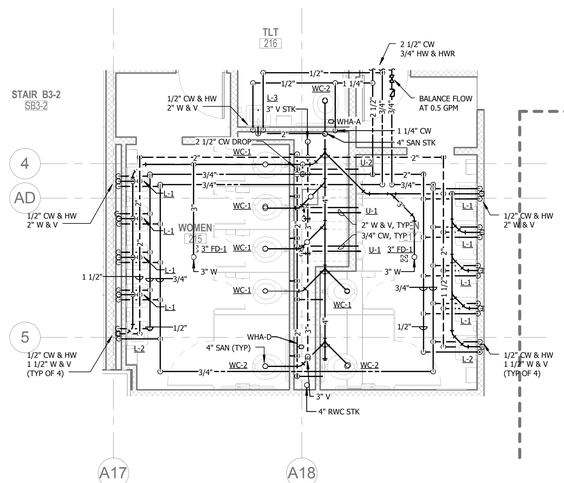
4 P 400 ENLARGED MEN'S 008/WOMEN'S 009
1/4" = 1'-0"



6 P 400 ENLARGED MEN 318/WOMEN 319
1/4" = 1'-0"



7 P 400 ENLARGED MEN'S 060/WOMEN'S 062
1/4" = 1'-0"



8 P 400 ENLARGED MEN 215A/WOMEN215B
1/4" = 1'-0"

1

5/6/2016 3:00:30 PM

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EXPIRATION DATE: 12/14/2016

No.	DATE	DESCRIPTION
1	04/14/16	ADDENDUM #1
2	04/27/16	ADDENDUM #3
3	05/06/16	ADDENDUM #5

BID ISSUE

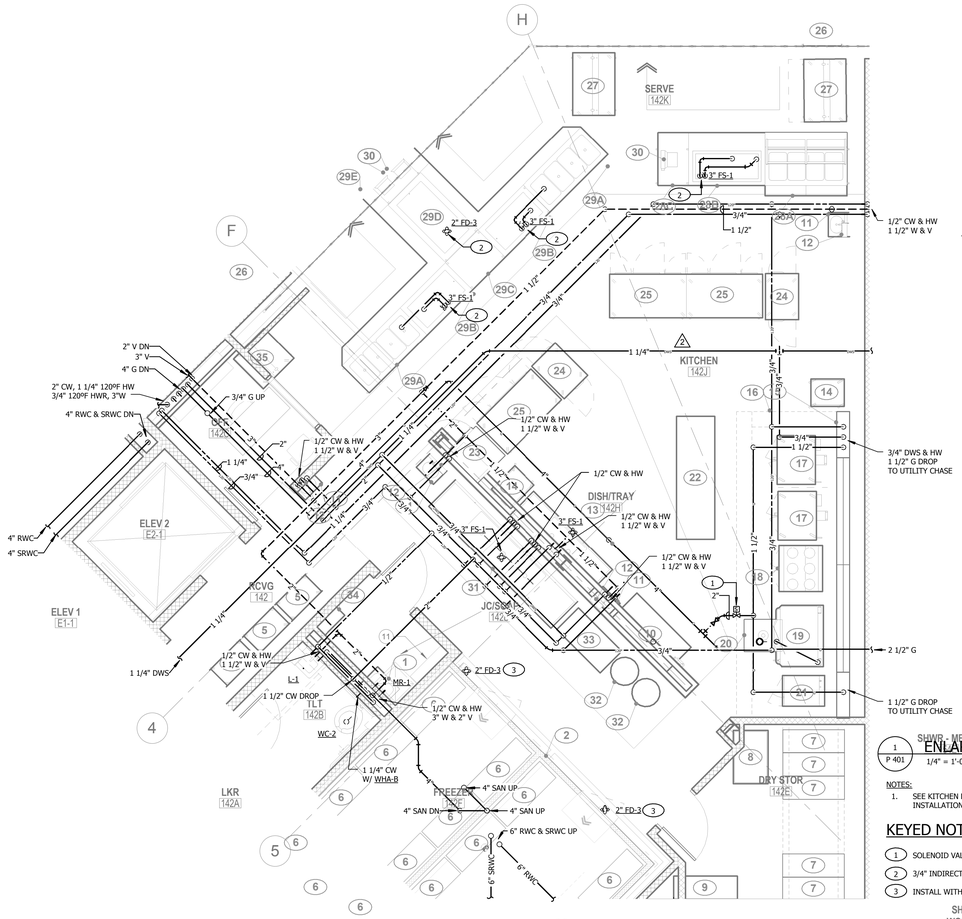
PROJECT No.: 152-01

DATE: 03/31/16

SCALE: AS NOTED

DRAWING NAME
ENLARGED PLANS - PLUMBING

P 400



ENLARGED KITCHEN - PLUMBING

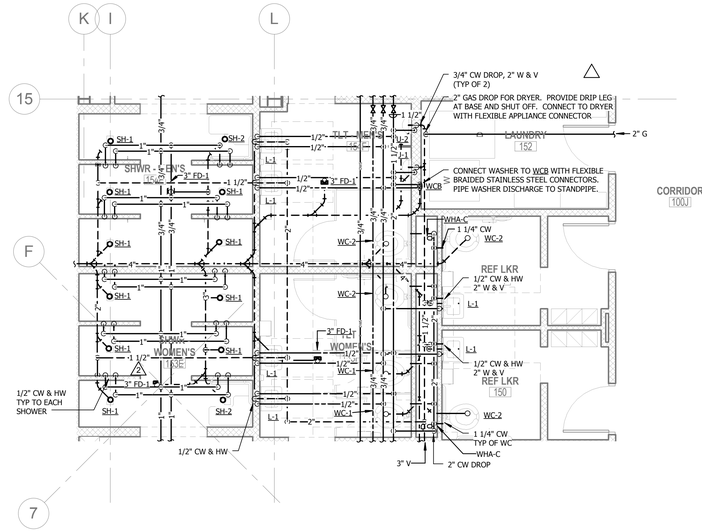
1/4" = 1'-0"

NOTES:

1. SEE KITCHEN DRAWINGS FOR PLUMBING CONTRACTOR RESPONSIBILITIES RELATED TO INSTALLATION OF KITCHEN EQUIPMENT.

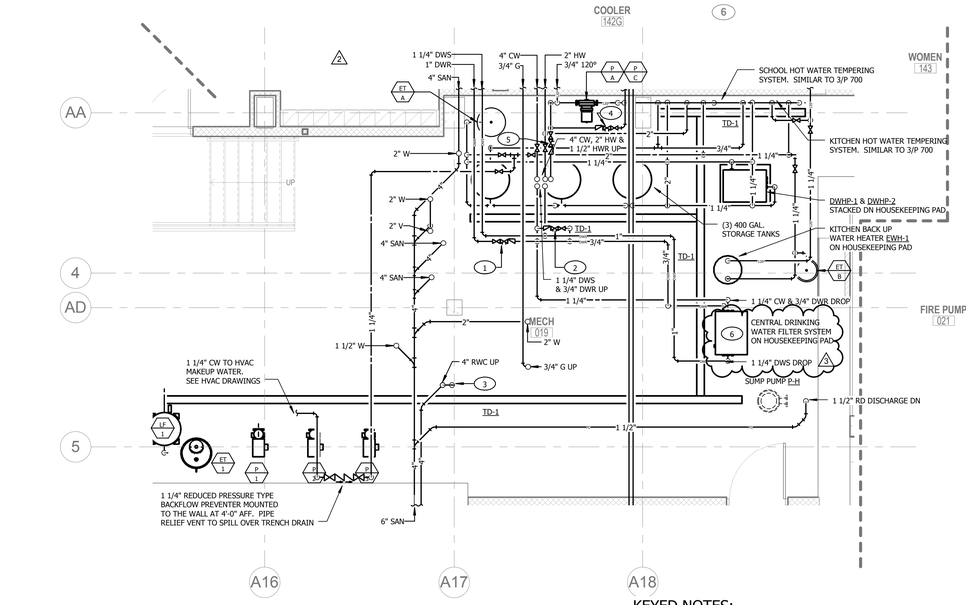
KEYED NOTES:

1. SOLENOID VALVE BY P.C. FOR CONNECTION TO HOOD SUPPRESSION SYSTEM.
2. 3/4" INDIRECT WASTE FROM HOT WELLS/COLD WELLS TO FLOOR SINK WITH AIR GAP.
3. INSTALL WITH TOP OF RIM FLUSH WITH FINISHED FLOOR.



ENLARGED LOCKER ROOM

1/4" = 1'-0"

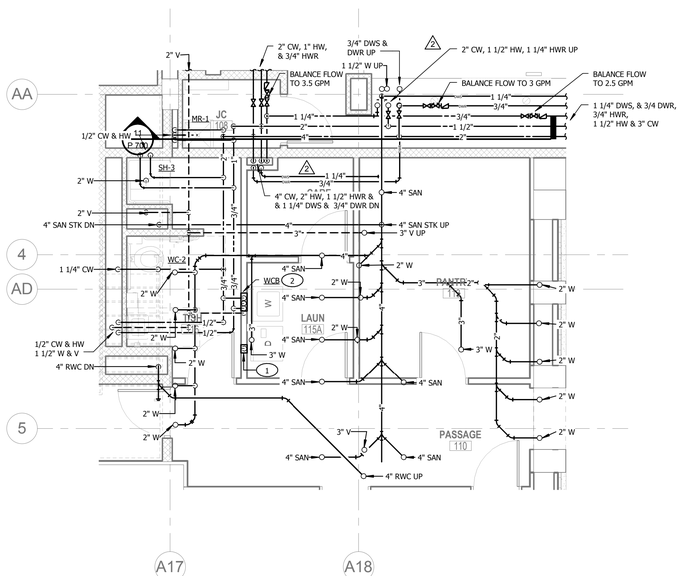


ENLARGED MECHANICAL ROOM - PLUMBING

1/4" = 1'-0"

KEYED NOTES:

1. BALANCE FLOW TO 3 GPM.
2. BALANCE FLOW TO 3.5 GPM.
3. FIXED AIR GAP FOR AIR CONDITIONING CONDENSATE AT BASE OF STACK. SIMILAR TO DETAIL 10/P 700.
4. BALANCE FLOW TO 5.5 GPM.
5. BALANCE FLOW TO 12.5 GPM.
6. (1) IL10-SF-TM-L-MOD MODIFIED IN-LINE STERI-FLO FILTER/PURIFIER/STERILIZER (ON SKID) INCLUDING 1 RETICULATING PUMP, (1) QUARTZ SLEEVE AND LAMP, (3) 5 MICRON SPUN POLYPRO PRE-FILTER ELEMENT AND MICRON LEAD REMOVAL CARBON BLOCK FILTER ELEMENTS. PUMP TO BE PLACED ON THE RETURN LINE. 100 GPM RATE.

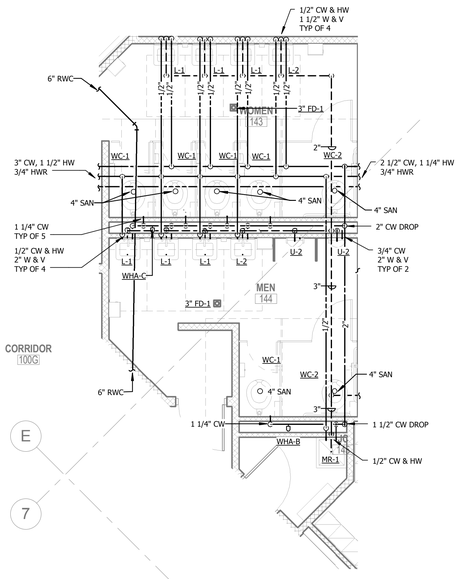


ENLARGED LAUNDRY - PLUMBING

1/4" = 1'-0"

KEYED NOTES:

1. GAS CONNECTION BOX IN WALL WITH 3/4" GAS FROM BELOW. CONNECT DRYER WITH FLEXIBLE APPLIANCE CONNECTION.
2. 1/2" COLD AND HOT WATER, 2" WASTE AND VENT TO WCB. CONNECT WASHER WITH FLEXIBLE STAINLESS STEEL BRAIDED SUPPLY CONNECTORS.



ENLARGED WOMEN 143/MEN 144

1/4" = 1'-0"

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BID ISSUE

PROJECT No.: 152-01

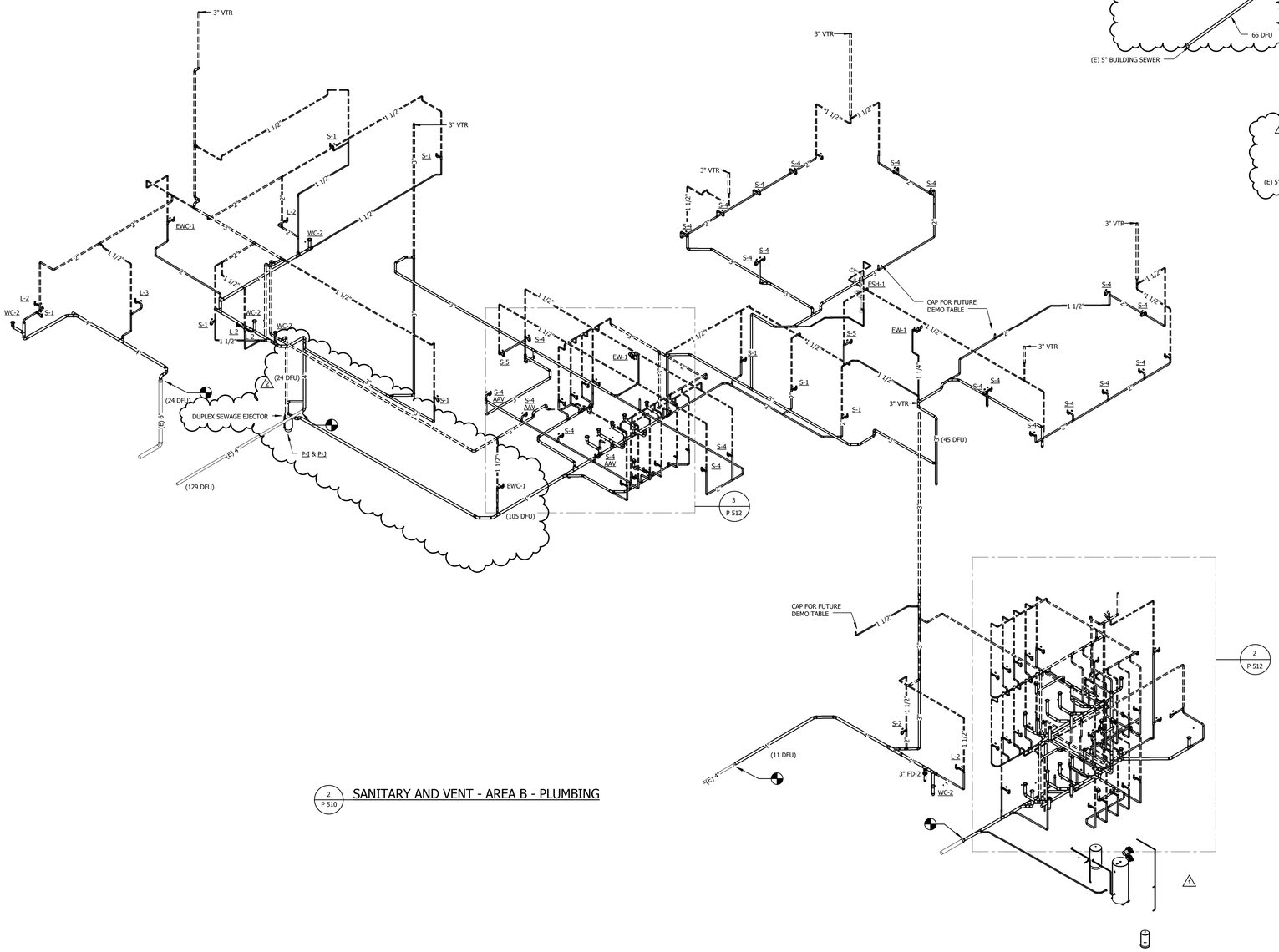
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SCALE: AS NOTED

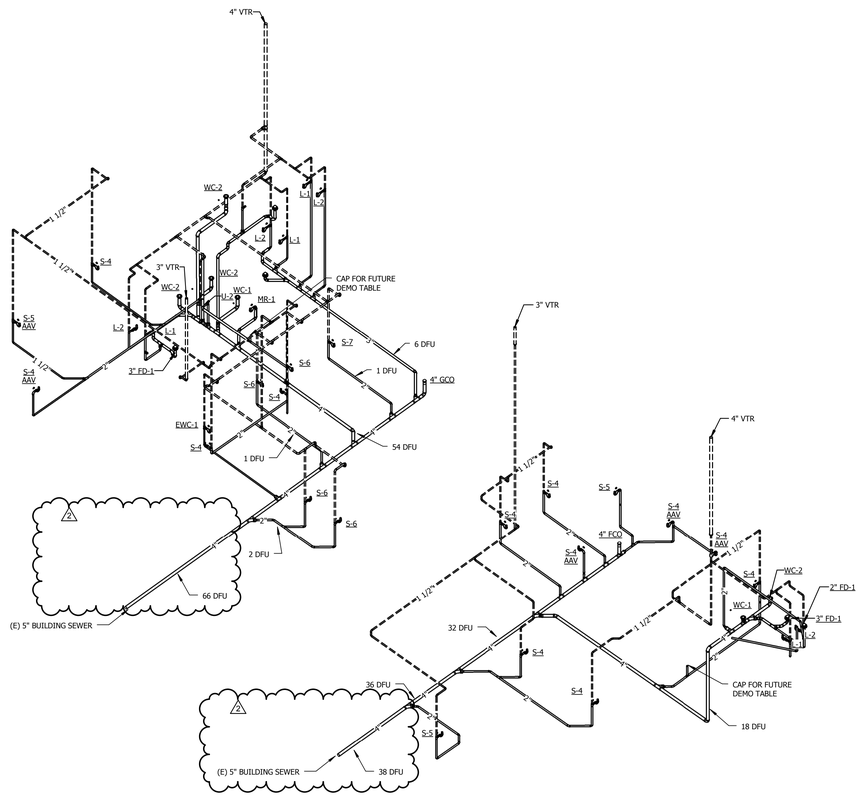
DRAWING NAME:
ENLARGED PLANS - PLUMBING

P 401

5/3/2016 4:33:58 PM



2 P 510 SANITARY AND VENT - AREA B - PLUMBING



1 P 510 SANITARY AND VENT - AREA A - PLUMBING

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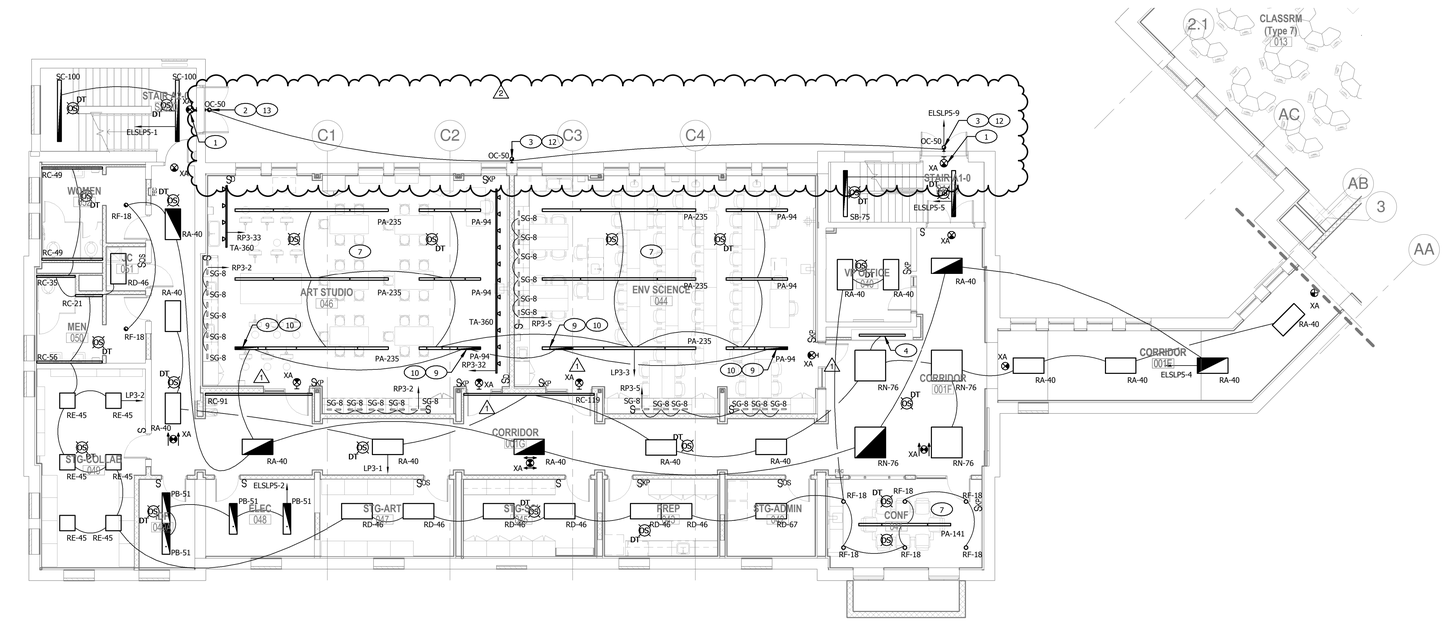
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SCALE: AS NOTED

DRAWING NAME
SANITARY AND VENT - AREA A & B - PLUMBING

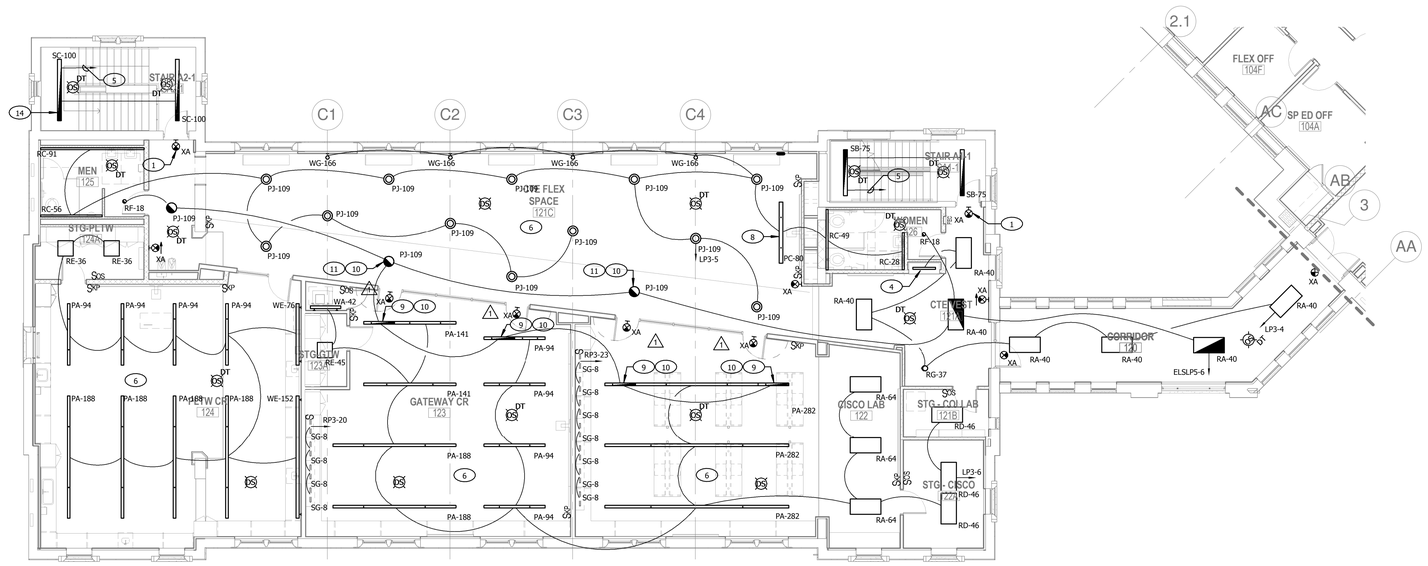
P 510

5/6/2016 3:05:09 PM



1 E 111 NEW WORK BASEMENT FLOOR PLAN A - LIGHTING

1/8" = 1'-0"



2 E 111 NEW WORK FIRST FLOOR PLAN A - LIGHTING

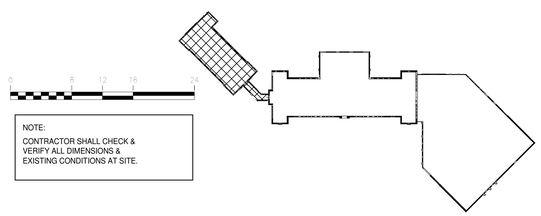
1/8" = 1'-0"

GENERAL NOTES:

A. UNLESS NOTED OTHERWISE, PROVIDE BODINE GTD (OR APPROVED EQUAL) FOR CONNECTION OF EMERGENCY CIRCUIT TO NORMAL/EMERGENCY FIXTURES. REFER TO DRAWING E 501 FOR TYPICAL INSTALLATION DETAIL.
B. OCCUPANCY SENSOR/DAYLIGHT SENSOR LOCATIONS ARE DIAGRAMMATIC AND ARE SHOWN TO INDICATE AREAS TO BE COVERED ONLY. PROVIDE QUANTITIES/LOCATIONS AND RELATED APPURTENANCES AS REQUIRED FOR COVERAGE AS DEFINED IN THE SPECIFICATIONS.
C. CONNECT EXIT SIGNS UNSWITCHED TO NEAREST NORMAL/EMERGENCY CIRCUIT WITH 2 #12 & 1 #12 GROUND IN 3/4" CONDUIT.
D. REFER TO DRAWING E401 FOR A TYPICAL CLASSROOM LAYOUT AND CONTROL DETAIL.

KEYED NOTES:

1. MOUNT EXIT SIGN 1'-0" ABOVE TOP OF DOOR FRAME.
2. MOUNT WALL SCONCE HALFWAY BETWEEN EXISTING STEEL LINTEL AND CAST STONE BAND DIRECTLY ABOVE IT; AT APPROXIMATELY 14' AFG.
3. MOUNT WALL SCONCE AT SAME DISTANCE BELOW CAST STONE BAND AS THE TYPE 'OC-50' FIXTURE THAT IS LOCATED AT EASTERN EXIT DOOR FROM STAIR A2-0.
4. DISPLAY CASE LIGHTING TO BE PROVIDED BY CASEWORK VENDOR. ELECTRICAL CONTRACTOR SHALL PROVIDE POWER AND CONNECTION TO LIGHT FIXTURES. CONNECT FIXTURES TO NORMAL POWER CIRCUIT FEEDING THE NEAREST CORRIDOR LIGHT FIXTURE.
5. CONNECT TO CIRCUIT DOWN ON FLOOR BELOW.
6. MOUNT THE PENDANT LIGHT FIXTURES IN THIS ROOM SUCH THAT THE FIXTURES ARE CENTERED ON THE UPPER WINDOWS OF THE EXTERIOR WALL; AT APPROXIMATELY 14' AFF TO CENTER OF FIXTURE.
7. MOUNT THE PENDANT LIGHT FIXTURES IN THIS ROOM AT 7'-9" AFF TO BOTTOM OF FIXTURE.
8. MOUNT FIXTURE AS NOTED IN LIGHTING FIXTURE SCHEDULE, SHEET E700.
9. CONNECT LAST 4' OF FIXTURE ROW TO NORMAL/EMERGENCY CIRCUIT INDICATED AND PROVIDE BODINE GTD-20A CONTROL UNIT FOR CIRCUIT INTERFACE. REMAINDER OF FIXTURE ROW SHALL BE CONNECTED TO NORMAL POWER CIRCUIT INDICATED.
10. INSTALL ALL NECESSARY CONTROL AND POWER WIRING BETWEEN ROOM CONTROL SYSTEM AND LOCAL FIXTURE GTD DEVICE TO ALLOW CONTROL OF NORMAL EMERGENCY FIXTURES WITH LOCAL ZONING REQUIREMENTS.
11. NORMAL/EMERGENCY LIGHT FIXTURES IN CTE FLEX SPACE TO BE CONTROLLED WITH ASSOCIATED NORMAL LIGHTS IN SAME SPACE. PROVIDE BODINE GTD-20A CONTROL UNIT FOR CIRCUIT INTERFACE.
12. THIS 'OC-50' FIXTURE SHALL HAVE TYPE 3 OPTICAL DISTRIBUTION.
13. THIS 'OC-50' FIXTURE SHALL HAVE TYPE 4 OPTICAL DISTRIBUTION.
14. MOUNT THIS FIXTURE VIA RIGID STEM SUSPENSION, AT HEIGHT OF 14'-0" AFF FROM BOTTOM OF FIXTURE TO TOP OF STAIR LANDING DIRECTLY UNDERNEATH.



NOTE:
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No.	DATE	DESCRIPTION
1	04/22/16	ADDENDUM #2
2	05/06/16	ADDENDUM #5

BID ISSUE

PROJECT No.: 152-01

DATE: 03/31/16

SCALE: AS NOTED

DRAWING NAME
NEW WORK BASEMENT & FIRST FLOOR PLAN A - LIGHTING

E 111

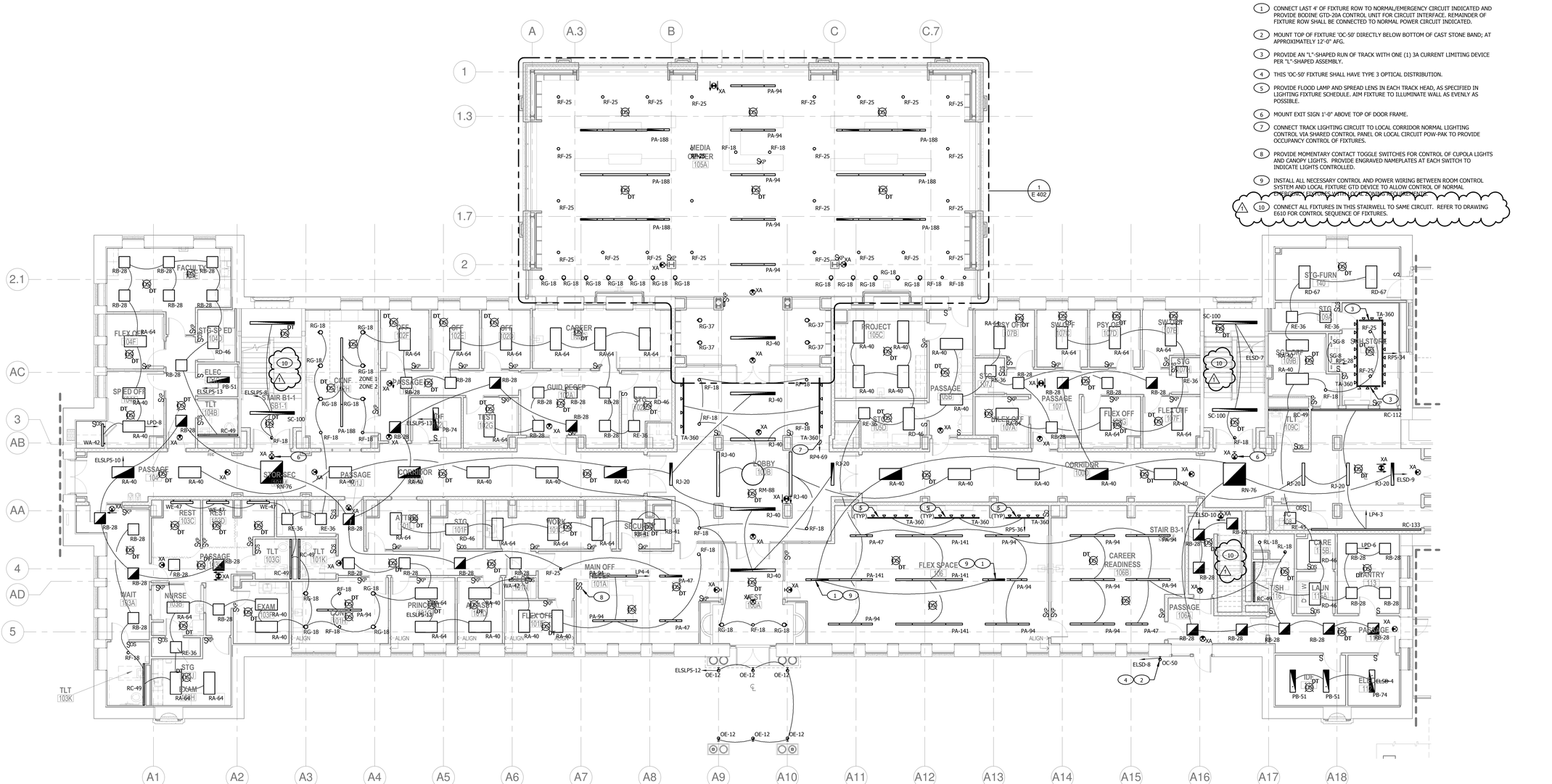
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GENERAL NOTES:

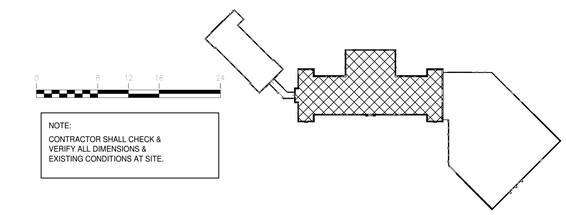
A. UNLESS NOTED OTHERWISE, PROVIDE BODINE GTD (OR APPROVED EQUAL) FOR CONNECTION OF EMERGENCY CIRCUIT TO NORMAL/EMERGENCY FIXTURES. REFER TO DRAWING E 501 FOR TYPICAL INSTALLATION DETAIL.
B. OCCUPANCY SENSOR/DAYLIGHT SENSOR LOCATIONS ARE DIAGRAMMATIC AND ARE SHOWN TO INDICATE AREAS TO BE COVERED ONLY. PROVIDE QUANTITIES/LOCATIONS AND RELATED APPURTENANCES AS REQUIRED FOR COVERAGE AS DEFINED IN THE SPECIFICATIONS.
C. CONNECT EXIT SIGNS UNSWITCHED TO NEAREST NORMAL/EMERGENCY CIRCUIT WITH 2 #12 & 1 #12 GROUND IN 3/4" CONDUIT.
D. REFER TO DRAWING E401 FOR A TYPICAL CLASSROOM LAYOUT AND CONTROL DETAIL.

KEYED NOTES:

1. CONNECT LAST 4' OF FIXTURE ROW TO NORMAL/EMERGENCY CIRCUIT INDICATED AND PROVIDE BODINE GTD-20A CONTROL UNIT FOR CIRCUIT INTERFACE. REMAINDER OF FIXTURE ROW SHALL BE CONNECTED TO NORMAL POWER CIRCUIT INDICATED.
2. MOUNT TOP OF FIXTURE 'OC-50' DIRECTLY BELOW BOTTOM OF CAST STONE BAND; AT APPROXIMATELY 12'-0" AFG.
3. PROVIDE AN "L"-SHAPED RUN OF TRACK WITH ONE (1) 3A CURRENT LIMITING DEVICE PER "L"-SHAPED ASSEMBLY.
4. THIS 'OC-50' FIXTURE SHALL HAVE TYPE 3 OPTICAL DISTRIBUTION.
5. PROVIDE FLOOD LAMP AND SPREAD LENS IN EACH TRACK HEAD, AS SPECIFIED IN LIGHTING FIXTURE SCHEDULE. AIM FIXTURE TO ILLUMINATE WALL AS EVENLY AS POSSIBLE.
6. MOUNT EXIT SIGN 1'-0" ABOVE TOP OF DOOR FRAME.
7. CONNECT TRACK LIGHTING CIRCUIT TO LOCAL CORRIDOR NORMAL LIGHTING CONTROL VIA SHARED CONTROL PANEL OR LOCAL CIRCUIT POW-PAK TO PROVIDE OCCUPANCY CONTROL OF FIXTURES.
8. PROVIDE MOMENTARY CONTACT TOGGLE SWITCHES FOR CONTROL OF CUPOLA LIGHTS AND CANOPY LIGHTS. PROVIDE ENGRAVED NAMEPLATES AT EACH SWITCH TO INDICATE LIGHTS CONTROLLED.
9. INSTALL ALL NECESSARY CONTROL AND POWER WIRING BETWEEN ROOM CONTROL SYSTEM AND LOCAL FIXTURE GTD DEVICE TO ALLOW CONTROL OF NORMAL EMERGENCY FIXTURES WITH LOCAL SWITCHING REQUIREMENTS.
10. CONNECT ALL FIXTURES IN THIS STAIRWELL TO SAME CIRCUIT. REFER TO DRAWING E610 FOR CONTROL SEQUENCE OF FIXTURES.



1 / E 114 NEW WORK FIRST FLOOR PLAN B - LIGHTING
1/8" = 1'-0"



NOTE:
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BID ISSUE

PROJECT No.: 152-01
DATE: 03/31/16
SCALE: AS NOTED

DRAWING NAME
NEW WORK FIRST FLOOR PLAN B - LIGHTING

E 114



GENERAL NOTES:

A. UNLESS NOTED OTHERWISE, PROVIDE BODINE GTD (OR APPROVED EQUAL) FOR CONNECTION OF EMERGENCY CIRCUIT TO NORMAL/EMERGENCY FIXTURES. REFER TO DRAWING E 501 FOR TYPICAL INSTALLATION DETAIL.
B. OCCUPANCY SENSOR/DAYLIGHT SENSOR LOCATIONS ARE DIAGRAMMATIC AND ARE SHOWN TO INDICATE AREAS TO BE COVERED ONLY. PROVIDE QUANTITIES/LOCATIONS AND RELATED APPURTENANCES AS REQUIRED FOR COVERAGE AS DEFINED IN THE SPECIFICATIONS.
C. CONNECT EXIT SIGNS UNSWITCHED TO NEAREST NORMAL/EMERGENCY CIRCUIT WITH 2 #12 & 1 #12 GROUND IN 3/4" CONDUIT.
D. REFER TO DRAWING E401 FOR A TYPICAL CLASSROOM LAYOUT AND CONTROL DETAIL.

KEYED NOTES:

1. MOUNT FIXTURE TYPE 'WA-42' ON WALL OF ELEVATOR HOISTWAY, AS HIGH AS POSSIBLE WHILE STILL MAINTAINING FULL ACCESSIBILITY TO FIXTURE. COORDINATE WITH SAFETY BEAM(S) AT TOP OF HOISTWAY, AND ALL OTHER TRADES.
2. PROVIDE FIXTURE WITH INTERNAL HEXCELL LOUVER ACCESSORY.
3. MOUNT WALL SCONCE AT SAME ELEVATION AS 'OC-50' FIXTURES MOUNTED ON EXTERIOR WALL OF DINING 141.
4. MOUNT WALL SCONCE 'OC-50' CENTERED VERTICALLY BETWEEN THE TWO HIGHEST CAST STONE BANDS ON THIS FACADE; AT APPROXIMATELY 14'-6" ABOVE FLOOR LEVEL OF FIRST FLOOR.
5. MOUNT FIXTURE CENTERED VERTICALLY IN CAST STONE BAND; AT APPROXIMATELY 11'-10" ABOVE FLOOR LEVEL OF FIRST FLOOR.
6. MOUNT FIXTURE CENTERED VERTICALLY IN UPPER BRICK BAND OF THIS FACADE; AT APPROXIMATELY 18'-0 ABOVE FLOOR LEVEL OF FIRST FLOOR.
7. LIGHTING INSIDE OF WALK-IN FREEZER AND COOLER UNITS SHALL BE PROVIDED BY FREEZER/COOLER VENDOR. ELECTRICAL CONTRACTOR SHALL PROVIDE POWER TO UNITS.
8. PROVIDE WIRE GUARD OVER EXIT SIGN.
9. DISPLAY CASE LIGHTING TO BE PROVIDED BY CASEWORK VENDOR. ELECTRICAL CONTRACTOR SHALL PROVIDE POWER AND CONNECTION TO LIGHT FIXTURES. CONNECT FIXTURES TO NORMAL POWER CIRCUIT FEEDING THE NEAREST CORRIDOR LIGHT FIXTURE.
10. MOUNT EXIT SIGN 1'-0" ABOVE TOP OF DOOR FRAME.
11. MATCH MOUNTING HEIGHT OF EXIT SIGNS ON OPPOSITE SIDE OF GYMNASIUM.
12. MAIN ENTRY LIGHTING CONTROL STATION.
13. NORMAL/EMERGENCY LIGHTING FIXTURES IN THIS AREA TO BE CONTROLLED WITH ADJACENT NORMAL LIGHTING FIXTURES WITHIN SAME CONTROL ZONE OF SAME AREA. PROVIDE BODINE GTD-20A CONTROL UNIT FOR CIRCUIT INTERFACE.
14. FOR ALL REQUIRED OCCUPANCY SENSOR IN GYMNASIUM AREA, UTILIZE HIGH BAY DUAL TECHNOLOGY SENSOR UNDER FOR CONTROL REVISION.
15. CONNECT ALL FIXTURES IN THIS STAIRWELL TO SAME CIRCUIT. REFER TO DRAWING E610 FOR CONTROL SEQUENCE OF FIXTURES.

1 / E 115 NEW WORK FIRST FLOOR PLAN AREA C - LIGHTING
1/8" = 1'-0"

NOTE:
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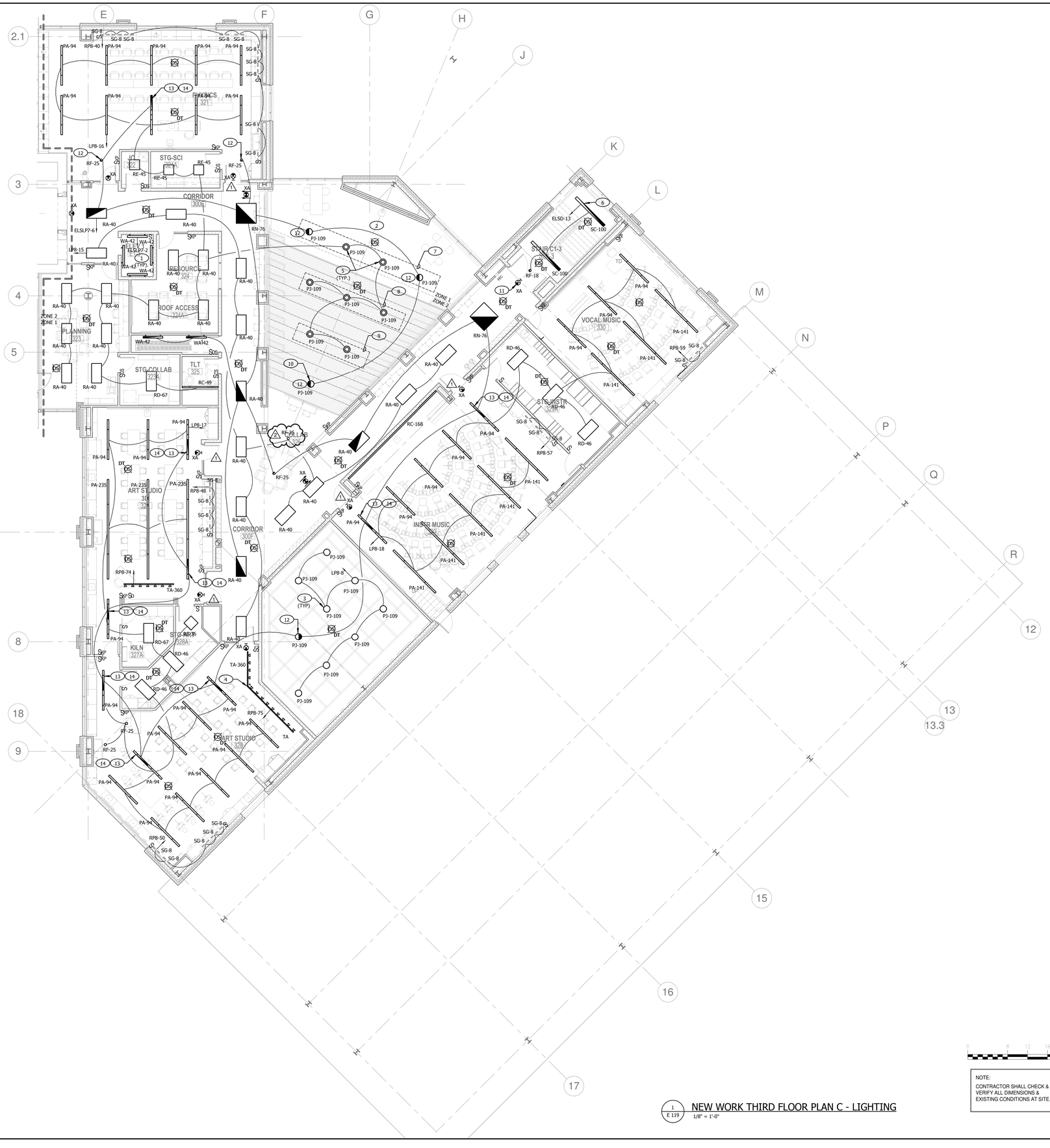
No.	DATE	DESCRIPTION
1	05/06/16	ADDENDUM #5

BID ISSUE

PROJECT No.: 152-01
DATE: 03/31/16
SCALE: AS NOTED
DRAWING NAME
NEW WORK FIRST FLOOR PLAN C - LIGHTING

E 115

5/6/2016 11:15:14 AM



GENERAL NOTES:

A. UNLESS NOTED OTHERWISE, PROVIDE BODINE GTD (OR APPROVED EQUAL) FOR CONNECTION OF EMERGENCY CIRCUIT TO NORMAL/EMERGENCY FIXTURES. REFER TO DRAWING E 501 FOR TYPICAL INSTALLATION DETAIL.
B. OCCUPANCY SENSOR/DAYLIGHT SENSOR LOCATIONS ARE DIAGRAMMATIC AND ARE SHOWN TO INDICATE AREAS TO BE COVERED ONLY. PROVIDE QUANTITIES/LOCATIONS AND RELATED APPURTENANCES AS REQUIRED FOR COVERAGE AS DEFINED IN THE SPECIFICATIONS.
C. CONNECT EXIT SIGNS UNSWITCHED TO NEAREST NORMAL/EMERGENCY CIRCUIT WITH 2 #12 & 1 #12 GROUND IN 3/4" CONDUIT.
D. REFER TO DRAWING E401 FOR A TYPICAL CLASSROOM LAYOUT AND CONTROL DETAIL.

KEYED NOTES:

1. MOUNT FIXTURE TYPE 'WA-42' ON WALL OF ELEVATOR HOISTWWAY, AS HIGH AS POSSIBLE WHILE STILL MAINTAINING FULL ACCESSIBILITY TO FIXTURE. COORDINATE WITH SAFETY BEAM(S) AT TOP OF HOISTWAY, AND ALL OTHER TRADES.
2. REFER TO SECOND FLOOR LIGHTING PLAN, SHEET E117, FOR WALL MOUNTED LIGHTS IN THIS ROOM.
3. MOUNT BOTTOM OF FIXTURE 1'-0" HIGHER THAN BOTTOM OF THEATRICAL PIPE GRID; AT APPROXIMATELY 13'-6" AFF. COORDINATE FIXTURE LOCATION WITH THEATRICAL PIPE GRID, SUCH THAT EACH FIXTURE IS CENTERED WITHIN A SQUARE OF THE GRID.
4. PROVIDE FLEXIBLE TRACK JOINER TO CONNECT TWO STRAIGHT RUNS OF TRACK. EACH RUN OF TRACK SHALL BE INSTALLED PARALLEL TO RESPECTIVE WALL ADJACENT TO IT. PROVIDE ONE (1) 3A CURRENT LIMITING DEVICE FOR ENTIRE ASSEMBLY OF BOTH RUNS.
5. MOUNT "PJ-109" FIXTURES IN THIS ROOM CENTERED BETWEEN ADJACENT ROWS OF FLOATING CEILING PANELS. SUPPORT FIXTURES FROM STRUCTURE ABOVE CEILING SYSTEM.
6. MOUNT THIS FIXTURE VIA RIGID STEM SUSPENSION, AT HEIGHT OF 13'-0" AFF FROM BOTTOM OF FIXTURE TO TOP OF STAIR LANDING DIRECTLY UNDERNEATH.
7. MOUNT ROW OF FIXTURES AT FRONT OF ROOM SUCH THAT BOTTOM OF FIXTURE IS AT 14'-0" AFF AT SECOND FLOOR LEVEL.
8. MOUNT SECOND ROW OF FIXTURES FROM FRONT OF ROOM SUCH THAT BOTTOM OF FIXTURE IS AT 13'-0" AFF ABOVE STAIR DIRECTLY BENEATH IT.
9. MOUNT THIRD ROW OF FIXTURES FROM FRONT OF ROOM SUCH THAT BOTTOM OF FIXTURE IS AT 12'-1" AFF ABOVE STAIR DIRECTLY BENEATH IT.
10. MOUNT THIS FIXTURE AS HIGH AS POSSIBLE, WHILE KEEPING ENTIRE FIXTURE HOUSING BELOW ADJACENT FLOATING CEILING PANELS.
11. MOUNT EXIT SIGN 1'-0" ABOVE TOP OF DOOR FRAME.
12. NORMAL/EMERGENCY LIGHTING FIXTURES IN THIS AREA TO BE CONTROLLED WITH ADJACENT NORMAL LIGHTING FIXTURES WITHIN SAME CONTROL ZONE OF SAME AREA. PROVIDE BODINE GT20-A CONTROL UNIT FOR CIRCUIT INTERFACE.
13. CONNECT LAST 4' OF FIXTURE ROW TO NORMAL/EMERGENCY CIRCUIT INDICATED AND PROVIDE BODINE GTD-20A CONTROL UNIT FOR CIRCUIT INTERFACE. REMAINDER OF FIXTURE ROW SHALL BE CONNECTED TO NORMAL POWER CIRCUIT INDICATED.
14. INSTALL ALL NECESSARY CONTROL AND POWER WIRING BETWEEN ROOM CONTROL SYSTEM AND LOCAL FIXTURE GTD DEVICE TO ALLOW CONTROL OF NORMAL EMERGENCY FIXTURES WITH LOCAL ZONING REQUIREMENTS.

1 / E 119 NEW WORK THIRD FLOOR PLAN C - LIGHTING
1/8" = 1'-0"

NOTE:
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2	05/06/16	ADDENDUM #5

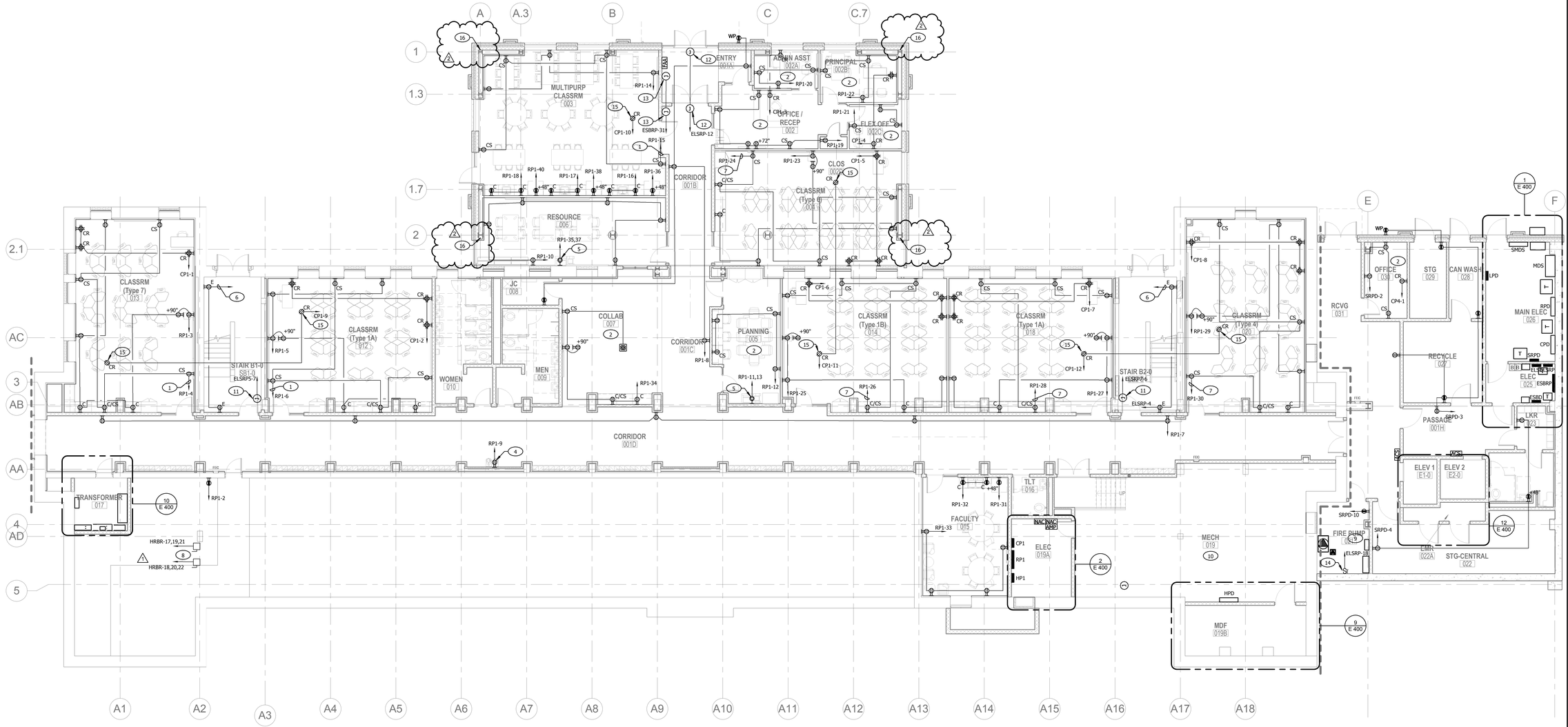
BID ISSUE

PROJECT No.: 152-01
DATE: 03/31/16
SCALE: AS NOTED

DRAWING NAME
NEW WORK THIRD FLOOR PLAN C - LIGHTING

E 119

5/6/2016 9:45:00 AM



1 E 213 NEW WORK BASEMENT FLOOR PLAN B - POWER
1/8" = 1'-0"

GENERAL NOTES:

A. FOR DEVICES BOXES SHOWN AS BEING MOUNTED BACK TO BACK IN A STUD WALL, OFFSET ONE BOX TO BE IN THE ADJACENT STUD SPACE. OUTLET BOXES IN ADJACENT ROOMS SHALL NOT BE INSTALLED SIDE BY SIDE IN THE SAME STUD SPACE.

B. FOR COUNTERTOP RECEPTACLES, CONFIRM REACH DISTANCE FROM EDGE OF COUNTERTOP TO FACE OF DEVICE DOES NOT EXCEED 24". IF DEVICE FACE EXCEEDS 24" REACH LIMIT, PROVIDE BOX EXTENSION TO BRING FACE TO 24" FROM EDGE OF COUNTERTOP.

KEYED NOTES:

1. EXTEND CIRCUIT THROUGH ROOM LIGHTING CONTROLLER IN ROOM 013. REFER TO DRAWING E-501 FOR DETAILS OR CIRCUIT OPERATION AND CONTROL.
2. FOR RECEPTACLES INDICATED AS CONTROLLED/SWITCHED, ROUTE RECEPTACLE CIRCUIT THROUGH ASSOCIATED ROOM LIGHTING CONTROLLER TO PROVIDE OCCUPANCY SENSOR CONTROL OF RECEPTACLES. REFER TO DRAWING E-501 FOR DETAILS OF CIRCUIT OPERATION AND CONTROL.
3. RECEPTACLE FOR COW (COMPUTERS ON WHEELS) CABINET. COORDINATE FINAL LOCATION WITH EQUIPMENT IN THE FIELD.
4. MOUNT RECEPTACLE BEHIND ACCESSIBLE PANEL ON OR ADJACENT TO ELECTRIC WATER COOLER CHILLER UNIT. EXTEND CIRCUIT THROUGH ELECTRICAL ROOM LIGHTING CONTROL UNIT FOR TIMECLOCK CONTROL OF CIRCUIT.
5. PROVIDE NEMA 6-20 RECEPTACLE FOR COPIER. COORDINATE FINAL LOCATION WITH EQUIPMENT IN THE FIELD.
6. REFER TO DRAWING E-214 FOR CONTINUATION OF CIRCUIT.
7. EXTEND CIRCUIT THROUGH ROOM LIGHTING CONTROLLER IN ROOM 020. REFER TO DRAWING E-501 FOR DETAILS OR CIRCUIT OPERATION AND CONTROL.
8. PROVIDE NEW CIRCUITS TO EXISTING GAS BOOSTER DISCONNECTS IN CRAWLSPACE.
9. TERMINATE 3 1/C #8 MI CABLES IN 12"X12"X8" JUNCTION BOX ADJACENT TO NEW FIRE PUMP AND JOCKEY PUMP CONTROLLER. EXTEND 3 #4 & 1 #10 GROUND IN 1-1/4" CONDUIT FROM JUNCTION BOX TO NEW FIRE PUMP CONTROLLER AND MAKE FINAL CONNECTION TO UNIT. EXTEND 3 #10 & 1 #10 GROUND IN 3/4" CONDUIT FROM JUNCTION BOX TO JOCKEY PUMP CONTROLLER.

KEYED NOTES (CONT'D):

10. REFER TO DRAWING E-401 FOR DETAILS OF WORK IN THE MECHANCIAL ROOM.
11. POWER CONNECTION TO DOOR MAGNETIC HOLD OPEN. COORDINATE FINAL LOCATION IN THE FIELD.
12. POWER CONNECTION TO AUTOMATIC DOOR OPERATOR. PROVIDE LOW VOLTAGE CABLES FROM DOOR OPERATOR TO ACTUATORS. COORDINATE ACTUATOR LOCATIONS IN THE FIELD.
13. POWER CONNECTION TO DOOR HARDWARE POWER SUPPLY LOCATED ABOVE ACCESSIBLE CEILING.
14. POWER CONNECTION TO ATTIC SUPPRESSION SYSTEM AIR COMPRESSOR.
15. PROVIDE TWO DUPLEX RECEPTACLES IN CEILING MOUNTED A/V CABINET. COORDINATE FINAL LOCATION WITH EQUIPMENT IN THE FIELD.
16. GROUND COLUMN PER DETAIL ON DRAWING E-502. CONNECT TO OTHER GROUNDED COLUMNS ON THIS DRAWING WITH #2 BARE COPPER GROUNDING CONDUCTOR IN 3/4" PVC CONDUIT. EXTEND #2 BARE COPPER GROUNDING CONDUCTOR FROM ONE COLUMN BOND BACK TO MAIN GROUNDING BUSBAR IN MAIN ELECTRICAL ROOM.

0 8 12 16 24

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LICENSE NO.: 19294
EXPIRATION DATE: 12/14/2016

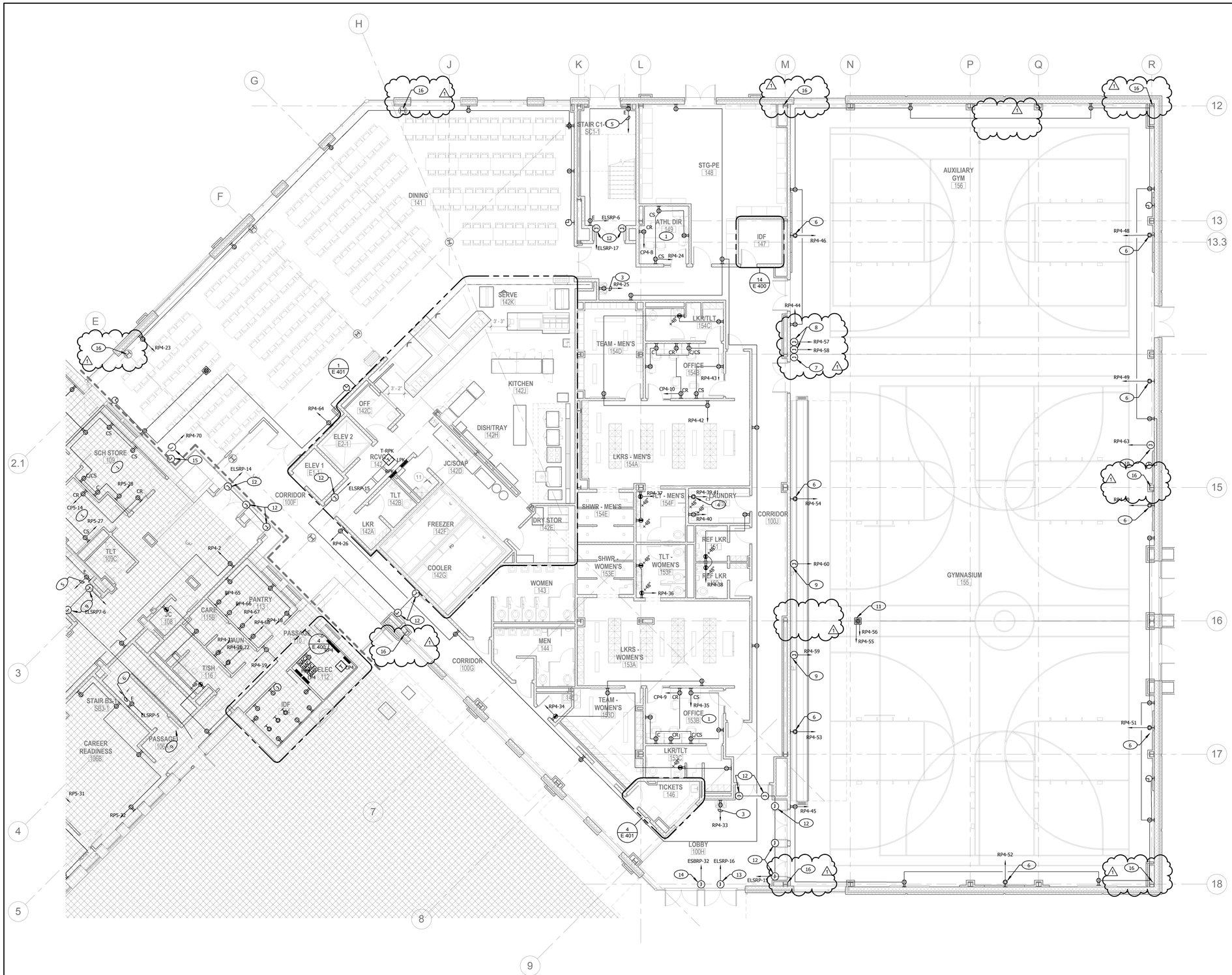
No.	DATE	DESCRIPTION
1	04/27/16	ADDENDUM #3
2	05/06/16	ADDENDUM #5

BID ISSUE

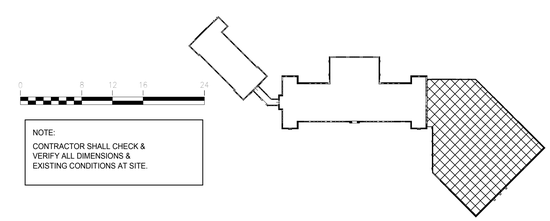
PROJECT No.: 152-01
DATE: 03/31/16
SCALE: AS NOTED

DRAWING NAME:
NEW WORK BASEMENT PLAN B - POWER

E 213



1 E 215 NEW WORK FIRST FLOOR PLAN C - POWER
1/8" = 1'-0"



NOTE:
CONTRACTOR SHALL CHECK & VERIFY ALL DIMENSIONS & EXISTING CONDITIONS AT SITE.

GENERAL NOTES:

A. FOR DEVICES BOXES SHOWN AS BEING MOUNTED BACK TO BACK IN A STUD WALL, OFFSET ONE BOX TO BE IN THE ADJACENT STUD SPACE. OUTLET BOXES IN ADJACENT ROOMS SHALL NOT BE INSTALLED SIDE BY SIDE IN THE SAME STUD SPACE.

B. FOR COUNTERTOP RECEPTACLES, CONFIRM REACH DISTANCE FROM EDGE OF COUNTERTOP TO FACE OF DEVICE DOES NOT EXCEED 24". IF DEVICE FACE EXCEEDS 24" REACH LIMIT, PROVIDE BOX EXTENSION TO BRING FACE TO 24" FROM EDGE OF COUNTERTOP.

KEYED NOTES:

1. FOR RECEPTACLES INDICATED AS CONTROLLED/SWITCHED, ROUTE RECEPTACLE CIRCUIT THROUGH ASSOCIATED ROOM LIGHTING CONTROLLER TO PROVIDE OCCUPANCY SENSOR CONTROL OF RECEPTACLES. REFER TO DRAWING E-501 FOR DETAILS OF CIRCUIT OPERATION AND CONTROL.
2. RECEPTACLE FOR COW (COMPUTERS ON WHEELS) CABINET. COORDINATE FINAL LOCATION WITH EQUIPMENT IN THE FIELD.
3. MOUNT RECEPTACLE BEHIND ACCESSIBLE PANEL ON OR ADJACENT TO ELECTRIC WATER COOLER CHILLER UNIT. EXTEND CIRCUIT THROUGH ELECTRICAL ROOM LIGHTING CONTROL UNIT FOR TIMECLOCK CONTROL OF CIRCUIT.
4. COORDINATE RECEPTACLE TYPE WITH SUPPLIED EQUIPMENT IN THE FIELD.
5. REFER TO DRAWING E-217 FOR CONTINUATION OF CIRCUIT.
6. POWER CONNECTION FOR BACKBOARD WINCH. COORDINATE FINAL LOCATION OF RECEPTACLE WITH SUPPLIED EQUIPMENT IN THE FIELD. PROVIDE RECEPTACLE NEMA CONFIGURATION TO MATCH SUPPLIED EQUIPMENT. EXTEND 3 #12 & 1 #12 GROUND IN 3/4" CONDUIT FROM RECEPTACLE LOCATION DOWN TO FLUSH JUNCTION BOX AT GYM ENTRANCE FOR KEY SWITCH CONTROLLER.
7. PROVIDE MULTIGANG FLUSH MOUNTED JUNCTION BOXES FOR BACKBOARD KEYSWITCH CONTROLLERS. COORDINATE QUANTITY WITH SUPPLIED EQUIPMENT. MOUNT AT 42" AFF.
8. POWER CONNECTION TO SCREEN DIVIDER CONTROL SWITCH. EXTEND 2 #12 & 1 #12 GROUND FROM CONTROL SWITCH LOCATION UP TO MOTOR CONTROL PANEL AND MAKE FINAL CONNECTION. COORDINATE FINAL LOCATION AND CONNECTION TYPE IN FIELD.
9. POWER CONNECTION TO BLEACHER CONTROL. COORDINATE FINAL LOCATION AND CONNECTION TYPE IN FIELD.
10. POWER CONNECTION TO SCOREBOARD. COORDINATE MOUNTING HEIGHT IN FIELD WITH SUPPLIED EQUIPMENT. PROVIDE ADDITIONAL 6"X6"X2-1/8" FLUSH MOUNTED JUNCTION BOX FOR SCOREBOARD CONTROL CABLING. EXTEND TWO 2" CONDUITS FROM JUNCTION BOX TO FLLOR BOX LOCATION IN GYMNASIUM FLOOR FOR SCORER'S TABLE.
11. PROVIDE SIX-GANG FLUSH FLOORBOX (LEGRAND EVOLUTION EFB6S) WITH TWO RECEPTACLES AND FOUR JUNCTION BOXES FOR SCOREBOARD/DATA ACTIVATIONS.
12. POWER CONNECTION TO DOOR MAGNETIC HOLD OPEN. COORDINATE FINAL LOCATION IN THE FIELD.
13. POWER CONNECTION TO AUTOMATIC DOOR OPERATOR. PROVIDE LOW VOLTAGE CABLES FROM DOOR OPERATOR TO ACTUATORS. COORDINATE ACTUATOR LOCATIONS IN THE FIELD.
14. POWER CONNECTION TO DOOR HARDWARE POWER SUPPLY LOCATED ABOVE ACCESSIBLE CEILING.
15. POWER CONNECTION TO MOTORIZED PROJECTION SCREEN. COORDINATE FINAL LOCATION IN THE FIELD. EXTEND 3/4" CONDUIT FROM SCREEN MOTOR CONTROL DOWN TO SINGLE GANG JUNCTION BOX AT 48" AFF FOR SCREEN CONTROL. PROVIDE CONTROL WIRING AS NECESSARY BETWEEN MOTOR AND CONTROL SWITCH.
16. GROUND COLUMN PER DETAIL ON DRAWING E-502. CONNECT TO OTHER GROUNDED COLUMNS ON THIS DRAWING WITH #2 BARE COPPER GROUNDING CONDUCTOR IN 3/4" PVC CONDUIT. EXTEND #2 BARE COPPER GROUNDING CONDUCTOR FROM ONE COLUMN BOND BACK TO MAIN GROUNDING BUSBAR IN MAIN ELECTRICAL ROOM.

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LICENSE NO.: 16294
EXPIRATION DATE: 12/14/2016

No.	DATE	DESCRIPTION
1	05/06/16	ADDENDUM #5

BID ISSUE

PROJECT No.: 152-01

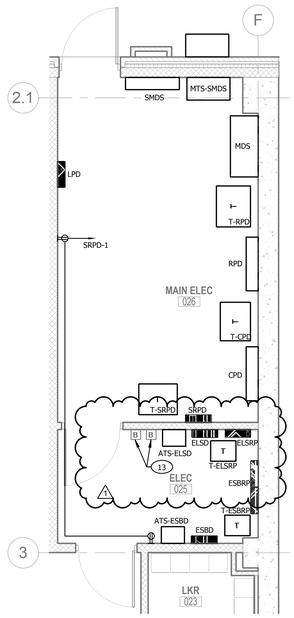
DATE: 03/31/16

SCALE: AS NOTED

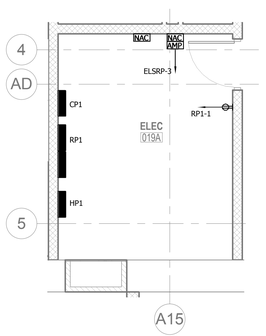
DRAWING NAME
NEW WORK FIRST FLOOR PLAN C - POWER

E 215

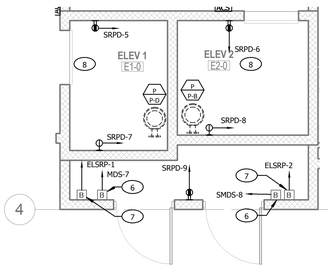
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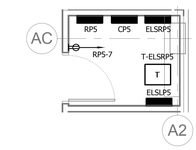
1 E 400 ENLARGED PLAN - MAIN ELEC 026, ELEC 025
1/4" = 1'-0"



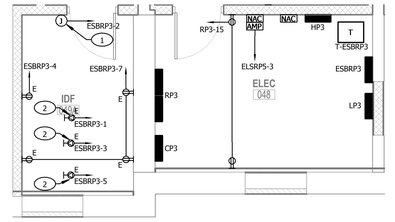
2 E 400 ENLARGED PLAN - ELEC 019A
1/4" = 1'-0"



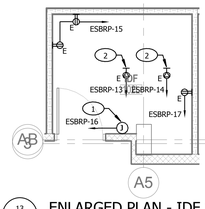
12 E 400 ENLARGED PLAN ELEV PIT, EMR 022A
1/4" = 1'-0"



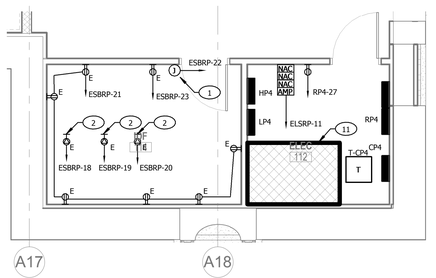
5 E 400 ENLARGED PLAN - ELEC 104C
1/4" = 1'-0"



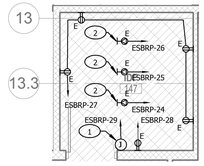
3 E 400 ENLARGED PLAN - ELEC 048, IDF 049A
1/4" = 1'-0"



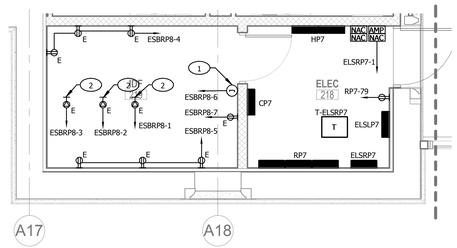
13 E 400 ENLARGED PLAN - IDF 102L
1/4" = 1'-0"



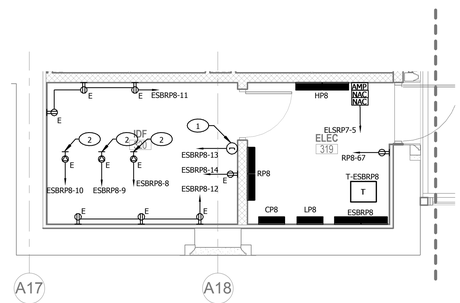
4 E 400 ENLARGED PLAN - IDF 114 ELEC 112
1/4" = 1'-0"



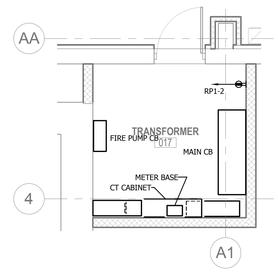
14 E 400 ENLARGED PLAN - IDF 147
1/4" = 1'-0"



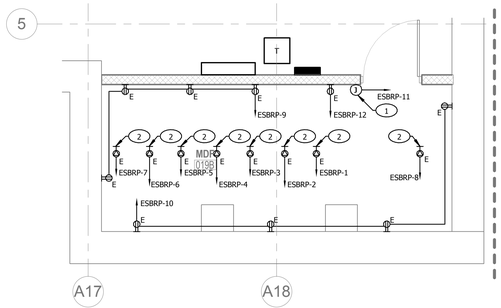
6 E 400 ENLARGED PLAN - IDF 219, ELEC 218
1/4" = 1'-0"



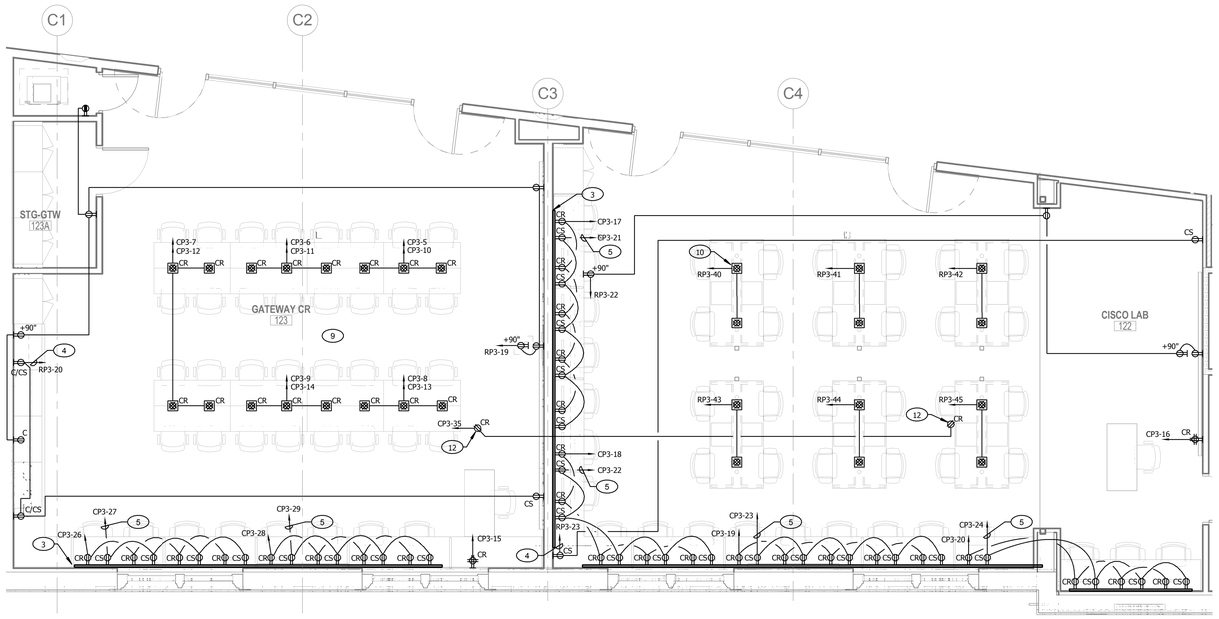
7 E 400 ENLARGED PLAN - IDF 320, ELEC 319
1/4" = 1'-0"



10 E 400 ENLARGED PLAN - TRANSFORMER 017
1/4" = 1'-0"



9 E 400 ENLARGED PLAN - MDF 019B
1/4" = 1'-0"



11 E 400 ENLARGED PLAN - GATEWAT CR 123, CISCO CR 122
1/4" = 1'-0"

NOTE:
CONTRACTOR SHALL CHECK & VERIFY ALL DIMENSIONS & EXISTING CONDITIONS AT SITE.

GENERAL NOTES:

A. FOR DEVICES BOXES SHOWN AS BEING MOUNTED BACK TO BACK IN A STUD WALL, OFFSET ONE BOX TO BE IN THE ADJACENT STUD SPACE. OUTLET BOXES IN ADJACENT ROOMS SHALL NOT BE INSTALLED SIDE BY SIDE IN THE SAME STUD SPACE.
B. FOR COUNTERTOP RECEPTACLES, CONFIRM REACH DISTANCE FROM EDGE OF COUNTERTOP TO FACE OF DEVICE DOES NOT EXCEED 24". IF DEVICE FACE EXCEEDS 24" REACH LIMIT, PROVIDE BOX EXTENSION TO BRING FACE TO 24" FROM EDGE OF COUNTERTOP.

KEYED NOTES:

1. POWER CONNECTION TO ACCESS CONTROL POWER SUPPLY. COORDINATE LOCATION IN THE FIELD.
2. PROVIDE NEMA L5-30 RECEPTACLE MOUNTED ON CABLETRAY ABOVE EQUIPMENT CABINETS. COORDINATE FINAL LOCATION WITH SUPPLIED EQUIPMENT IN FIELD.
3. PROVIDE DUAL CHANNEL HORIZONTAL RACEWAY AT 18" AFF. PROVIDE ALL REQUIRED APPURTENANCES FOR A COMPLETE INSTALLATION.
4. EXTEND CIRCUIT THROUGH ROOM LIGHTING CONTROLLER IN ROOM 121. REFER TO DRAWING E-501 FOR DETAILS OR CIRCUIT OPERATION AND CONTROL.
5. PROVIDE MULTIZONE CONTROL UNIT FOR OCCUPANCY SENSOR CONTROL, OR SENSOR RELAY (LUTRON POW-PAK OR APPROVED EQUAL) FOR CONNECTION TO LOCAL OCCUPANCY SENSOR IN THIS AREA FOR CONTROL OF CONTROLLED/SWITCHED RECEPTACLES.
6. POWER CONNECTION TO ELEVATOR CONTROL PANEL. PROVIDE 480V-40A-3P ENCLOSED CIRCUIT BREAKER WITH SHUNT TRIP OPERATOR. PROVIDE 2 N.O. AND 2 N.C. CONTACTS. BREAKER SHALL BE LOCKABLE IN THE OPEN AND CLOSED POSITION. PROVIDE FINAL CONNECTION TO CONTROL PANEL.
7. POWER CONNECTION TO ELEVATOR CAB LIGHTS. PROVIDE 120V-20A-1P ENCLOSED CIRCUIT BREAKER. PROVIDE FINAL CONNECTION TO CONTROL PANEL.
8. ALL DEVICES, OUTLETS, JUNCTION BOXES, OUTLET BOXES, CONDUIT AND WIRING WITHIN 4' OF THE ELEVATOR PIT FLOOR SHALL BE NEMA TYPE 4. COORDINATE FINAL LOCATIONS WITH THE ELEVATOR INSTALLER IN THE FIELD.
9. PROVIDE POKE-THRU WITH TWO DUPLEX RECEPTACLES, CONNECT ONE RECEPTACLE TO UNCONTROLLED CIRCUIT AND THE SECOND RECEPTACLE TO THE CONTROLLED CIRCUIT. PROVIDE MULTIZONE CONTROL UNIT FOR OCCUPANCY SENSOR CONTROL, OR SENSOR RELAY (LUTRON POW-PAK OR APPROVED EQUAL) FOR CONNECTION TO LOCAL OCCUPANCY SENSOR IN THIS AREA FOR CONTROL OF CONTROLLED/SWITCHED RECEPTACLE.
10. FLOORBOX POWER FOR CUSTOM WORKSTATION. COORDINATE FINAL LOCATION WITH SUPPLIED CASEWORK IN THE FIELD. TYPICAL FOR POKE-THRU LOCATIONS IN CISCO CR.
11. MAINTAIN 4'X6' CLEAR SPACE IN ELECTRICAL ROOM FOR FUTURE SOLAR TRANSFER EQUIPMENT. EXTEND THREE 4" CONDUITS FROM ABOVE CEILING IN ELECTRICAL ROOM ABOVE SPACE THROUGH ELECTRICAL ROOM ON FLOOR ABOVE AND ACROSS CEILING SPACE TO EXTERIOR WALL AT GYM ROOFTOP. EXTEND CONDUITS THROUGH WALL 6" AND CAP. PROVIDE PULL ROPE FOR FUTURE USE. REFER TO DRAWING E219 FOR LOCATION.
12. PROVIDE TWO DUPLEX RECEPTACLES IN CEILING MOUNTED A/V CABINET. COORDINATE FINAL LOCATION WITH EQUIPMENT LOCATION IN THE FIELD.
13. FIRE PUMP AND LIFE SAFETY TRANSFER SWITCH CIRCUIT BREAKERS. REFER TO DRAWING E500 FOR FURTHER DETAIL.

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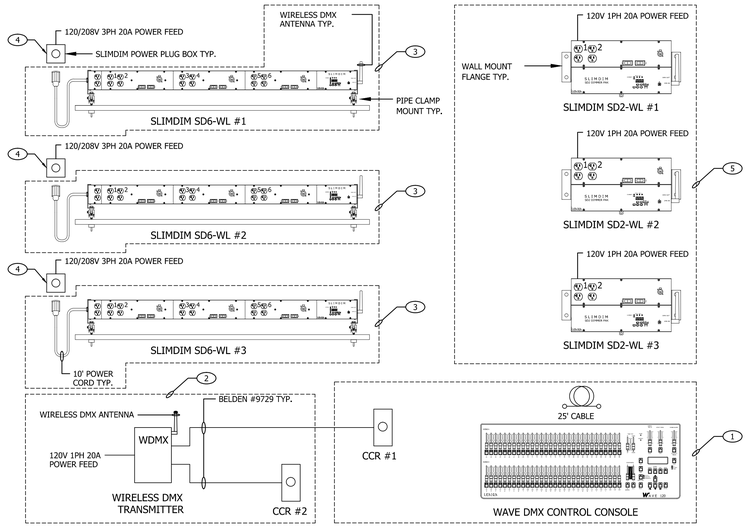
No.	DATE	DESCRIPTION
1	05/06/16	ADDENDUM #5

BID ISSUE

PROJECT No.: 152-01
DATE: 03/31/16
SCALE: AS NOTED
DRAWING NAME: ENLARGED FLOOR PLANS - ELECTRICAL

E 400

5/6/2016 10:52:03 AM



1 E 503 STUDIO LIGHTING CONTROL DRAWING
NO SCALE

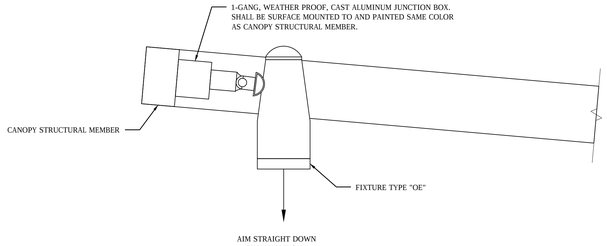
GENERAL NOTES:

1. PART NUMBERS INDICATED IN THIS DIAGRAM ARE BY LEHIGH ELECTRIC PRODUCTS COMPANY, AS BASIS OF DESIGN. REFER TO SPECIFICATION SECTION 265561 FOR MORE DETAIL.
2. REFER TO POWER DRAWINGS E217 AND E219 FOR MORE INFORMATION ON EQUIPMENT LOCATION AND CIRCUITING.

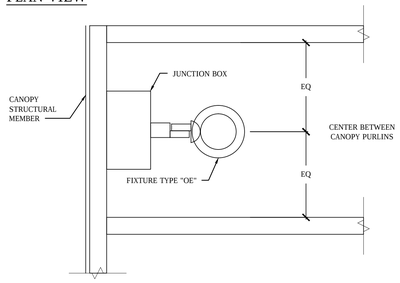
KEYED NOTES:

1. LOCATE IN CONTROL ROOM 232
2. LOCATE IN THEATER/ DANCE CR 231, ON WALL, AT HEIGHT AS NOTED ON SHEET E217.
3. LOCATE IN THEATER/DANCE CR 231, ON THEATRICAL PIPE GRID.
4. LOCATE IN THEATER/DANCE CR 231, ON CEILING, AS NOTED ON SHEET E219.
5. LOCATE IN THEATER/DANCE CR 231, ON WALL. MOUNTING HEIGHT SHALL BE SUCH THAT RECEPTACLES WITHIN SLIMDIM ARE EQUAL TO STANDARD RECEPTACLE MOUNTING HEIGHT FOR THIS PROJECT.

SIDE VIEW



PLAN VIEW



2 E 503 CANOPY MOUNTING DETAIL
NO SCALE

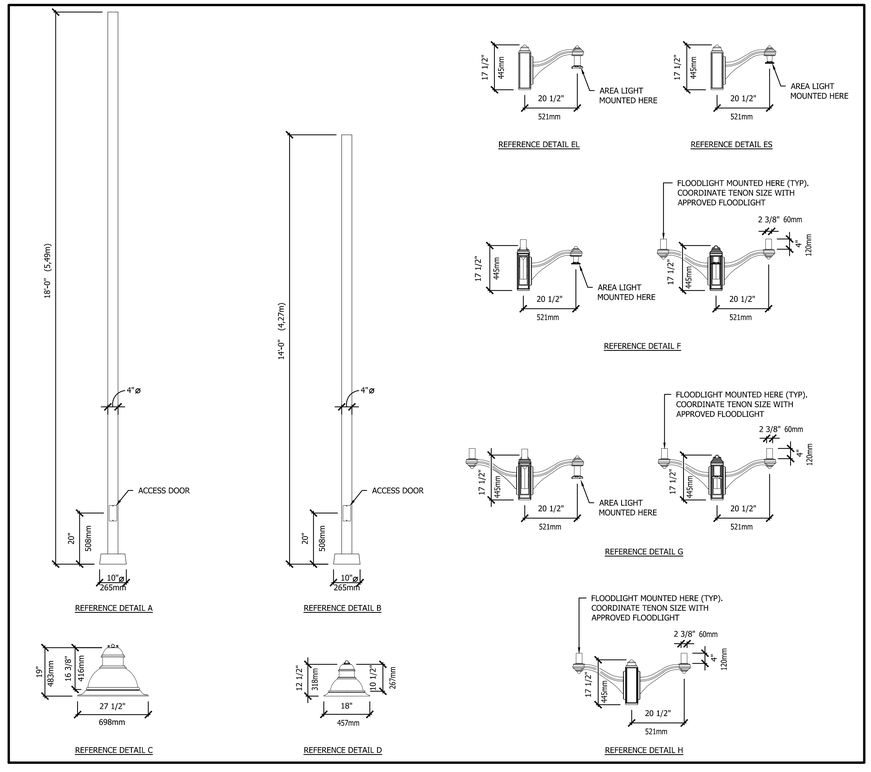
SUMMARY OF EXTERIOR LIGHT POLE SET-UPS

SET-UP #	FIXTURE TYPE	POLE		AREA LIGHT		FLOODLIGHT		MOUNTING BRACKET		REFERENCE DETAILS	CONFIGURATION***
		HEIGHT	MIN. WALL THICKNESS	SIZE	QTY	TYPE	QTY	QTY. OF ARMS DOWN*	QTY. OF ARMS UP**		
1	OA-84	18'	0.120"	LARGE	1	N/A	0	1	0	A, C, EL	
2	OA-84	18'	0.250"	LARGE	1	OH-36	3	1	3	A, C, G	
3	OB-49	14'	0.120"	SMALL	1	N/A	0	1	0	B, D, ES	
4	OB-49	14'	0.120"	SMALL	1	OH-36	2	1	2	B, D, F	
5	OB-49	14'	0.120"	SMALL	0	OH-36	2	0	2	B, H	

*AREA LIGHT HANGING BELOW ARM
**FLOODLIGHT SITTING ON TOP OF THE ARM

*** LEGEND:

- POLE
- ACCESS DOOR
- MOUNTING ARM
- AREA LIGHT
- FLOODLIGHT



3 E 503 EXTERIOR LIGHT POLE SET-UP DETAILS
NO SCALE

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1	05/06/16	ADDENDUM #5

BID ISSUE

PROJECT No.: 152-01

DATE: 03/31/16

SCALE: AS NOTED

DRAWING NAME
ELECTRICAL DETAILS

E 503

JUAN PARDO-CHAVEZ 5/6/2016 3:10 PM I:\PROJ\JRS_ARCHITECTS, INC\MPS\15-004\26-00--ROPS--ROBERT POOLE RENOVATION ADDITION\C_DRAWINGS E\NDA_CAD\A_DRAWINGS\MEP\ESD3--15-004\26-00.DWG

PANEL DESIGNATION: LPK | BUS AMP: 225A | MIN. A.I.C.: 35,000 | MAIN BREAKER: 225A
LOCATION: RCVG. 142 | PHASE: 3 | WIRE: 4 | VOLTAGE: 480Y/277
MOUNTING: FLUSH | NOTES: PROVIDE STAINLESS STEEL TRIM.
TOTAL POLES: 30

CKT NO	DESCRIPTION	BREAKER AMP	POLES	LOAD (KW) A	B	C	WIRE NO	SIZE	GND. SIZE	COND SIZE	COND SIZE	GND. SIZE	WIRE SIZE	NO	LOAD (KW) A	B	C	BREAKER POLES	AMP	DESCRIPTION	CKT NO
1	PANEL 'RPK' VIA XFMR	70	3	0.0			4	4	8	1 1/4	2	8	1	4	19.0			3	100	UTILITY RACEWAY	2
3	----------				0.0											19.0				----------	4
5	----------					0.0											19.0			----------	6
7	LIGHTS	20	1	2.2			2	12	12	3/4	3/4	12	12	4	1.0			3	15	GSHP C1-4	8
9	GSHP C1-4	15	1		0.9		2	12	12	3/4						1.0				----------	10
11	SPARE	20	1			0.0											1.0			----------	12
13	SPARE	20	1	0.0											0.0			1	20	SPARE	14
15	SPACE - PFFB		1		0.0											0.0		1		SPACE - PFFB	16
17	SPACE - PFFB		1			0.0											0.0	1		SPACE - PFFB	18
19	SPACE - PFFB		1	0.0											0.0			1		SPACE - PFFB	20
21	SPACE - PFFB		1		0.0											0.0		1		SPACE - PFFB	22
23	SPACE - PFFB		1			0.0											0.0	1		SPACE - PFFB	24
25	SPACE - PFFB		1	0.0											0.0			1		SPACE - PFFB	26
27	SPACE - PFFB		1		0.0											0.0		1		SPACE - PFFB	28
29	SPACE - PFFB		1			0.0											0.0	1		SPACE - PFFB	30
31				0											0						32
33					0											0					34
35						0											0				36
37				0											0						38
39					0											0					40
41						0											0				42
	SIDE TOTAL KW LOAD			2	1	0									20	20	20			SIDE TOTAL KW LOAD	

NEC LOAD SUMMARY PANEL **LPK**

	LTS.	RECPS.	HVAC	MISC.	KITCH.		TOTAL	
	2.2	3.0	3.9	0.0	100.1	0.0	109.3	KVA (CONNECTED)
RECPS - 100% FIRST 10 kVA, 50% REMAINING (NEC 220.44)	125%	100%	100%	100%	65%	0%	68%	DEMAND FACTOR
KITCH. - BETWEEN 100% & 65% (NEC 220.56)	2.8	3.0	3.9	0.0	65.1	0.0	74.8	KVA (DEMAND)
NON-COINCIDENTAL - 0% (NEC 220.60)							**90**	AMPS (DEMAND)

NOTES:

PANEL DESIGNATION: RPK | BUS AMP: 225A | MIN. A.I.C.: 10,000 | MAIN BREAKER: 150A
LOCATION: RCVG. 142 | PHASE: 3 | WIRE: 4 | VOLTAGE: 208Y/120
MOUNTING: FLUSH | NOTES: PROVIDE STAINLESS STEEL TRIM
TOTAL POLES: 42 | *-PROVIDE GFCI CIRCUIT BREAKER

CKT NO	DESCRIPTION	BREAKER AMP	POLES	LOAD (KW) A	B	C	WIRE NO	SIZE	GND. SIZE	COND SIZE	COND SIZE	GND. SIZE	WIRE SIZE	NO	LOAD (KW) A	B	C	BREAKER POLES	AMP	DESCRIPTION	CKT NO
1	FREEZER	20	1	1.0			2	12	12	3/4	3/4	12	12	2	0.5			1	20	RECPS.-142A, 142B, 142D	2
3	COOLER	20	1		1.0		2	12	12	3/4	3/4	12	12	2		1.0		1	20	RECP.-MILK COOLER	4
5	HOT FOOD COUNTER	30	2			2.5	3	10	10	3/4	3/4	10	10	3			2.5	2	30	HOT FOOD COUNTER	6
7	----------			2.5											2.5					----------	8
9	COLD FOOD COUNTER	20	1		0.9		2	12	12	3/4	3/4	12	12	2		0.9		1	20	COLD FOOD COUNTER	10
11	COLD FOOD COUNTER	20	1			0.9	2	12	12	3/4	3/4	12	12	2			0.2	1	20	RECP.-CASH REGISTER	12
13	RECPS.-CASH REGISTERS	20	1	0.4			2	12	12	3/4	3/4	10	10	3	2.5			2	30	HOT FOOD COUNTER	14
15	COLD FOOD COUNTER	20	1		0.9		2	12	12	3/4						2.5				----------	16
17	RECP.-MILK COOLER	20	1			1.0	2	12	12	3/4	1 1/4	10	6	4			2.8	3	50	UTILITY RACEWAY	18
19	RECPS.-142C	20	1	0.5			2	12	12	3/4						2.8				----------	20
21	COOLER BLOWER COIL	15	1		0.2		2	12	12	3/4							2.8			----------	22
23	FREEZER BLOWER COIL	25	1			2.1	2	10	10	3/4	3/4	12	12	2			0.2	1	15	HEAT TRACE-*	24
25	RECPS. - CONVENIENCE	20	1	0.2			2	12	12	3/4	3/4	12	12	2	1.0			1	20	RECP.-MILK COOLER	26
27	HEATED CABINET	20	2		0.8		3	12	12	3/4	3/4	12	12	3		0.8		2	20	HEATED CABINET	28
29	----------					0.8											0.8			----------	30
31	RECP. - REF. WORKTOP	20	1	1.5			2	12	12	3/4	3/4	12	12	2	1.5			1	20	RECP. - REF. WORKTOP	32
33	RECP. - REF. WORKTOP	20	1		1.5		2	12	12	3/4	3/4	12	12	3		0.8		2	20	HEATED CABINET	34
35	RECP.-POWER SCRUBBER	20	1			0.2	2	12	12	3/4							0.8			----------	36
37	SPARE	20	1	0.0												0.0		1	20	SPARE	38
39	SPARE	20	1		0.0												0.0	1	20	SPARE	40
41	SPARE	20	1			0.0											0.0	1	20	SPARE	42
	SIDE TOTAL KW LOAD			6	5	8									11	9	7			SIDE TOTAL KW LOAD	

NEC LOAD SUMMARY PANEL **RPK**

	LTS.	RECPS.	HVAC	MISC.	KITCH.		TOTAL	
	0.0	3.0	0.0	0.0	43.1	0.0	46.1	KVA (CONNECTED)
RECPS - 100% FIRST 10 kVA, 50% REMAINING (NEC 220.44)	125%	100%	100%	100%	65%	0%	67%	DEMAND FACTOR
KITCH. - BETWEEN 100% & 65% (NEC 220.56)	0.0	3.0	0.0	0.0	28.0	0.0	31.0	KVA (DEMAND)
NON-COINCIDENTAL - 0% (NEC 220.60)							**86**	AMPS (DEMAND)

NOTES:

PANEL DESIGNATION: CP4 | BUS AMP: 100A | MIN. A.I.C.: 10,000 | MAIN BREAKER: 100A
LOCATION: ELEC. 112 | PHASE: 3 | WIRE: 4 | VOLTAGE: 208Y/120
MOUNTING: SURFACE | NOTES: 200% NEUTRAL
TOTAL POLES: 30

CKT NO	DESCRIPTION	BREAKER AMP	POLES	LOAD (KW) A	B	C	WIRE NO	SIZE	GND. SIZE	COND SIZE	COND SIZE	GND. SIZE	WIRE SIZE	NO	LOAD (KW) A	B	C	BREAKER POLES	AMP	DESCRIPTION	CKT NO
1	RECPS.-030	20	1	0.2			2	12	12	3/4	3/4	10	10	2	0.4			1	20	RECPS.-103A,103B	2
3	RECPS.-103F,103H	20	1		0.4		2	10	10	3/4	3/4	10	10	2		0.2		1	20	RECPS.-101G	4
5	RECPS.-101D,101E	20	1			0.4	2	10	10	3/4	3/4	10	10	2			0.4	1	20	RECPS.-101A	6
7	RECPS.-101B,101C,101L	20	1	0.5			2	10	10	3/4	3/4	12	12	2	0.2			1	20	RECPS.-149	8
9	RECPS.-153B	20	1		0.5		2	12	12	3/4	3/4	12	12	2		0.5		1	20	RECPS.-154B	10
11	RECPS.-142C	20	1			0.2	2	12	12	3/4							0.0	1	20	SPARE	12
13	SPARE	20	1	0.0											0.0			1	20	SPARE	14
15	SPARE	20	1		0.0											0.0		1	20	SPARE	16
17	SPARE	20	1			0.0											0.0	1	20	SPARE	18
19	SPARE	20	1	0.0											0.0			1	20	SPARE	20
21	SPARE	20	1		0.0											0.0		1	20	SPARE	22
23	SPACE - PFFB		1			0.0											0.0	1		SPACE - PFFB	24
25	SPACE - PFFB		1	0.0											0.0			1		SPACE - PFFB	26
27	SPACE - PFFB		1		0.0											0.0		1		SPACE - PFFB	28
29	SPACE - PFFB		1			0.0											0.0	1		SPACE - PFFB	30
31				0											0						32
33					0											0					34
35						0											0				36
37				0											0						38
39					0											0					40
41						0											0				42
	SIDE TOTAL KW LOAD			1	1	1									1	1	0			SIDE TOTAL KW LOAD	

NEC LOAD SUMMARY PANEL **CP4**

	LTS.	RECPS.	HVAC	MISC.	KITCH.		TOTAL	
	0.0	3.8	0.0	0.0	0.0	0.0	3.8	KVA (CONNECTED)
RECPS - 100% FIRST 10 kVA, 50% REMAINING (NEC 220.44)	125%	100%	100%	100%	100%	0%	100%	DEMAND FACTOR
KITCH. - BETWEEN 100% & 65% (NEC 220.56)	0.0	3.8	0.0	0.0	0.0	0.0	3.8	KVA (DEMAND)
NON-COINCIDENTAL - 0% (NEC 220.60)							**10**	AMPS (DEMAND)

NOTES:

PANEL DESIGNATION: HP4 | BUS AMP: 225A | MIN. A.I.C.: 35,000 | MAIN BREAKER: 150A
LOCATION: ELEC. 112 | PHASE: 3 | WIRE: 4 | VOLTAGE: 480Y/277
MOUNTING: SURFACE | NOTES:
TOTAL POLES: 42

CKT NO	DESCRIPTION	BREAKER AMP	POLES	LOAD (KW) A	B	C	WIRE NO	SIZE	GND. SIZE	COND SIZE	COND SIZE	GND. SIZE	WIRE SIZE	NO	LOAD (KW) A	B	C	BREAKER POLES	AMP	DESCRIPTION	CKT NO
1	GSHP B1-1	15	1	2.9			2	10	10	3/4	3/4	10	10	2	2.4			1	15	GSHP B1-2	2
3	GSHP B1-3	15	3		1.2		4	10	10	3/4	3/4	10	10	2		2.9		1	15	GSHP B1-4	4
5	----------					1.2					3/4	10	10	4			1.9	3	15	GSHP B1-5	6
7	----------			1.2												1.9				----------	8
9	GSHP B1-6	15	3		1.9		4	12	12	3/4							1.9			----------	10
11	----------					1.9					3/4	12	12	2		0.9		1	15	GSHP B1-7	12
13	----------			1.9							3/4	12	12	2	2.4			1	15	GSHP B1-8	14
15	GSHP B1-9	15	1		0.9		2	12	12	3/4	3/4	12	12	2		0.9		1	15	GSHP B1-10	16
17	GSHP B1-11	15	3			1.9	4	12	12	3/4	3/4	12	12	2			2.9	1	15	GSHP B1-12	18
19	----------			1.9							3/4	12	12	2	1.1			1	15	GSHP B1-13	20
21	----------				1.9						3/4	12	12	2		1.8		1	15	GSHP B1-14	22
23	GSHP C1-1	15	3			2.7	4	12	12	3/4	3/4	12	12	4			2.7	3	15	GSHP C1-2	24
25	----------			2.7											2.7					----------	26
27	----------				2.7											2.7				----------	28
29	GSHP C1-3	15	3			2.7	4	12	12	3/4	3/4	12	12	2			0.8	1	15	EBB B1-1	30
31	----------			2.7							3/4	12	12	2	2.0			1	15	CUH B1-1	32
33	----------				2.7						3/4	12	12	2		3.0		1	15	CMUH B1-1	34
35	CUH B1-2	15	1			2.0	2	12	12	3/4	3/4	12	12	2			2.0	1	15	CUH B1-3	36
37	CUH C1-1	15	1	2.0			2	12	12	3/4	3/4	10	10	2	3.0			1	15	UH C1-1	38
39	SPARE	15	1		0.0												0.0	1	15	SPARE	40
41	SPARE	15	1			0.0											0.0	1	15	SPARE	42
	SIDE TOTAL KW LOAD			15	11	12									15	13	11			SIDE TOTAL KW LOAD	

NEC LOAD SUMMARY PANEL **HP4**

	LTS.	RECPS.	HVAC	MISC.	KITCH.		TOTAL	
	0.0	0.0	78.3	0.0	0.0	0.0	78.3	KVA (CONNECTED)
RECPS - 100% FIRST 10 kVA, 50% REMAINING (NEC 220.44)	125%	100%	100%	100%	100%	0%	100%	DEMAND FACTOR
KITCH. - BETWEEN 100% & 65% (NEC 220.56)	0.0	0.0	78.3	0.0	0.0	0.0	78.3	KVA (DEMAND)
NON-COINCIDENTAL - 0% (NEC 220.60)							**94**	AMPS (DEMAND)

NOTES:

PANEL DESIGNATION: RP4 (SECTION 1) | BUS AMP: 225A | MIN. A.I.C.: 10,000 | MAIN BREAKER: 175A
LOCATION: ELEC. 112 | PHASE: 3 | WIRE: 4 | VOLTAGE: 208Y/120
MOUNTING: SURFACE | NOTES: *-PROVIDE GFCI CIRCUIT BREAKER
TOTAL POLES: 42 | 7 | 8 | 6 | SECTION 2 TOTAL KW LOAD

CKT NO	DESCRIPTION	BREAKER AMP	POLES	LOAD (KW) A	B	C	WIRE NO	SIZE	GND. SIZE	COND SIZE	COND SIZE	GND. SIZE	WIRE SIZE	NO	LOAD (KW) A	B	C	BREAKER POLES	AMP	DESCRIPTION	CKT NO
1	ELECTRIC WATER COOLER-*	20	1	0.5			2	10	10	3/4	3/4	10	10	2	1.4			1	20	RECPS.-CORRIDOR	2
3	RECPS.-103A	20	1		0.7		2	10	10	3/4	3/4	10	10	2		1.3		1	20	RECPS.-103C,103D,103H,103L	4
5	RECPS.-103B,103H,103J	20	1			0.9	2	10	10	3/4	3/4	10	10	2			1.0	1	20	RECP.-REFRIGERATOR 103H	6
7	RECP.-REFRIGERATOR 103B	20	1	1.0			2	10	10	3/4	3/4	10	10	2	1.0			1	20	RECP.-REFRIGERATOR 103F	8
9	RECPS.-101H	20	1		0.7		2	10	10	3/4	3/4	10	10	2		0.9		1	20	RECPS.-101G,101H	10
11	RECPS.-101D,101E	20	1			1.1	2	10	10	3/4	3/4	10	10	2			0.7	1	20	RECPS.-101A	12
13	RECP.-COPIER 101A	20	2	0.8			3	10	10	3/4	3/4	10	10	2	0.7			1	20	RECPS.-101J,101M	14
15	----------				0.8						3/4	10	10	2		0.9		1	20	RECPS.-101C,101F,101L	16
17	RECPS.-101B,101C,101N	20	1			1.3	2	10	10	3/4	3/4	12	12	2			0.7	1	20	RECPS.-113	18
19	RECPS.-106A,110,115A,115B	20	1	0.7			2	12	12	3/4	3/4	10	10	3	1.0			2	30	RECP.-DRYER 115A	20
21	RECP.-WASHER 115A	20	1		1.0		2	12	12	3/4						1.0				----------	22
23	RECPS.-141	20	1			0.9	2	12	12	3/4	3/4	12	12	2			0.5	1	20	RECPS.-149	24
25	ELECTRIC WATER COOLER-*	20	1	0.5			2	12	12	3/4	3/4	12	12	2	1.1			1	20	RECPS.-CORRIDOR	26
27	RECPS.-112	20	1		0.2		2	12	12	3/4	3/4	12	12	2		1.0		1	20	RECP.-APPLIANCE 146	28
29	RECP.-APPLIANCE 146	20	1			1.0	2	12	12	3/4	3/4	12	12	2			1.0	1	20	RECP.-APPLIANCE 146	30
31	RECP.-APPLIANCE 146	20	1	1.0			2	12	12	3/4	3/4	12	12	2	0.5			1	20	RECPS.-146	32
33	ELECTRIC WATER COOLER-*	20	1		0.5		2	12	12	3/4	3/4	12	12	2		0.9		1	20	RECPS.-145,153C,153D	34
35	RECPS.-153B	20	1			0.7	2	12	12	3/4	3/4	12	12	2			0.4	1	20	RECPS.-153F	36
37	RECPS.-154F	20	1	0.2			2	12	12	3/4	3/4	12	12	2	0.5			1	20	RECPS.-150,151,152	38
39	RECP.-DRYER 152	15	2		0.9		3	12	12	3/4	3/4	12	12	2		1.7		1	20	RECP.-WASHER 152	40
41	----------					0.9					3/4	12	12	2			0.9	1	20	RECPS.-154A,154C,154D	42
	SIDE TOTAL KW LOAD			5	5	7									6	8	5			SIDE TOTAL KW LOAD	

PANEL DESIGNATION: RP4 (SECTION 2) | BUS AMP: 225A | MIN. A.I.C.: 10,000 | MAIN BREAKER: MLO
LOCATION: ELEC. 112 | PHASE: 3 | WIRE: 4 | VOLTAGE: 208Y/120
MOUNTING: SURFACE | NOTES:
TOTAL POLES: 42

CKT NO	DESCRIPTION	BREAKER AMP	POLES	LOAD (KW) A	B	C	WIRE NO	SIZE	GND. SIZE	COND SIZE	COND SIZE	GND. SIZE	WIRE SIZE	NO	LOAD (KW) A	B	C	BREAKER POLES	AMP	DESCRIPTION	CKT NO
43	RECPS.-154B	20	1	0.7			2	12	12	3/4	3/4	10	10	2	1.1			1	20	RECPS.-GYM	44
45	RECPS.-GYM	20	1		1.1		2	10	10	3/4	3/4	10	10	2		1.0		1	20	BACKBOARD WINCH	46
47	SPARE	20	1			0.0					3/4	10	10	2			1.0	1	20	BACKBOARD WINCH	48
49	BACKBOARD WINCH	20	1	1.0			2	10	10	3/4	3/4	10	10	2	1.0			1	20	BACKBOARD WINCH	50
51	BACKBOARD WINCH	20	1		1.0		2	10	10	3/4	3/4	10	10	2		1.0		1	20	BACKBOARD WINCH	52
53	BACKBOARD WINCH	20	1			1.0	2	10	10	3/4	3/4	10	10	2			1.0	1	20	BACKBOARD WINCH	54
55	RECPS. - SCORER'S TABLE	20	1	0.4			2	10	10	3/4	3/4	10	10	2	0.4			1	20	RECPS. - SCORER'S TABLE	56
57	SCREEN DIVIDER	20	1		1.0		2	10	10	3/4	3/4	10	10	2		1.0		1	20	SCREEN DIVIDER	58
59	BLEACHERS	20	1			1.0	2	10	10	3/4	3/4	10	10	2			1.0	1	20	BLEACHERS	60
61	RECP.-REFRIGERATOR 101C	20	1	1.0			2	12	12	3/4	3/4	10	10	2	0.7			1	15	EF-3	62
63	SCOREBOARD	20	1		0.2		2	10	10	3/4	3/4	12	12	2		0.9		1	20	RECPS. - 141	64
65	RECP.-113 - APPLIANCE	20	1			0.2	2	12	12	3/4	3/4	12	12	2			0.2	1	20	RECP.-113 - APPLIANCE	66
67	RECP.-113 - APPLIANCE	20	1	0.2			2	12	12	3/4	3/4	12	12	2	0.2			1	20	RECP.-113 - APPLIANCE	68
69	LIGHTS - 100B	20	1		0.7		2	12	12	3/4	3/4	12	12	2		0.7		1	20	PROJECTION SCREEN	70
71	SPARE	20	1			0.0											0.0	1	20	SPARE	72
73	SPARE	20	1	0.0											0.0			1	20	SPARE	74
75	SPARE	20	1		0.0											0.0		1	20	SPARE	76
77	SPARE	20	1			0.0											0.0	1	20	SPARE	78
79	SPARE	20	1	0.0											0.0			1	20	SPARE	80
81	SPARE	20	1		0.0												0.0	1	20	SPARE	82
83	SPARE	20	1			0.0											0.0	1	20	SPARE	84
	SIDE TOTAL KW LOAD			3	4	2									3	5	3			SIDE TOTAL KW LOAD	

NEC LOAD SUMMARY PANEL **RP4**

	LTS.	RECPS.	HVAC	MISC.	KITCH.		TOTAL	
	0.7	24.1	0.7	12.4	8.0	10.0	55.9	KVA (CONNECTED)
RECPS - 100% FIRST 10 kVA, 50% REMAINING (NEC 220.44)	125%	71%	100%	100%	65%	0%	65%	DEMAND FACTOR
KITCH. - BETWEEN 100% & 65% (NEC 220.56)	0.9	17.1	0.7	12.4	5.2	0.0	36.2	KVA (DEMAND)
NON-COINCIDENTAL - 0% (NEC 220.60)							**101**	AMPS (DEMAND)

NOTES:

PANEL SCHEDULES

LPK
CP4
RP4-1
RPK
HP4
RP4-2

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2010 Clipper Park Rd.
Suite 101
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410.235.7256

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SCHRADER GROUP ARCHITECTURE LLC
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LANDSCAPE ARCHITECT
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CIVIL ENGINEER
STV, INC.
7125 AMBASSADOR RD, SUITE 200
BALTIMORE, MD 21244

STRUCTURAL ENGINEER
ALBRECHT ENGINEERING
3500 BOSTON ST, SUITE 329
BALTIMORE, MD 21224

MEP ENGINEER
BRINJAC ENGINEERING
1800 N. CHARLES ST, SUITE 310
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FOOD SERVICE
NYIKOS ASSOCIATES
18219A FLOWER HILL WAY
GAITHERSBURG, MD 20879

AVIT CONSULTANT
EDUCATIONAL SYSTEMS PLANNING
49 OLD SOLOMONS ISLAND RD, SUITE 301
ANNAPOLIS, MD 21401

Baltimore City Public Schools
Additions & Renovations at Robert Poole Building #056

1300 W 36TH ST., BALTIMORE, MD 21211

I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND.
LICENSE NO.: 16094
EXPIRATION DATE: 12/14/2016

No.	DATE	DESCRIPTION
1	04/22/16	ADDENDUM #2
2	05/06/16	ADDENDUM #5

BID ISSUE

PROJECT No.: 152-01
DATE: 03/31/16
SCALE: AS NOTED

DRAWING NAME
ELECTRICAL PANEL SCHEDULES

E 604

5/6/2016 3:13 PM L:\PROJ\JRS_ARCHITECTS_INC\MPS.15.05ADE.00-ROPS-ROBERT POOLE RENOVATION ADDITION\E_DRAWINGS ENG\A_CAD\A_DRAWINGS\MEP\E604-15.05ADE.DGN
SARA MILLER

GENERAL NOTES:

1. PROVIDE SEISMIC SEPARATION ASSEMBLIES AT THE BUILDING EXPANSION JOINTS. REFER TO THE STRUCTURAL DRAWING FOR THE EXPANSION JOINT LOCATIONS.

KEYED NOTES:

(1) PROVIDE A KITCHEN HOOD SUPPRESSION SYSTEM. SEE THE SPECIFICATIONS FOR MORE DETAILS. SEE MECHANICAL DRAWINGS FOR HOOD TYPE.

(2) SEE FP 117 FOR GYM SPRINKLER MAIN LOCATION.

(3) PROVIDE DRY PENDANT HEADS IN THE FREEZER AND COOLER.

STANDPIPE RISER (UP)
DRAIN DISCHARGE
STAIR C1-1
SC1-1
STG-PE
148
OH-2
SPRINKLER RISER (UP)
GYM RISER (UP)
149
DRAIN RISER (UP)
IDF
147
AUXILIARY GYM
156
DINING
141
SERVE
142K
LKR/TLT
154C
TEAM - MEN'S
154D
OFFICE
154B
OH-1
KITCHEN
143
OFF
142C
DISH/TRAY
142H
ELEV 2
E2-1
ELEV 1
E1-1
RCVG
142
JC/SOAP
142D
SCH STORE
109
STG
109A
LKRS - MEN'S
154A
CORRIDOR
100F
TLT
142B
LKR
142A
FREE
142F
OH-2
DRY STOR
142E
TLT - MEN'S
154F
LAUNDRY
152
SHWR - MEN'S
154E
CORRIDOR
100J
SGA OFF
109B
RE
OH-2
TLT
109C
COOLER
142G
SHWR - WOMEN'S
153E
TLT - WOMEN'S
153F
REF LKR
150
GYMNASIUM
155
WOMEN
143
PANTRY
113
CARE
115B
JC
108
PASSAGE
110
LAUN
115A
MEN
144
LKRS - WOMEN'S
153A
CORRIDOR
100G
T/SH
116
ELEC
112
OH-1
(2)
OH-2
TEAM - WOMEN'S
153D
OFFICE
153B
STAIR B3-1
SB3-1
IDF
114
LKR/TLT
153C
CAREER READINESS
106B
PASSAGE
106A
TICKETS
146
LOBBY
100H
ALIGN

(1) FP 115 NEW WORK FIRST FLOOR PLAN C - FIRE PROTECTION
1/8" = 1'-0"

0 8 12 16 24

NOTE:
CONTRACTOR SHALL CHECK & VERIFY ALL DIMENSIONS & EXISTING CONDITIONS AT SITE.

5/6/2016 2:50:40 PM

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I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND.
LICENSE NO.: 19284
EXPIRATION DATE: 12/14/2016

No.	DATE	DESCRIPTION
1	05/06/16	ADDENDUM #5

BID ISSUE

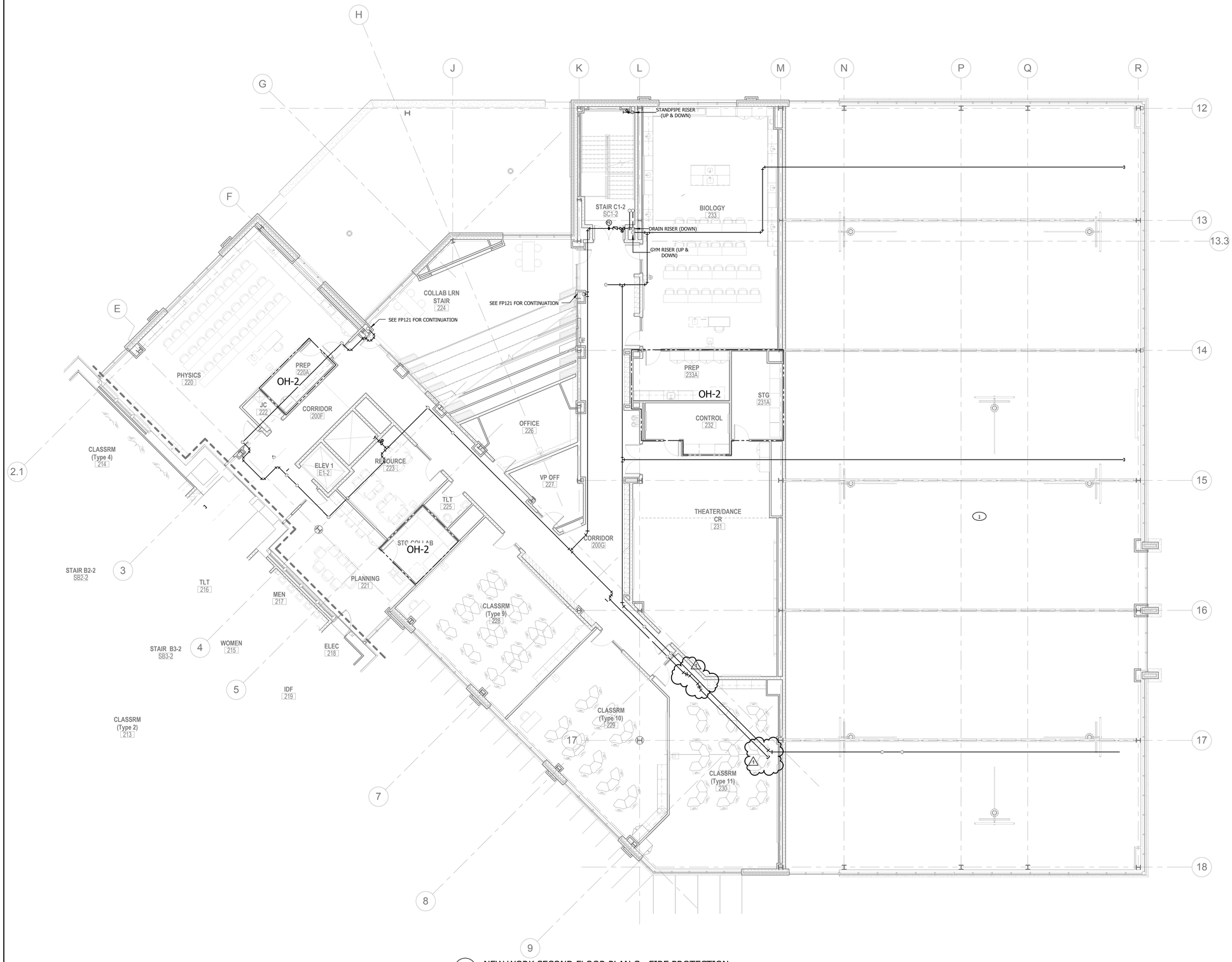
PROJECT No.: 152-01

DATE: 03/31/16

SCALE: AS NOTED

DRAWING NAME
NEW WORK FIRST FLOOR PLAN C - FIRE PROTECTION

FP 115



1 / FP 117 NEW WORK SECOND FLOOR PLAN C - FIRE PROTECTION

1/8" = 1'-0"

GENERAL NOTES:

1. PROVIDE SEISMIC SEPARATION ASSEMBLIES AT THE BUILDING EXPANSION JOINTS. REFER TO THE STRUCTURAL DRAWING FOR THE EXPANSION JOINT LOCATIONS.

KEYED NOTES:

(1) PROVIDE COMPLETE COVERAGE IN THE GYM WITH THE PARTITIONS OPEN OR CLOSED.

0 6 12 16 24

NOTE:
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No.	DATE	DESCRIPTION
1	05/06/16	ADDENDUM #5

BID ISSUE

PROJECT No.: 152-01

DATE: 03/31/16

SCALE: AS NOTED

DRAWING NAME:
NEW WORK SECOND FLOOR PLAN C - FIRE PROTECTION

FP 117

5/6/2016 2:53:58 PM